B. Tech. (Fashion Technology)

2022 Regulations, Curriculum & Syllabi

Stay Ahead

BANNARI AMMAN INSTITUTE OF TECHNOLOGY

An Autonomous Institution Affiliated to Anna University - Chennai • Approved by AICTE • Accredited by NAAC with "A+" Grade

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BANNARI AMMAN INSTITUTE OF TECHNOLOGY, SATHYAMANGALAM

REGULATIONS 2022

(CHOICE BASED CREDIT SYSTEM)

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

Regulations 2022 have been prepared in accordance with the guidelines given by the University Grants Commission, All India Council for Technical Education and affiliating Universities incorporating the features of the Choice Based Credit System (CBCS). The Regulations 2022 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 2022-2023 for Regular admission (Academic Year 2023-2024 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 (DoTE) 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 / 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 DoTE from time to time.

(or)

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 DoTE 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

1. Biomedical Engineering
2. Civil Engineering
3. Computer Science and Design
4. Computer Science and Engineering
5. Electrical and Electronics Engineering
6. Electronics and Communication Engineering
7. Electronics and Instrumentation Engineering
8. Information Science and Engineering
9. Mechanical Engineering
10. Mechatronics

B. Tech. Programmes

1. Agricultural Engineering
2. Artificial Intelligence and Data Science
3. Artificial Intelligence and Machine Learning
4. Biotechnology

5. Computer Science and Business Systems
6. Computer Technology
7. Fashion Technology
8. Food Technology
9. Information Technology
10. Textile Technology

3. STRUCTURE OF THE PROGRAMME

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

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

Engineering Science (ES) courses including Engineering Graphics, Basics of Electrical / Electronics / Civil / Mechanical, Engineering Mechanics and Computer Programming.

Humanities and Social Sciences (HSS) courses including Language Courses, Management Courses, Soft Skills and Professional Ethics.

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

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

The medium of instruction is English for all the Courses (except Tamil), examinations, seminar presentation, projects, and any other courses that a student registers for.

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

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

3.3 All the B.E. / B.Tech. Students will study Communicative English I during the firstsemester. In the second semester, they will be provided an option to enroll and study Communicative English II / German / Japanese / French / Hindi. while the lower segment will study Communicative English II.

3.4 Every student shall be required to opt for 10electives from the list of electives. Students can opt for the electives (Core / Professional) from his / her own discipline courses, during IV to VII Semesters, if he/she satisfies the prerequisite for that particular course.

3.5 However, out of ten electives, every student shall be required to opt for, a minimum of one and subject to a maximum of three courses as open electives from the list of electives of the branch / branches other than his / her branch of specialization, if he/she satisfies the prerequisite for that particular course. The course / content should not be covered in their own curriculum and syllabi.

3.6 Students can also opt for **one-credit courses** of 15 to 20 hours duration, which will be offered by the experts from the industry on specialised topics. Students can opt for such **one-credit courses** during the semesters I to VI as and when these courses are offered. A student will also be permitted to register the **one-credit courses** offered by other departments, provided the student has fulfilled the necessary prerequisites or the courses that may not require any prerequisites. Under no circumstances, the same one credit course shall be repeated in subsequent semesters in any department / centre for the same batch of the students and a maximum batch size for a given course shall not exceed 40. In case of disciplines with multiple divisions (intake more than 60) multiple batches/ 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 VII, he / she can do so by exercising his / her option in writing to the respective Head of the Department during the beginning of the VII semester, following the equivalence norm, that one **regular elective** (in the **VII Semester**) is equivalent to **three one-credit courses** completed by the student during the previous semesters, III to VI. 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 II semesters shall be maintained in the Grade sheet as “Additional credits earned” (not considered for the computation of SGPA/CGPA).

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

3.8 A Student may be permitted to credit three online courses with the approval of the Departmental Consultative Committee constituted by the Head of the Department, subject to a maximum of 9 credits. The Head of the Institution shall form a 3-member committee with one of the members as HoD and two senior faculty members to ensure that the student has not studied such courses and would not repeat it again as Professional Core/Professional Elective/Open Elective courses. A student can get exemption for a maximum of 9 credits (refer amendments of R2022 approved in 29th ACM) during the entire programme (in lieu of core elective or open elective). These online courses shall be chosen from the SWAYAM NPTEL platform, provided the offering organisation conducts regular examination and provides marks. The credits earned shall be transferred and the marks earned shall be converted into grades and transferred, provided the student has passed in the examination as per the norms of the offering organisation.

For online courses the following grading pattern is applicable in case of credit transfer and CGPA calculations

Range of percentage of total marks	Letter Grade	Grade Point
91 - 100	O	10
81 - 90	A+	9
71 - 80	A	8
61 - 70	B+	7
51 - 60	B	6
40-50	C	5
< 40	U	0

3.9 Industrial Training / Internship

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

Duration of Training / Internship	Credit(s)
2 Weeks	1
4 Weeks	2
6 Weeks	3

3.10 Socially Relevant Projects

A student may be permitted to carry out socially relevant projects during semester II to semester VI in consultation with the faculty guide and submit the project report, in the prescribed format, at the end of the Semester for valuation.

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

3.11 Mandatory courses

The student shall study the mandatory courses prescribed by the institute which will be mentioned in the Grade Sheet. However, it will not be considered for computation of CGPA.

For the students who complete the Mandatory Course satisfying the attendance requirement, the title of the Mandatory Course will be mentioned in the Grade Sheet.

3.12 Choice of Professional Elective Courses

The professional Elective Courses are listed in the Curriculum in Table format as verticals (Specialisation groups). A student can choose all the Professional Elective

Courses either from one of the verticals or a combination of courses from all verticals in a semester. However, students irrespective of enrolling for additional Insertion of New Clause 6.3 are not permitted to choose more than one course from a row. Students are permitted to enroll in more than one elective course from the same vertical in a semester. In the subsequent semesters students are permitted to enroll one more course in a row, provided if he/she has cleared the earlier course of the same row. For a professional elective course and open elective course, the minimum number of students enrolment permitted shall be 10. However, the minimum number is not applicable for students enrolling B.E. / B. Tech. (Hons) and B.E. / B. Tech. Minor. For the offer of each professional elective at least two choices shall be offered.

4. VALUE ADDED COURSES

A student can opt for the Value Added Courses offered by the various departments from semester II to VII.A separate certificate will be issued on successful completion of the value added course by the competent authority.

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 75 working days. Head of the Department shall ensure that every faculty member teaches the course as prescribed in the approved curriculum and syllabi.

5.4 Special Theory / Practical Sessions may be conducted for students who require additional inputs (remedial classes) over and above the number of periods normally specified, 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 Each student shall register for all courses to be undergone in the curriculum of a particular semester (with the facility to drop courses to a maximum of 8 credits (vide clause 6.6)). The courses dropped in earlier semesters can be registered in the subsequent semesters when offered.

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

6.3 The courses that a student registers in a particular semester may include

i. Courses of the current semester.

ii. Courses dropped in the lower semesters

6.4 The maximum number of credits that can be registered in a semester is 30. However, this does not include the number of Re-appearance (RA) and Withdrawal (W) courses registered by the student for the appearance of the examination.

6.4.1 From the V to VIII semesters, the student has the option of registering for additional courses in a semester. With regard to enrolling for B.E. / B. Tech. (Hons) or B.E. / B. Tech. Minor. Maximum number of credits enrolled in a semester (Honours and Minor) shall not exceed 36. The online courses registered for B.E. / B. Tech. (Hons.) and B.E. / B. Tech. minor shall be over and above this 36 credits.

6.5 Flexibility to Drop Courses

6.5.1 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.

6.5.2 From the III to VII semesters (from IV to VII semesters in case of lateral entry students), the student has the option for dropping existing courses. The number of courses a student can drop is limited to 2 in a given semester. The student is permitted to drop the course(s) within 30 days of the commencement of the academic schedule. In such cases, the attendance requirement as stated in Clause 7 is mandatory.

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

6.6 Reappearance Registration

6.6.1 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.

6.6.2 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.

6.6.3 If the theory course, in which the student has failed, is either a professional elective or an open elective, the student may register for Semester End Examinations of the same professional elective or open elective course, respectively in the subsequent semesters.

6.6.4 In this case (Clause 6.6.3), the student shall attend the classes, satisfy the attendance requirements (vide Clause 7), earn Continuous Assessment marks and appear for the Semester End Examination.

6.6.5 The student who fails in any continuous assessment courses shall register for the same in the subsequent semesters or when offered next, and **repeat** the course as per Clause 6.6.4.

6.6.6 If a student is prevented from writing the Semester End Examination of courses due to lack of attendance, the student has to repeat the semester when it is offered next time.

7. REQUIREMENTS FOR APPEARING FOR THE SEMESTER END EXAMINATIONS 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 Semester End 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% overall attendance.

7.2 If a student, secures overall attendance between 70% and less than 80%) 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 Institution (along with condonation form). Such certificates along with the condonation forms shall be forwarded to the Office of 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.

7.3 A student shall normally be permitted to appear for Semester End 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% overall attendance would not be permitted to move to the higher semester and has to repeat the current semester in the next academic year as per the norms prescribed.

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

7.6 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. The faculty advisor also discusses with or informs the parents about the progress / performance of the students concerned.

The responsibilities of the faculty advisor are:

- To inform the students about the various facilities and activities available to enhance the student's curricular and co-curricular activities.
- To guide student enrolment and registration of the courses.
- To authorize the final registration of the courses at the beginning of each semester.

- To monitor the academic and general performance of the students including attendance and to counsel them accordingly.

9. COMMITTEES

9.1 Common Course Committee

9.1.1 A theory course handled by more than one faculty member 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 to this, Common Course Committee (without the student representatives) shall meet to ensure uniform evaluation through the common question papers during continuous assessment and Semester End 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) Semester End Examination at the end of the semester for the regular courses or as given in the Clause 17.

10.2 Each course, both theory, theory with lab component and laboratory including project work, shall be evaluated as per the scheme of assessment given in Clause 17.

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

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

11. PASSING REQUIREMENTS AND PROVISIONS

11.1 The Passing requirement for a student in a course is determined based on the marks obtained both in continuous assessment and Semester End Examinations. A student who secures not less than 50% of total marks prescribed for the course [Continuous Assessment + Semester End Examinations] with a minimum of 45% of the marks prescribed for the Semester End Examinations, shall be declared to have passed the course and acquired the relevant number of credits.

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

Continuous Assessment (CA) marks obtained by the student in the first appearance shall be retained and considered valid for one subsequent attempt, except Clause 6.6.4, 6.6.5, 6.6.6 and 6.6.7. However, from the third attempt onwards, the student shall be declared to have passed the course if he/she secures a minimum of 50% in the course prescribed during the Semester End Examinations.

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

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

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

Branch of Study	**Minimum Credits**	
	Regular Admission	**Lateral Entry**
B.E. Programmes		
Biomedical Engineering	163	121
Civil Engineering	164	122
Computer Science and Design	163	119
Computer Science and Engineering	163	119
Electrical and Electronics Engineering	163	121
Electronics and Communication Engineering	163	121
Electronics and Instrumentation Engineering	163	121
Information Science and Engineering	162	118
Mechanical Engineering	164	122
*Mechatronics / #Mechatronics Engineering	165	123
B.Tech. Programmes		
Artificial Intelligence and Data Science	165	121
Artificial Intelligence and Machine Learning	163	119
Biotechnology	165	123

Computer Science and Business Systems	163	123
Computer Technology	163	119
Fashion Technology	163	121
Food Technology	163	121
Information Technology	163	119
Textile Technology	163	121

*-applicable to candidates admitted during the AY.:2022-2023

#-applicable to candidates admitted during the AY.:2023-2024 onwards

11.5 Total number of credits to be earned by the student shall be more than or equal to the total number of credits prescribed in the curriculum in force. If the credit assigned for L T P of the courses are not same in two Regulations under consideration, then equivalence shall be arrived as per the credit assignment followed in the Regulations in force.

11.6 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 the Institution, if a student migrates from other affiliated institutions to Bannari Amman Institution of Technology or rejoins from previous regulation to this regulation.

11.7 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 Semester End Examinations and/or Continuous Assessments, carrying marks as specified in Clause 17. Letter Grades (based on Credits and Grades) are awarded to the students based on the performance in the evaluation process.

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

12.3 Condition for Relative Grading

The students' strength is greater than 30, the relative grading method shall be adopted. If the students' strength is less than or equal to 30 then the absolute grading system shall be followed with the grade range as specified below. The relative grading system shall not be applicable for laboratory, project works and continuous assessment courses.

O	A+	A	B+	B	C	U
91-100	81- 90	71- 80	61-70	56- 60	50–55	<50

12.4 The performance of a student will be reported using Letter Grades, each carrying certain points as detailed below: A student who earns a minimum of 5 grade points in a course is declared to have successfully passed the course.

Description	Letter Grade	Grade Points
Outstanding	O	10
Excellent	A +	9
Very Good	A	8
Good	B +	7
Average	B	6
Satisfactory	C	5
Reappearance	U	0
Withdrawal	W	0
Absent	AB	0
Shortage of Attendance	SA	0

'U' ---Reappearance is required for that particular course

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

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

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

Where

C_i : Credit allotted to the course.

g_i : Grade Point secured corresponding to the course.

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

RA grades will be excluded for calculating SGPA and CGPA.

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

12.7 For the non-credit courses grades shall be indicated as given in Clause 17 and shall not be counted for the computation of SGPA/CGPA.

For the co-curricular activities such as NCC / NSS / NSO / YRC etc.., a completed status will appear in the grade sheet. Every student shall put in a minimum of 75% attendance in the training and attend the camp compulsorily. The training and camp shall be completed before registering for the fifth semester courses. A completed status in the co-curricular activities is compulsory for the award of a degree.

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

12.9 **Eligibility for the Award of Degree**

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

i. Successfully gained the required number of total credits as specified in the curriculum corresponding to the student's programme within the stipulated time.

ii. Successfully completed the course requirements, appeared for the Semester End Examinations and passed all the courses prescribed in all the 8 semesters within a maximum period of 7 years for regular / 6 years for lateral reckoned from the commencement of the first semester to which the candidate was admitted.

iii. Successfully completed the NCC / NSS / NSO / YRC / Extra-curricular/ Co-curricular requirements.

iv. No disciplinary action is pending against the student.

v. The award of degree must have been approved by the Syndicate of the University.

12.10 Conduct of Academic Audit

The purpose of the academic audit is to encourage departments to evaluate the quality of their education processes, thereby assure and regularly improve the quality of teaching learning process and the outputs. A regular academic audit is conducted in the Institute to evaluate the performance of various departments so that the issues that need attention can be identified to improve the overall quality of curriculum design, teaching learning process, and evaluation. The academic audits are conducted by internal and external academic experts.

12.11 Conduct of Special Examination

The special or makeup exams may be conducted for the students who missed the regular examination due to participation / representing the institute in various activities and the schedule may be included in the academic calendar. The special or makeup exams may be conducted after the completion of Semester End Examinations and prior to publishing the results of semester end examinations.

12.12 In the consolidated grade sheet the CGPA earned shall be convertedinto Percentage of marks as follows: Percentage of Marks = CGPA × 10

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 of the period of Break of study as per Clause 15 and satisfy any one of the conditions required as given below.

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

- Should have passed the examination in all the courses of all the eight semesters (six semesters for lateral entry students) in the student’s First Appearance within five years / four years for lateral, which includes authorised break of study of one year. Withdrawal from examination (vide Clause 15) will not be considered as an appearance.

- Should have secured a CGPA of **not less than 8.50**
- Should **NOT** have been prevented from writing Semester End Examination due to lack of attendance.

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

- Should have passed the examination in all the courses of all eight semesters (six semesters for lateral entry students) within five years / four years for lateral, which includes one year of authorized break of study (if availed) or prevention from writing the Semester End Examination due to lack of attendance (if applicable).
- Should have secured a CGPA of **not less than 6.50**

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

14. WITHDRAWAL FROM THE EXAMINATION

14.1 A student may, for valid reasons, be granted permission by the Head of the Department to withdraw from appearing in the examination in any course(s) only once during the entire duration of the degree programme. The application shall be sent to the office of the Controller of Examinations through the Head of the Institution with required documents.

14.2 Withdrawal application shall be valid only, if the student is eligible to write the examination as per Clause 7 and, if it is made within 10 working days before the commencement of the Semester End Examination in that course or courses and also recommended by the Head of the Department.

14.3 Notwithstanding the requirement of mandatory 10 working days notice, applications for withdrawal for special cases under extraordinary conditions will be considered on the merit of the case.

14.4 If a student withdraws a course or courses from writing Semester End Examinations, he/she shall register the same in the subsequent semester and write the Semester End Examination(s).

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

14.6 Withdrawal is permitted for the Semester End Examinations in the final semester, only if the period of study of the student concerned does not exceed 5 years (for regular) / 4 years (for lateral) as per clause 13.1 & 13.2.

15. AUTHORIZED BREAK OF STUDY FROM A PROGRAMME

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

15.2 A student is normally not permitted to break the period of study temporarily. However, if a student happens to discontinue the programme temporarily during the middle of programme of study, for reasons such as personal accident or hospitalization due to ill health or in need of health care, he/she shall apply to the Head of the Institution in advance, in any case, not later than the last date for registering for the semester examination, through the Head of the Department stating the reasons for the break of study. 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 re-join the programme after the break / prevention due to lack of attendance, shall be governed by the curriculum and regulations in force at the time of rejoining. The students re-joining in new regulations shall apply to the Academic In charge in the prescribed format through the Head of the Department at the beginning of the readmitted semester itself for prescribing additional/equivalent courses, if any, from any semester of the regulations in force, so as to bridge the curriculum in force and the old curriculum.

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

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

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

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

16. IMPLEMENTATION OF HONOURS / MINOR DEGREE

16.1 B.E. / B.Tech. (Hons.)

- The students should have earned additionally a minimum of 18 credits from more than one vertical of the same programme.
- Should have passed all the courses in the first attempt.
- Should have earned a minimum CGPA of 7.50.

16.2 B.E. / B.Tech. Minor in another discipline

The student should have earned additionally a minimum of 18 credits in any one of the verticals of other B.E/B.Tech. programmes.

- B.E / B.Tech. (Hons.) and B.E./B.Tech. Minor in another discipline will be optional for students and the students shall be permitted to select any of them only.
- B.E/B.Tech. (Hons.) or B.E./ B.Tech. Minor shall be offered by the Department irrespective of the number of students enrolled.

If the student has failed in the additional courses or faced a shortage of attendance, they will not be printed in the grade sheet and will not be considered for CGPA calculation and classification of degree.

16.3 Students can earn a maximum of 6 credits in online mode (SWAYAM NPTEL platform), out of these 18 credits with the approval of the Departmental Consultative Committee constituted by the Head of the Department.

16.4 B.E./ B. Tech. (Honours) in the same discipline, B.E. / B.Tech. Honours and B.E. / B.Tech. Minor in another discipline degrees will be optional for students.

16.5 For category 16.1, the students will be permitted to register for the courses from V Semester onwards provided the CGPA earned by the students until semester III should be of 7.50 and above and cleared all the courses in the first attempt.

16.6 For category 16.2, the students will be permitted to register the courses from semester V onwards provided the CGPA earned by the students until semester III is 7.50 and above.

16.7 If a student decides not to opt for Honours, after completing a certain number of additional courses, the additional courses studied shall be considered instead of the professional elective courses which are part of the curriculum. If the student has studied more number of such courses than the number of Professional Elective courses required as per the curriculum, the courses with higher grades shall be considered for the calculation of CGPA. Remaining courses shall be printed in the grade sheet, however, they will not be considered for the calculation of CGPA.

16.8 If a student decides not to opt for Minor degree, after completing a certain number of courses, the additional courses studied shall be considered instead of open elective courses which are part of the curriculum. If the student has studied more of such courses than the number of open electives required as per the curriculum, the courses with higher grades shall be considered for calculation of CGPA. Remaining courses shall be printed in the grade sheet, however, they will not be considered for the calculation of CGPA.

16.9. If a student successfully completes all the requirements of the programme and also meets the requirements of B.E. / B. Tech. (Hons) or B.E. / B. Tech. Minor but desires not to opt for the additional qualification, then he/she has to submit a declaration with regard to the same 30 days before the completion of VIII semester.

16.10 Classification of the Degree Awarded

The conditions for First Class with Distinction, First Class, and Second Class are the same as Clause 13.1, 13.2 and 13.3 except the following classification.

First Class: A student who satisfies the following conditions shall be declared to have passed the examination in First class for the purpose of the 'Award of Degree', of **B.E. / B.Tech.** Honors should have secured a CGPA of not less than 7.50.

17. SCHEME OF ASSESSMENT

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

I CO- CURRICULAR /EXTRACURRICULAR ACTIVITY

a. CO-CURRICULAR ACTIVITY

Component	Applicable from academic year 2024-2025 onwards
	Marks
Continuous Internal Assessment (CIA)	**100**
Distribution of marks for CIA	
Programme Organization / Participation	20
Member of Technical society (International / National repute like IEEE, IET etc.)	20
Brief Report of event	20
Sharing of Views / Presentation / Seminar	20
Attendance	10
Coordinator Assessment	10
Total Marks	**100**

b. EXTRACURRICULAR ACTIVITY (NCC/NSS/ NON-TECHNICAL CLUBS)

Component	Applicable from academic year 2024-2025 onwards
	Marks
Continuous Internal Assessment (CIA)	**100**
Distribution of marks for CIA	
Activity plan and Programme Organization	20
Participation (National / State / Regional /Institute)	20
Activity Report	20
Achievements	20
Attendance	10
Coordinator Assessment	10
Total Marks	**100**

c. EXTRA CURRICULAR ACTIVITY (SPORTS AND GAMES)

Component	**Applicable from academic year 2024-2025 onwards**
	Marks
Continuous Internal Assessment (CIA)	**100**
Distribution of marks for CIA	
Participation (National / State / Regional /Institute)	20
Regular practice	20
Skill Development	20
Sportsmanship (sports ethics) and Teamwork	20
Achievements	10
Coordinator Assessment	10
Total Marks	**100**

II COMPREHENSIVE WORK

Component	**Applicable till academic year 2022-2023**
	Marks
Concept Application	50
Comprehensive Interview	50
Total Marks	**100**

III ENGINEERING DRAWING

Component	**Applicable till academic year 2023-2024**	**Applicable from academic year 2024-2025 onwards**
	Marks	**Marks**
Continuous Internal Assessment (CIA)	**100**	**50**

Distribution of marks for CIA		
Exercise (Minimum 10 Exercises /Modelling)	60	-
Model Examinations	40	25
Class work	-	05
Assignments (Minimum 8)	-	20
Semester End Examinations (SEE)	**-**	**50**
Total Marks	**100**	**100**

IV ENVIRONMENTAL SCIENCE

Component	**Applicable till academic year 2023-2024**	**Applicable from academic year 2024-2025 onwards**
	Marks	**Marks**
Continuous Internal Assessment (CIA)	**100**	**100**
Distribution of marks for CIA		
Periodical Test I	25	25
Periodical Test II	25	25
Innovative Practices / Case studies (50)	50	-
Assignments / Case studies	-	50
Total Marks	**100**	**100**

V HOSPITAL TRAINING

Component	**Applicable till academic year 2023-2024**	**Applicable from academic year 2024-2025 onwards**
	Marks	**Marks**
Continuous Internal Assessment (CIA)	**100**	**60**
Distribution of marks for CIA		
Assessment by Industry	30	-

Viva-voce	20	-
Presentation	30	-
Case Study / Report	20	-
Daily Work log	-	30
Workplace learning report (1 page)	-	10
Trainer Assessment	-	20
Semester End Examinations (SEE) *a. Presentation* *b. Report* *c. Viva voce*	-	**40** *20* *10* *10*
Total Marks	**100**	**100**

VI HUMAN VALUES AND ETHICS

Component	Applicable till academic year 2023-2024	Applicable from academic year 2024-2025 onwards
	Marks	**Marks**
Continuous Internal Assessment (CIA)	**100**	**40**
Distribution of marks for CIA		
Periodical Test I	25	15
Periodical Test II	25	15
Innovative Practices / Case studies	50	-
Assignments / Case studies	-	10
Semester End Examinations (SEE)	-	**60**
Total Marks	**100**	**100**

VII INDUSTRIAL TRAINING/ INTERNSHIP

Component	Marks
Midterm Review	30
Final Presentation	30
Viva-voce	20

Case Study / Report	20
Total Marks	**100**

VIII LABORATORY COURSES

Component	**Applicable till academic year 2023-2024**	**Applicable from academic year 2024-2025 onwards**
	Marks	**Marks**
Continuous Internal Assessment (CIA)	**100**	**60**
Distribution of marks for CIA		
Preparation	20	10
Experiment and Analysis of Results	20	10
Record	10	10
Test – Cycle I	25	15
Test – Cycle II	25	15
Semester End Examinations (SEE)	-	**40**
Total Marks	**100**	**100**

IX LANGUAGE COURSES

a. LANGUAGE ELECTIVES - COMMUNICATIVE ENGLISH II / HINDI / GERMAN / JAPANESE / FRENCH)

Component	**Applicable till academic year 2023-2024**	**Applicable from academic year 2024-2025 onwards**
	Marks	**Marks**
Continuous Internal Assessment (CIA)	**100**	**50**
Distribution of marks for CIA		
Test1 *a. Listening* *b. Speaking* *c. Reading* *d. Writing*	**25** *5* *10* *5* *5*	**25** *5* *5* *5* *10*
Test 2	**25**	**25**

a. Listening *b. Speaking* *c. Reading* *d. Writing*	*5* *10* *5* *5*	*5* *5* *5* *10*
Oral Exam	**50**	**-**
Semester End Examinations (SEE)	**-**	**50**
Total Marks	**100**	**100**

b. TAMIL COURSES

Component	Applicable till academic year 2023-2024	Applicable from academic year 2024-2025 onwards
	Marks	**Marks**
Continuous Internal Assessment (CIA)	**100**	**40**
Distribution of marks for CIA		
Periodical Test	50	-
Quiz/ Assignment	50	20
Case study report	-	20
Semester End Examinations (SEE)	**-**	**60**
Total Marks	**100**	**100**

c. FOUNDATIONAL ENGLISH / SOFT SKILLS & EFFECTIVE COMMUNICATION / ADVANCED ENGLISH AND TECHNICAL EXPRESSION

Component	Applicable till academic year 2023-2024	Applicable from academic year 2024-2025 onwards
	Marks	**Marks**
Continuous Internal Assessment (CIA)	**100**	**60**
Distribution of marks for CIA		
Test	**50**	**-**
Quiz/ Assignment	**50**	**-**
Test 1 *a. Listening* *b. Speaking*	**-**	**30** *5* *10*

c. Reading *d. Writing*		*5* *10*
Test 2 *a. Listening* *b. Speaking* *c. Reading* *d. Writing*	-	**30** *5* *10* *5* *10*
Semester End Examinations (SEE)	-	**40**
Total Marks	**100**	**100**

d. BUSINESS COMMUNICATION AND VALUE SCIENCE COURSES

Component	**Applicable from academic year 2024-2025 onwards**
	Marks
Continuous Internal Assessment (CIA)	**50**
Distribution of marks for CIA	
Periodical Tests	25
Laboratory Assessment	25
Semester End Examinations (SEE) *Laboratory Assessment only*	**50**
Total Marks	**100**

X MINI PROJECT I & II

Component	**Applicable till academic year 2023-2024**	**Applicable from academic year 2024-2025 onwards**
	Marks	**Marks**
Continuous Internal Assessment (CIA)	**100**	**60**
Distribution of marks for CIA		
Review I	25	30
Review II	25	30
Final Presentation and Viva-voce	30	-
Report	20	

Semester End Examinations (SEE) *a. Report* *b. Presentation & Viva Voce*	**-**	**40** *20* *20*
Total Marks	**100**	**100**

XI PROJECT WORK I

Component	Applicable till academic year 2023-2024	Applicable from academic year 2024-2025 onwards
	Marks	**Marks**
Continuous Internal Assessment (CIA)	**50**	**60**
Distribution of marks for CIA		
Review I *a. Literature Survey* *b. Identification of topic and Justification* *c. Work plan* *d. Problem Statement and Literature Survey* *e. Contribution to the work* *f. Viva voce*	**20** *5* *5* *10* - - -	**30** - - *10* *5* *10* *5*
Review II *a. Approach & Results* *b. Conclusion* *c. Methodology & Results* *d. Conclusion with report* *e. Publication* *f. Viva voce*	**30** *15* *15* - - - -	**30** - - *10* *10* *5* *5*
Semester End Examinations (SEE) *a. Report* *b. Presentation* *c. Viva voce*	**50** *20* *20* *10*	**40** *15* *15* *10*
Total Marks	**100**	**100**

XII PROJECT WORK II

Component	Applicable till academic year 2023-2024	Applicable from academic year 2024-2025 onwards
	Marks	**Marks**
Continuous Internal Assessment (CIA)	**50**	**60**

Distribution of marks for CIA		
Review I *a. Progress* *b. Problem Statement and Literature Survey* *c. Methodology* *d. Work Contribution* *e. Viva voce*	**10** *10* - - - -	**20** - *5* *5* *5* *5*
Review II *a. Approach & Results* *b. Work Contribution* *c. Viva voce*	**10** *10* - -	**20** *10* *5* *5*
Review III *a. Conclusion & Final Presentation* *b. Report* *c. Publication of Paper in Conferences / Journals* *d. Results & Discussions* *e. Report and Contribution* *f. Publication* *g. Viva voce*	**30** *10* *15* *5* - - - -	**20** - - - *5* *5* *5* *5*
Semester End Examinations (SEE) *a. Presentation* *b. Viva voce* *c. Report*	**50** *30* *20* -	**40** *15* *10* *15*
Total Marks	**100**	**100**

XIII SOCIALLY RELEVANT PROJECT

Component	**Applicable from academic year 2024-2025 onwards**
	Marks
Continuous Internal Assessment (CIA)	**100**
Distribution of marks for CIA	
Field Survey	20
Problem Statement / Problem Identification and Social Relevance	20
Approach to the Problem / Methodology	20
Presentation / Seminar	10
Sustainable solutions and Future Plans	10
Report	10

Novelty	10
Total Marks	**100**

XIV STARTUP MANAGEMENT

Component	Applicable till academic year 2023-2024	Applicable from academic year 2024-2025 onwards
	Marks	Marks
Continuous Internal Assessment (CIA)	**100**	**50**
Distribution of marks for CIA		
Conduct of Fieldwork / Case Studies & Report	60	25
Model Examination	40	-
Assignments / Experiments & Report	-	25
Semester End Examinations (SEE)	**-**	**50**
Total Marks	**100**	**100**

XV THEORY COURSES

Component	Marks
Continuous Internal Assessment (CIA)	**40**
Distribution of marks for CIA	
Periodical Test I	12
Periodical Test II	12
Innovative Practices	16
Semester End Examinations (SEE)	**60**
Total Marks	**100**

XVI THEORY COURSES WITH LAB COMPONENT

<table>
<tr><th rowspan="2">Component</th><th>Applicable till academic year 2023-2024*</th><th>Applicable from academic year 2024-2025 onwards#</th></tr>
<tr><th>Marks</th><th>Marks</th></tr>
<tr><td>Continuous Internal Assessment (CIA)</td><td>50</td><td>50</td></tr>
<tr><td colspan="3">Distribution of marks for CIA</td></tr>
<tr><td>Periodical Test I</td><td>15</td><td rowspan="2">25</td></tr>
<tr><td>Periodical Test II</td><td>15</td></tr>
<tr><td>Innovative Practices
(Laboratory Assessment & Report)</td><td>20</td><td>25</td></tr>
<tr><td>Semester End Examinations (SEE) *
(QP pattern as per (I))</td><td>50</td><td>50</td></tr>
<tr><td>Semester End Examinations (SEE) #
Courses with L T P C: 2 0 2 3
a. Theory Examinations
b. Laboratory Assessment</td><td>-</td><td>25
25</td></tr>
<tr><td>Semester End Examinations (SEE) #
Courses with L T P C: 3 0 2 4, 2 1 2 4, 3 1 2 5
a. Theory Examinations
b. Laboratory Assessment</td><td>-</td><td>35
15</td></tr>
<tr><td align="right">Total Marks</td><td>100</td><td>100</td></tr>
</table>

XVII VALUE-ADDED / CERTIFICATE COURSES

Component	Marks
Daily Assessment	50
Final Evaluation / Test	50
Total Marks	**100**

Optional Test: A student becomes eligible to appear for an optional test conducted after the Periodical Test II, only under the following circumstances: (i) absent for Test I or Test II or both on account of medical reasons (hospitalization / accident / specific illness), or (ii) participation in the College / University / State / National / International level Sports events with prior permission from the Head of the Institution and (iii) on satisfying the conditions (i) or (ii), the student should have registered for the Optional Test, through the concerned member of faculty who handles the course or through the respective Head of the Department, submitted to the Controller of Examinations. Such Optional Tests are conducted for the courses under the categories I and II courses listed above.

18. FIELD / INDUSTRIAL VISIT / INTERNSHIP

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

19. 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. The attendance of the personality and character development courses / events shall be maintained on the regular basis by the club coordinator and made available in the Office of the Controller of Examinations before the commencement of Semester examinations of Semester I to Semester IV.

20. 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 Semester End Examination / Continuous Assessments, he / she shall be liable for punitive action as prescribed by the Institution / University from time to time.

21. REVISION OF REGULATIONS, CURRICULUM AND SYLLABI

The Institution reserves the right to revise/amend/change the Regulations, Curriculum, Syllabi, Scheme of Examinations through the Academic Council.

CONTENTS

VISION OF THE DEPARTMENT

To provide dynamic and impactful education in the field of Fashion Design and Technology, facilitate transfer of knowledge and skills, achieve academic excellence in meeting the emerging needs of the nation"s fashion industry and the world.

MISSION OF THE DEPARTMENT

- To pursue impactful research, impart value based education and skill based education to meet the challenging needs of the Fashion industry as well as society.
- To foster students for higher education in fashion designing, merchandising and research related activities.
- To nurture and develop entrepreneurial skills among students for project management and entrepreneurial ventures by providing infra-structure, human resource and enterprise knowledge.

PROGRAMME EDUCATIONAL OBJECTIVIES (PEOs)

I. Graduates will be having successful careers in industry, academics and research in the fields of apparel technology and fashion design with a fundamental knowledge and skill in basics of science, technology, arts, mathematics, computers and apparel manufacturing processes

II. Graduates will be globally competent in fashion industry project management and entrepreneurship through effective communication, design and technology skills and also be able to appraise social and environmental issues.

III. Graduates will demonstrate spirit of ethics, leadership and engage in professional practice throughout their career.

PROGRAMME OUTCOMES (POs)

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. 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.
4. 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.
5. 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.
6. 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.
7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. 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.
11. 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.
12. 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.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

1. Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.
2. Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

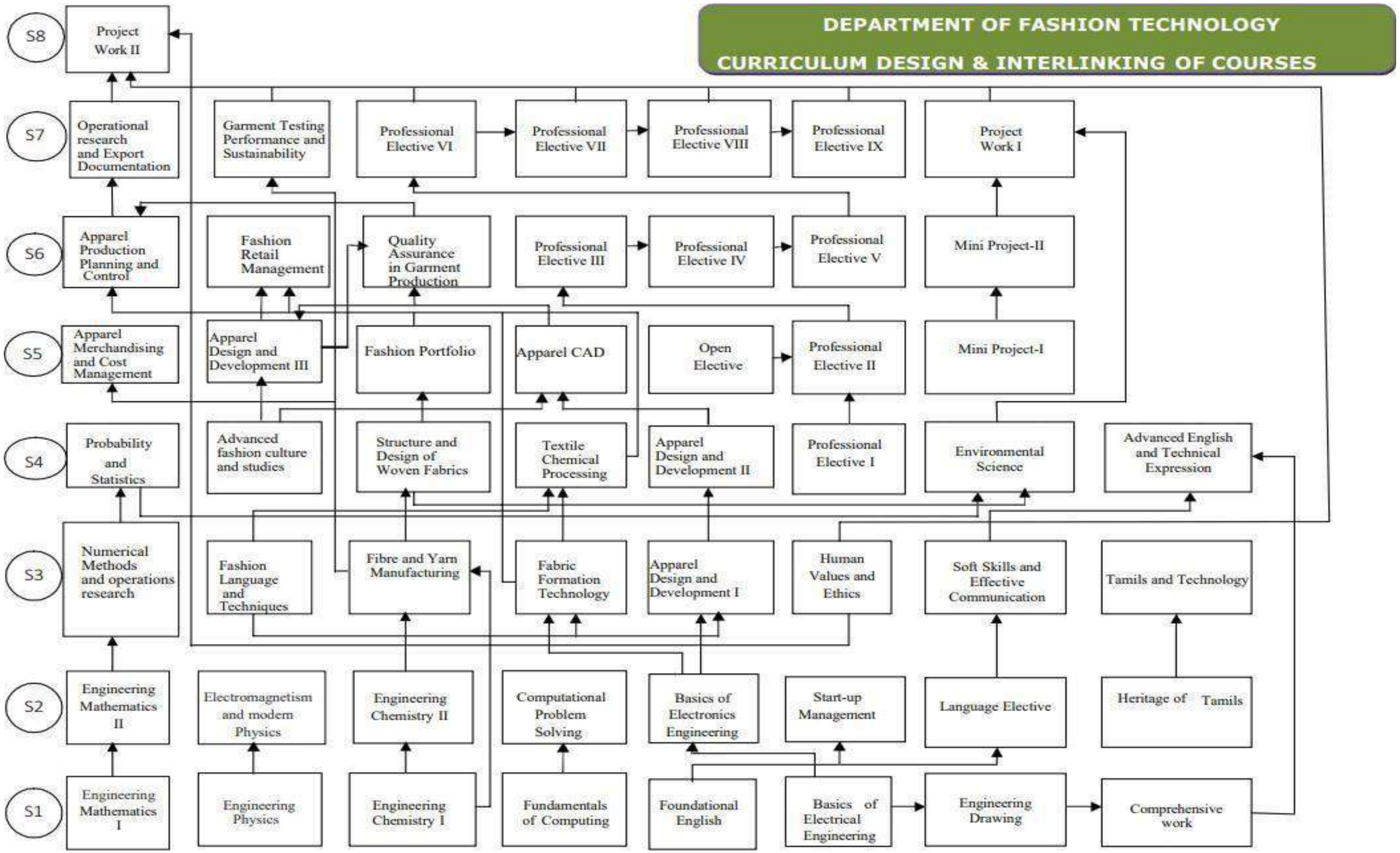
MAPPING OF PEOs AND POs

PEO(s)	Programme Outcomes(s)													
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
I	X	X	X	X	X		X				X	X	X	X
II			X			X	X	X	X	X		X	X	X
III			X	X		X	X	X	X	X	X	X	X	X

DEPARTMENT OF FASHION TECHNOLOGY

CURRICULUM DESIGN & INTERLINKING OF COURSES

CONNECTIVITY CHART



GENERAL ELECTIVES (I TO IX) ARE THE COURSES OFFERED BY THE DEPARTMENT

Candidates admitted during Academic Year 2023-2024

DEPARTMENT: B. TECH FASHION TECHNOLOGY R2022
CURRICULUM (2023-2027 Batch)
Minimum Credits to be Earned: 163

I SEMESTER

Code No.	Course	L	T	P	C	Hours/ Week	Maximum Marks			Category
							CIA	SEE	Total	
22MA101	ENGINEERING MATHEMATICS I	3	1	0	4	4	40	60	100	BS
22PH102	ENGINEERING PHYSICS	2	0	2	3	4	50	50	100	BS
22CH103	ENGINEERING CHEMISTRY I	2	0	2	3	4	50	50	100	BS
22GE001	FUNDAMENTALS OF COMPUTING	3	0	0	3	3	40	60	100	ES
22HS001	FOUNDATIONAL ENGLISH	1	0	2	2	3	100	0	100	HSS
22GE003	BASICS OF ELECTRICAL ENGINEERING	2	0	2	3	4	50	50	100	ES
22GE005	ENGINEERING DRAWING	1	0	2	2	3	100	0	100	ES
22HS003	தமிழர் மரபு HERITAGE OF TAMILS#*	1	0	0	1	1	40	60	100	HSS
22FT108	COMPREHENSIVE WORK$	0	0	2	1$	2	100	0	100	EEC
Total		**15**	**1**	**10**	**21**	**26**	-	-	-	-

II SEMESTER

Code No.	Course	L	T	P	C	Hours/ Week	Maximum Marks			Category
							CIA	SEE	Total	
22MA201	ENGINEERING MATHEMATICS II	3	1	0	4	4	40	60	100	BS
22PH202	ELECTROMAGNETISM AND MODERN PHYSICS	2	0	2	3	4	50	50	100	BS
22CH203	ENGINEERING CHEMISTRY II	2	0	2	3	4	50	50	100	BS
22GE002	COMPUTATIONAL PROBLEM SOLVING	3	0	0	3	3	40	60	100	ES
22GE004	BASICS OF ELECTRONICS ENGINEERING	2	0	2	3	4	50	50	100	ES
22HS002	STARTUP MANAGEMENT	1	0	2	2	3	100	0	100	EEC
	LANGUAGE ELECTIVE	1	0	2	2	3	100	0	100	HSS
22HS006	தமிழரும் தொழில்நுட்பமும் TAMILS AND TECHNOLOGY^*	1	0	0	1	1	40	60	100	HSS
Total		**15**	**1**	**10**	**21**	**26**	-	-	-	-

The lateral entry students have to complete these courses during III and IV semesters.
Students admitted during academic year 2022-2023 studied this course in semester II.
^ Students admitted during academic year 2022-2023 studied this course in semester III.
$ Applicable only for the students admitted during academic year 2022-2023.

III SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CIA	**SEE**	**Total**	
22FT301	NUMERICAL METHODS AND OPERATIONS RESEARCH	3	1	0	4	4	40	60	100	BS
22FT302	FASHION LANGUAGE AND TECHNIQUES	3	0	2	4	5	50	50	100	PC
22FT303	FIBRE AND YARN MANUFACTURING	3	0	2	4	5	50	50	100	PC
22FT304	FABRIC FORMATION TECHNOLOGY	3	0	2	4	5	50	50	100	PC
22FT305	APPAREL DESIGN AND DEVELOPMENT I	3	0	2	4	5	50	50	100	PC
22HS004	HUMAN VALUES AND ETHICS	2	0	0	2	2	40	60	100	HSS
22HS005	SOFT SKILLS AND EFFECTIVE COMMUNICATION	0	0	2	1	2	60	40	100	HSS
Total		**17**	**1**	**10**	**23**	**28**	**-**	**-**	**-**	**-**

IV SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CIA	**SEE**	**Total**	
22FT401	PROBABILITY AND STATISTICS	3	1	0	4	4	40	60	100	BS
22FT402	ADVANCED FASHION CULTURE AND STUDIES	3	0	2	4	4	50	50	100	PC
22FT403	STRUCTURE AND DESIGN OF WOVEN FABRICS	3	0	2	4	5	50	50	100	PC
22FT404	TEXTILE CHEMICAL PROCESSING	3	0	2	4	5	50	50	100	PC
22FT405	APPAREL DESIGN AND DEVELOPMENT II	3	0	2	4	5	50	50	100	PC
	PROFESSIONAL ELECTIVE I	3	0	0	3	3	40	60	100	PE
22HS007	ENVIRONMENTAL SCIENCE	2	0	0	-	2	100	0	100	HSS
22HS008	ADVANCED ENGLISH AND TECHNICAL EXPRESSION	0	0	2	1	2	60	40	100	HSS
Total		**20**	**1**	**10**	**24**	**30**	**-**	**-**	**-**	**-**

V SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CIA	**SEE**	**Total**	
22FT501	APPAREL MERCHANDISING AND COST MANAGEMENT	3	1	0	4	4	40	60	100	PC
22FT502	APPAREL DESIGN AND DEVELOPMENT III	3	0	2	4	5	50	50	100	PC
22FT503	FASHION PORTFOLIO	3	0	2	4	5	50	50	100	PC
22FT504	APPAREL CAD	0	0	4	2	4	60	40	100	PC
	PROFESSIONAL ELECTIVE II	3	0	0	3	3	40	60	100	PE
	OPEN ELECTIVE	3	0	0	3	3	40	60	100	PE
22FT507	MINI PROJECT I	0	0	2	1	2	60	40	100	EEC
Total		**15**	**1**	**10**	**21**	**26**	**-**	**-**	**-**	**-**

VI SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours /Week**	**Maximum Marks**			**Category**
							CIA	**SEE**	**Total**	
22FT601	APPAREL PRODUCTION PLANNING AND CONTROL*	3	1	0	4	3	40	60	100	PC
22FT602	FASHION RETAIL MANAGEMENT	3	0	0	3	3	40	60	100	PC
22FT603	QUALITY ASSURANCE IN GARMENT PRODUCTION	3	1	0	4	4	40	60	100	PC
	PROFESSIONAL ELECTIVE III	3	0	0	3	3	40	60	100	PE
	PROFESSIONAL ELECTIVE IV	3	0	0	3	3	40	60	100	PE
	PROFESSIONAL ELECTIVE V	3	0	0	3	3	40	60	100	PE
22FT607	MINI PROJECT II	0	0	2	1	2	60	40	100	EEC
Total		**18**	**2**	**2**	**21**	**21**	**-**	**-**	**-**	**-**

* LTPC for this course is 3 0 0 3 for the students admitted during academic year 2022-2023.

VII SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours / Week**	**Maximum Marks**			**Category**
							CIA	**SEE**	**Total**	
22FT701	OPERATIONAL RESEARCH AND EXPORT DOCUMENTATION	3	1	0	4	4	40	60	100	PC
22FT702	GARMENT TESTING PERFORMANCE AND SUSTAINABILITY	3	1	0	4	5	40	60	100	PC
	PROFESSIONAL ELECTIVE VI	3	0	0	3	3	40	60	100	PE
	PROFESSIONAL ELECTIVE VII	3	0	0	3	3	40	60	100	PE
	PROFESSIONAL ELECTIVE VIII	3	0	0	3	3	40	60	100	PE
	PROFESSIONAL ELECTIVE IX	3	0	0	3	3	40	60	100	PE
22FT707	PROJECT WORK I	0	0	4	2	4	60	40	100	EEC
Total		**18**	**2**	**4**	**22**	**25**	**-**	**-**	**-**	**-**
VIII SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours /Week**	**Maximum Marks**			**Category**
							CIA	**SEE**	**Total**	
22FT801	PROJECT WORK II	0	0	20	10	20	60	40	100	EEC
Total		**0**	**0**	**20**	**10**	**20**	**-**	**-**	**-**	-

ELECTIVES										
LANGUAGE ELECTIVES										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CIA	**SEE**	**Total**	
22HS201	COMMUNICATIVE ENGLISH II	1	0	2	2	3	100	0	100	HSS
22HSH01	HINDI	1	0	2	2	3	100	0	100	HSS
22HSG01	GERMAN	1	0	2	2	3	100	0	100	HSS
22HSJ01	JAPANESE	1	0	2	2	3	100	0	100	HSS
22HSF01	FRENCH	1	0	2	2	3	100	0	100	HSS

ELECTIVES										
PROFESSIONAL ELECTIVES										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CIA	**SEE**	**Total**	
VERTICAL I - APPAREL MARKETING										
22FT001	TREND ANALYSIS AND FASHION FORECASTING	3	0	0	3	3	40	60	100	PE
22FT002	VISUAL MERCHANDISING	3	0	0	3	3	40	60	100	PE
22FT003	ESSENTIALS OF APPAREL MARKETING	3	0	0	3	3	40	60	100	PE
22FT004	APPAREL RETAIL MANAGEMENT	3	0	0	3	3	40	60	100	PE
22FT005	FASHION BRAND MANAGEMENT	3	0	0	3	3	40	60	100	PE
22FT006	DIGITAL MARKETING AND E- BUSINESS	3	0	0	3	3	40	60	100	PE
VERTICAL II - APPAREL PRODUCT DEVELOPMENT										
22FT007	KNIT WEAR DEVELOPMENT	3	0	0	3	3	40	60	100	PE
22FT008	CLOTHING COMFORT	3	0	0	3	3	40	60	100	PE
22FT009	FASHION ACCESSORIES	3	0	0	3	3	40	60	100	PE
22FT010	GARMENT FINISHING AND CARE	3	0	0	3	3	40	60	100	PE
22FT011	HOME FURNISHING	3	0	0	3	3	40	60	100	PE
22FT012	APPAREL PRODUCT DEVELOPMENT.	3	0	0	3	3	40	60	100	PE
VERTICAL III- GARMENT MANUFACTURING										
22FT013	ADVANCED TECHNOLOGIES FOR APPAREL INDUSTRY	3	0	0	3	3	40	60	100	PE
22FT014	SUPPLY CHAIN MANAGEMENT FOR APPAREL INDUSTRY	3	0	0	3	3	40	60	100	PE
22FT015	LEAN MANUFACTURING	3	0	0	3	3	40	60	100	PE
22FT016	SOCIAL COMPLIANCES AND QUALITY ASSURANCE IN APPAREL INDUSTRY	3	0	0	3	3	40	60	100	PE
22FT017	COMPUTER APPLICATIONS IN APPAREL MANUFACTURING	3	0	0	3	3	40	60	100	PE
22FT018	AUTOMATIONS IN APPAREL MANUFACTURING	3	0	0	3	3	40	60	100	PE
22FT019	TECHNICAL DESIGN FOR GARMENT MANUFACTURING	3	0	0	3	3	40	60	100	PE
VERTICAL IV- APPAREL MANAGEMENT										
22FT020	OPERATIONS RESEARCH IN APPAREL INDUSTRY	3	0	0	3	3	40	60	100	PE
22FT021	ENTERPRISE RESOURCE PLANNING IN APPAREL INDUSTRY	3	0	0	3	3	40	60	100	PE
22FT022	INTERNATIONAL BUSINESS IN APPAREL INDUSTRY	3	0	0	3	3	40	60	100	PE
22FT023	ENTREPRENEURSHIP IN APPAREL MANUFACTURING	3	0	0	3	3	40	60	100	PE
22FT024	SUSTAINABLE APPAREL BUSINESS MANAGEMENT	3	0	0	3	3	40	60	100	PE
22FT025	APPAREL PRODUCTION MANAGEMENT	3	0	0	3	3	40	60	100	PE

VERTICAL V- SPECIALTY APPAREL										
22FT026	TECHNOLOGY OF NON WOVENS	3	0	0	3	3	40	60	100	PE
22FT027	PROTECTIVE GARMENTS	3	0	0	3	3	40	60	100	PE
22FT028	INTIMATE APPARELS	3	0	0	3	3	40	60	100	PE
22FT029	SMART TEXTILES AND GARMENTS	3	0	0	3	3	40	60	100	PE
22FT030	SPORTS TEXTILES AND GARMENTS	3	0	0	3	3	40	60	100	PE
22FT031	MEDICAL TEXTILES AND GARMENTS	3	0	0	3	3	40	60	100	PE
VERTICAL VI - FASHION DESIGN										
22FT032	FASHION STYLING AND MODELLING	3	0	0	3	3	40	60	100	PE
22FT033	HISTORY OF CLOTHING AND FASHION	3	0	0	3	3	40	60	100	PE
22FT034	FASHION PHOTOGRAPHY AND CHOREO	3	0	0	3	3	40	60	100	PE
22FT035	FASHION COMMUNICATION	3	0	0	3	3	40	60	100	PE
22FT036	FASHION VISAGE	3	0	0	3	3	40	60	100	PE
22FT037	CHRONICLE OF FASHION	3	0	0	3	3	40	60	100	PE
22FT038	TEXTILE HERITAGE	3	0	0	3	3	40	60	100	PE
VERTICAL VII - IT APPLICATION FOR FASHION BUSINESS										
22FT039	DATA MANAGEMENT TECHNIQUES	3	0	0	3	3	40	60	100	PE
22FT040	PRINCIPLES OF WEB DESIGN	3	0	0	3	3	40	60	100	PE
22FT041	E-COMMERCE IN FASHION	3	0	0	3	3	40	60	100	PE
22FT042	ERP FOR FASHION BUSINESS	3	0	0	3	3	40	60	100	PE
22FT043	INTRODUCTION TO AI APPLICATION	3	0	0	3	3	40	60	100	PE
22FT044	IoT IN FASHION	3	0	0	3	3	40	60	100	PE
HONOURS VERTICAL COURSES										
VERTICAL III- GARMENT MANUFACTURING										
22FTH13	ADVANCED TECHNOLOGIES FOR APPAREL INDUSTRY	3	0	0	3	3	40	60	100	PE
22FTH14	SUPPLY CHAIN MANAGEMENT FOR APPAREL INDUSTRY	3	0	0	3	3	40	60	100	PE
22FTH15	LEAN MANUFACTURING	3	0	0	3	3	40	60	100	PE
22FTH16	SOCIAL COMPLIANCES AND QUALITY ASSURANCE IN APPAREL INDUSTRY	3	0	0	3	3	40	60	100	PE
22FTH17	COMPUTER APPLICATIONS IN APPAREL MANUFACTURING	3	0	0	3	3	40	60	100	PE
22FTH18	AUTOMATIONS IN APPAREL MANUFACTURING	3	0	0	3	3	40	60	100	PE

MINOR VERTICAL COURSES										
VERTICAL III- GARMENT MANUFACTURING										
22FTM13	ADVANCED TECHNOLOGIES FOR APPAREL INDUSTRY	3	0	0	3	3	40	60	100	PE
22FTM14	SUPPLY CHAIN MANAGEMENT FOR APPAREL INDUSTRY	3	0	0	3	3	40	60	100	PE
22FTM15	LEAN MANUFACTURING	3	0	0	3	3	40	60	100	PE
22FTM16	SOCIAL COMPLIANCES AND QUALITY ASSURANCE IN APPAREL INDUSTRY	3	0	0	3	3	40	60	100	PE

22FTM17	COMPUTER APPLICATIONS IN APPAREL MANUFACTURING	3	0	0	3	3	40	60	100	PE
22FTM18	AUTOMATIONS IN APPAREL MANUFACTURING	3	0	0	3	3	40	60	100	PE

ONE CREDIT COURSES										
22FT0XA	MOTIF DEVELOPMENT FOR TRADITIONAL TEXTILES.	1	0	0	1	-	100	0	100	EEC
22FT0XB	ADVANCED FASHION DIGITAL ILLUSTRATION	1	0	0	1	-	100	0	100	EEC
22FT0XC	PHOTOGRAPHY ESSENTIALS	1	0	0	1	-	100	0	100	EEC
22FT0XD	EXPLORING PRINTING TECHNIQUES FOR STARTUPS IN APPAREL INDUSTRY	1	0	0	1	-	100	0	100	EEC
22FT0XE	CERTIFICATION FOR PRODUCT AND PROCESS IN THE APPAREL INDUSTRY	1	0	0	1	-	100	0	100	EEC
OPEN ELECTIVES										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours /Week**	**Maximum Marks**			**Category**
							CIA	**SEE**	**Total**	
22OCE01	ENERGY CONSERVATION AND MANAGEMENT	3	0	0	3	3	40	60	100	OE
22OCS01	OBJECT ORIENTED PROGRAMMING	3	0	0	3	3	40	60	100	OE
22OCS02	JAVA FUNDAMENTALS	3	0	0	3	3	40	60	100	OE
22OCS03	KNOWLEDGE DISCOVERY IN DATABASES	3	0	0	3	3	40	60	100	OE
22OCS04	E-LEARNING TECHNIQUES	3	0	0	3	3	40	60	100	OE
22OCS05	SOCIAL TEXT AND MEDIA ANALYTICS	3	0	0	3	3	40	60	100	OE
22OEI01	PROGRAMMABLE LOGIC CONTROLLER	3	0	0	3	3	40	60	100	OE
22OEI02	SENSOR TECHNOLOGY	3	0	0	3	3	40	60	100	OE
22OEI03	FUNDAMENTALS OF VIRTUAL INSTRUMENTATION	3	0	0	3	3	40	60	100	OE
22OEI04	OPTOELECTRONICS AND LASER INSTRUMENTATION	3	0	0	3	3	40	60	100	OE
2OME01	DIGITAL MANUFACTURING	3	0	0	3	3	40	60	100	OE
22OME02	INDUSTRIAL PROCESS ENGINEERING	3	0	0	3	3	40	60	100	OE
22OME03	MAINTENANCE ENGINEERING	3	0	0	3	3	40	60	100	OE
22OME04	SAFETY ENGINEERING	3	0	0	3	3	40	60	100	OE
22OFD01	TRADITIONAL FOODS	3	0	0	3	3	40	60	100	OE
22OFD02	FOOD LAWS AND REGULATIONS	3	0	0	3	3	40	60	100	OE
22OFD03	POST-HARVEST TECHNOLOGY OF FRUITS AND VEGETABLES	3	0	0	3	3	40	60	100	OE
22OFD04	CEREAL, PULSES AND OIL SEED TECHNOLOGY	3	0	0	3	3	40	60	100	OE
22OPH01	NANOMATERIALS SCIENCE	3	0	0	3	3	40	60	100	OE

22OPH02	SEMICONDUCTOR PHYSICS AND DEVICES	3	0	0	3	3	40	60	100	OE
22OPH03	APPLIED LASER SCIENCE	3	0	0	3	3	40	60	100	OE
22OPH04	BIO-PHOTONICS	3	0	0	3	3	40	60	100	OE
22OPH05	PHYSICS OF SOFT MATTER	3	0	0	3	3	40	60	100	OE
22OCH01	CORROSION SCIENCE AND ENGINEERING	3	0	0	3	3	40	60	100	OE
22OCH02	POLYMER SCIENCE	3	0	0	3	3	40	60	100	OE
22OCH03	ENERGY STORING DEVICES	3	0	0	3	3	40	60	100	OE
22OGE01	PRINCIPLES OF MANAGEMENT	3	0	0	3	3	40	60	100	OE
22OGE02	ENTREPRENEURSHIP DEVELOPMENT I	3	0	0	3	3	40	60	100	OE
22OGE03	ENTREPRENEURSHIP DEVELOPMENT II	3	0	0	3	3	40	60	100	OE
22OGE04	NATION BUILDING,LEADERSHIP AND SOCIAL RESPONSIBILITY	3	0	0	3	3	40	60	100	OE
22OAI01	FUNDAMENTALS OF DATA SCIENCE	3	0	0	3	3	40	60	100	OE
22OAM01	COMPUTER VISION IN HEALTHCARE APPLICATION	3	0	0	3	3	40	60	100	OE
22OAM02	NEURAL NETWORKS	3	0	0	3	3	40	60	100	OE
22OBM01	OCCUPATIONAL SAFETY AND HEALTH IN PUBLIC HEALTH EMERGENCIES	3	0	0	3	3	40	60	100	OE
22OBM02	AMBULANCE AND EMERGENCY MEDICAL SERVICE MANAGEMENT	3	0	0	3	3	40	60	100	OE
22OBM03	HOSPITAL AUTOMATION	3	0	0	3	3	40	60	100	OE
22OIT01	DATA STRUCTURES	3	0	0	3	3	40	60	100	OE
22OIT02	C++ PROGRAMMING	2	0	2	3	3	50	50	100	OE
22OIT03	PROGRAMMING USING JAVA	2	0	2	3	3	50	50	100	OE
22OAG01	RAIN WATER HARVESTING TECHNIQUES	3	0	0	3	3	40	60	100	OE
22OEE01	VALUE ENGINEERING	3	0	0	3	3	40	60	100	OE
22OEE02	ELECTRICAL SAFETY	3	0	0	3	3	40	60	100	OE
22OIT04	FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS	2	0	2	3	3	50	50	100	OE
22OCB01	INTERNATIONAL BUSINESS MANAGEMENT	3	0	0	3	3	40	60	100	OE

22MA101 ENGINEERING MATHEMATICS I 3 1 0 4

Course Objectives

- To impart mathematical modeling to describe and explore real-world phenomena and data.
- To provide basic understanding on Linear, quadratic, power and polynomial, exponential, and multi variable models
- Summarize and apply the methodologies involved in framing the real world problems related to fundamental principles of polynomial equations

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Implement the concepts of mathematical modeling based on linear functions in Engineering.
2. Compute the real-world problems as a quadratic function model.
3. Demonstrate the real-world phenomena and data into Power and Polynomial functions.
4. Apply the concept of mathematical modeling of exponential functions in Engineering.
5. Apply the identification of multivariable functions in the physical dynamical problems.

Articulation Matrix

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

UNIT I **9 Hours**

MATHEMATICS MODELING OF LINEAR FUNCTIONS

The geometry of linear equations - Formation of linear equations: Method of least squares and method of regression - Vector spaces: Basic concepts with examples - Linear combination - Eigen values and vectors

UNIT II **9 Hours**

MATHEMATICAL MODELING OF QUADRATIC FUNCTIONS

General form of a quadratic function - Basic relationships between the equation and graph of a quadratic function - Sum of squares error and the quadratic function of best fit - Quadratic forms: Matrix form - Orhtogonality - Canonical form and its nature

UNIT III **9 Hours**

MATHEMATICAL MODELING OF POWER AND POLYNOMIAL FUNCTIONS

Characteristics of the graphs of power and polynomial functions - Fitting of power and polynomial functions using the method of least squares - Local maxima and local minima of power and polynomial functions - Power series of functions with real variables, Taylors series, radius and interval of convergence - Tests of convergence for series of positive terms - comparison test, ratio test

UNIT IV **9 Hours**

MATHEMATICAL MODELING OF EXPONENTIAL FUNCTIONS

Concept of exponential growth - Graphs of exponential functions - Relationship between the growth factor and exponential growth or decline - Exponential equations have a variable as an exponent and take the form y = abx through least square approximation - Calculus of exponential functions - Exponential series - Characteristics

UNIT V **9 Hours**

MATHEMATICAL MODELING OF MULTIVARIABLE FUNCTIONS

Graphing of functions of two variables - Partial derivatives - Total derivatives - Jacobians - Optimization of multivariable functions with constraints - Optimization of multivariable functions without constraints

Total: 45 +15 =60 Hours

Reference(s)

1. Erwin Kreyszig, Advanced Engineering Mathematics, Tenth Edition, Wiley India Private Limited, New Delhi, 2016.
2. B. S. Grewal, Numerical Methods in Engineering & Science: With Programs in C, C++ & MATLAB, Khanna, 2014.
3. S.C. Gupta, V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons2020
4. Thomas and Finney, Calculus and analytic Geometry, Fourteenth Edition, By Pearson Paperback, 2018.

22PH102 ENGINEERING PHYSICS 2 0 2 3

Course Objectives

- Understand the concept and principle of energy possessed by mechanical system
- Exemplify the propagation and exchange of energy
- Identify the properties of materials based on the energy possession

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: 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. Apply the concept and principles of energy to understand mechanical systems.
2. Analyze the types of mechanical oscillations based on vibrational energy.
3. Apply the concept of propagation of energy as transverse and longitudinal waves.
4. Analyze the exchange of energy and work between the systems using thermodynamic principles.
5. Apply the concept of energy and entropy to understand the mechanical properties of materials.

Articulation Matrix

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

UNIT I **6 Hours**

CONSERVATION OF ENERGY

Concept of energy - types of energy - conservation of energy Mechanical energy: - translation - rotation - vibration - Kinetic and potential energies - conservation - work and energy - laws of motion - minimization of potential energy - equilibrium - dissipative systems - friction

UNIT II **5 Hours**

VIBRATIONAL ENERGY

Periodic Motion - Simple Harmonic Motion - Energy of the SHM - Pendulum types - Damped oscillations - forced oscillations - natural frequency – resonance

UNIT III **6 Hours**

PROPAGATION OF ENERGY

Transfer of energy - material medium - Transverse wave - Longitudinal wave - standing wave - interference - Doppler effect. Sound waves and its types - characteristics - human voicere - reflection - refraction - beats

UNIT IV **7 Hours**

EXCHANGE OF ENERGY

Energy in transit - heat - Temperature - measurement - specific heat capacity and water - thermal expansion - Heat transfer processes. Thermodynamics: Thermodynamic systems and processes - Laws of thermodynamics - Entropy - entropy on a microscopic scale - maximization of entropy

UNIT V **6 Hours**

ENERGY IN MATERIALS

Elastic energy - Structure and bonding - Stress - strain - Tension and compression - elastic limit - Elastic Modulus - Stress - strain diagram - ductility - brittleness - rubber elasticity and entropy

EXPERIMENT 1 **5 Hours**

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

EXPERIMENT 2 **5 Hours**

Determination of moment of inertia - Torsional pendulum.

EXPERIMENT 3 **5 Hours**

Determination of thickness of a thin wire using interference of light - Air wedge method

EXPERIMENT 4 **4 Hours**

Determination of AC frequency using Meldes apparatus

EXPERIMENT 5 **3 Hours**

Determination of thermal conductivity of a bad conductor using Lees disc method

EXPERIMENT 6 **4 Hours**

(i) Wavelength of ultrasonics in a liquid medium
(ii) Velocity of ultrasonic waves in the given liquid
(iii) Compressibility of the given liquid using the ultrasonic interferometer

EXPERIMENT 7 **4 Hours**

Determination of Youngs modulus of a given material- Non uniform bending method

Total: 60 Hours

Reference(s)

1. C J Fischer, The energy of Physics Part I: Classical Mechanics and Thermodynamics, Cognella Academic Publishing, 2019.
2. P G Hewitt, Conceptual Physics, Pearson education, 2017.
3. R A Serway and J W Jewitt, Physics for Scientists and Engineers, Thomson Brooks/Cole, 2019.
4. J Walker, D Halliday and R Resnick, Principles of Physics, John Wiley and Sons, Inc, 2018.
5. H C Verma, Concepts of Physics (Vol I & II), Bharathi Bhawan Publishers & Distributors, New Delhi, 2017.

22CH103 ENGINEERING CHEMISTRY I **2 0 2 3**

Course Objectives

- Understand the origin of elements from the universe.
- Outline the properties of elements in the periodic table.
- Analyse the different types of bond formed during chemical reactions and its reaction thermodynamics.
- Summarize different states of matter based on atomic arrangement

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Assess the nuclear transmutation reactions that lead to the formation of elements in the universe
2. Find atomic structure of elements in the periodic table and interpret the periodic trends in properties of elements with its anomaly
3. Apply the conditions for the formation of different types of chemical bonds and predict the minimum energy required for a reaction to occur
4. Analyse endothermic and exothermic processes and exchange of energy during chemical reactions
5. Analyse whether the given matter is a solid, liquid, gas, or plasma and interpret the arrangement of atoms

Articulation Matrix

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

UNIT I **5 Hours**
ORIGIN OF ELEMENTS
Hydrogen - Elements and Sun - fusion - hypernova - supernova - dying stars - man-made elements

UNIT II **7 Hours**
ATOMIC STRUCTURE AND PERIODICITY
Atomic Structure - Electronic configuration - Periodic Table - Periodic trends in properties of elements - Anomalous behaviour in periodicity

UNIT III **6 Hours**

CHEMICAL BONDING

Octet rule & its limitations - types of chemical bonds - bond energy - bond cleavage - activation energy of reactions

UNIT IV **6 Hours**

REACTION THERMODYNAMICS

Conservation of energy - Endothermic reactions & exothermic reactions - Exchange of energy involved in chemical reactions

UNIT V **6 Hours**

STATES OF MATTER

Solid - liquid - gas - plasma - quantum dots - arrangement of atoms/ions/molecules in different phases

EXPERIMENT 1 **2 Hours**

Lab safety rules and guidelines for students - OSHA Guidelines

EXPERIMENT 2 **3 Hours**

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

EXPERIMENT 3 **4 Hours**

Determination of Fe (II) in a sample using a spectrophotometer

EXPERIMENT 4 **3 Hours**

Estimation of chromium content in a water sample by volumetric analysis

EXPERIMENT 5 **3 Hours**

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

EXPERIMENT 6 **3 Hours**

Conductometric titration of mixture of acids

EXPERIMENT 7 **4 Hours**

Estimation of magnesium ions in given solution by EDTA method

EXPERIMENT 8 **4 Hours**

Preparation of salt of fatty acid by saponification process

EXPERIMENT 9 **4 Hours**

Recrystallization of aspirin from water/ethanol

Total: 60 Hours

Reference(s)

1. Peter Atkins, Physical Chemistry, Oxford University Press, 2019.
2. Rose Marie Gallagher and Author Paul Ingram, Complete Chemistry Cambridge IGCSE, Oxford University Press, 2020.
3. P L Soni, Textbook of inorganic chemistry, Chand Publishers, New Delhi, 2017.
4. J.D. Lee, Concise inorganic chemistry, Blackman Science Ltd, France, Wiley-India, 5th edition (Reprint), 2016.
5. Gareth Price, Thermodynamics of chemical processes, Oxford University Press, 2019.
6. D Tabor, Gases, liquids and solids and other states of matter, Oxford University Press, 2018.

22GE001 FUNDAMENTALS OF COMPUTING 3 0 0 3

Course Objectives

- Understand the fundamental digital logics behind computations of computer systems.
- Develop simple assembly language programs with respect to arithmetic operations.
- Understand the program execution process and basics of software development methodologies.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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. Find the hidden languages and inner structures of computer hardware and software through codes and combinations.
2. Analyze the organizational and architectural issues of a digital computer with concepts of various data transfer techniques in digital computers and the I/O interfaces.
3. Analyze programming problems and apply assembly instructions to solve simple problems.
4. Assess the fundamentals of operating system and System programs basics.
5. Apply the software development methodologies to various real life scenarios.

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 **8 Hours**

CODES AND COMBINATIONS

Communication using Mores and Braille binary codes - Digitizing letters, numbers and objects using binary codes - Performing simple operations: addition through binary codes.

UNIT II **9 Hours**

COMPUTATION USING COMPUTER

Communication to computing devices through various input sources - Computational operation - flow, functions and controls - communication to output devices - Basic communication protocol.

UNIT III **11 Hours**

ASSEMBLY LANGUAGE PROGRAMMING

Little Man Computing (LMC) Model - Instruction Set - Labels - Calculation -Branching - Input - Output - Loops - Simple programs.

UNIT IV **9 Hours**

OPERATING SYSTEM AND APPLICATION GENERATION

BIOS - Device Drivers - Resources - Scheduler - Applications Generation and Creation - Stages of Compilation - Linkers, Loaders and Libraries.

UNIT V **8 Hours**

SOFTWARE DEVELOPMENT

Phases of application life cycle management - Software Development Methodologies - Web Page development.

Total: 45 Hours

Reference(s)

1. Charles Petzold, "Code: The Hidden Language of Computer Hardware and Software", Microsoft Press books, 2009.
2. David D. Riley, Kennya. Hunt, "Computational thinking for the modern problem Solver", CRC Press Taylor & Francis Group, 2014.
3. Andrew Eliaz, "Little Man Computer Programming: For the Perplexed from The Ground Up", The Internet Technical Bookshop; 1st edition, 2016.
4. Abraham Silberschatz, "Peter Baer Galvin and Greg Gagne, Operating System Concepts", 9th Edition, John Wiley & Sons Pvt. Ltd, 2015.
5. Roger S. Pressman, "Software Engineering: A Practitioner‟s Approach", McGraw Hill International edition, Seventh edition, 2010.

22HS001 FOUNDATIONAL ENGLISH 1 0 2 2

Course Objectives

- Heighten awareness of grammar in oral and written expression
- Improve speaking potential in formal and informal contexts
- Improve reading fluency and increased vocabulary
- Prowess in interpreting complex texts
- Fluency and comprehensibility in self-expression
- Develop abilities as critical readers and writers
- Improve ability to summarize information from longer text, and distinguish between primary and supporting ideas

Programme Outcomes (POs)

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Express themselves in a professional manner using error-free language.
2. Express in both descriptive and narrative formats.
3. Interpret and make effective use of the English Language in Business contexts.
4. Actively read and comprehend authentic text.
5. Express opinions and communicate experiences.

Articulation Matrix

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

UNIT I **15 Hours**

SELF-EXPRESSION

Self-Introduction-Recreating Interview Scenarios (with a focus on verbal communication)-Subject Verb Concord - Tenses - Common Errors in verbal communication Be-verbs Self-Introduction- Recreating interview scenarios-Haptics-Gestures-Proxemics-Facial expressions- Paralinguistic / Vocalic- Body Language- Appearance-Eye Contact-Artefacts Self-Introduction-Powerful openings and closings at the interview-Effective stock phrases - Modified for spontaneity and individuality-Question tags, framing questions including WH- questions- Prepositions-Listening to Ted talks-Listening for specific information

UNIT II **15 Hours**

CREATIVE EXPRESSION

Descriptive Expression-Picture Description and Blog Writing -Vocabulary-One-word substitution-Adjectives-Similes, Metaphors, Imagery & Idioms -Link words - Inclusive language Narrative Expression- Travelogue and Minutes of Meeting -Verbal Analogy-Sequence & Time order words - Jumbled paragraph, sentences, Sequencing-Text & Paragraph Completion-Past tense -Using quotation marks

UNIT III **15 Hours**

FORMAL EXPRESSION

Formal Letters and Emails-Writing: E-mails and Letters of apology, Requisition and Explanation, and Letters to newspapers-Speaking: Tendering verbal apologies, and explanations, persuading a listener/ audience-Hierarchy in Business correspondence- Subject of a mail, Header, Body (Salutation) and Footer of a mail- Conjunctional clause Punctuation-Formal Idioms-Phrases-Articles - Definite & Indefinite-Types of sentences-Modal verbs Precision in comprehension, Summary writing, Selective summary-Reading: Active reading- short paragraphs, excerpts, articles and editorials-Skimming and Scanning Reading comprehension & analysis- Tenses, QP/ PQ approach. Identifying the central themes/ crux-Interpreting tone - formal/informal/semi-formal-Note-taking-Listening: Listening for data, for specific information, for opinion-Active and passive Listening-Transcription-Paraphrasing and summarizing information-Agreeing & disagreeing-Note-taking-Writing: Summary writing, selective summary, paraphrasing, note-making, opinion pieces-Finding synonyms in the context Paraphrasing-Sentence Transformation - simple, compound, complex. Sentence Substitution-Sentence completion-Interpreting paragraphs

Total: 45 Hours

Reference(s)

1. Sasikumar, V, et.al. A Course in Listening & Speaking Foundation Books, 2005.
2. Murphy, Raymond. English Grammar in Use: A Self-Study Reference and Practice Book for Intermediate Students: with Answers. Cambridge: Cambridge University Press, 1985.
3. Prasad, Hari Mohan. A Handbook of Spotting Errors. McGraw Hill Education, 2010.
4. Reynolds, John. Cambridge IGCSEÃ‚Â® First Language English. 18th ed., Hodder Education, 2018.
5. Wiggins, Grant P., and Jay McTighe. Understanding by Design. Association for Supervision and Curriculum Development, 2008.

22GE003 BASICS OF ELECTRICAL ENGINEERING 2 0 2 3

Course Objectives

- To understand the basic concepts of electrical charge and its properties.
- To interpret the formation of electric field due to electric charges.
- To illustrate the concept of magnetic fields due to revolving electron.
- To illustrate the force on moving charges in electric and magnetic field.
- To understand the energy transfer in electro mechanical conversion.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12:Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Assess the behavior of electric charges in different medium using coulombs law.
2. Analyse the electric field due to different charge distributions.
3. Analyse the magnetic field intensity due to long conductor, solenoid, toroid and magnetic dipoles.
4. Analyze the force on conductors due to the moving charges.
5. Execute the energy conversion concepts in electromagnetic fields.

Articulation Matrix

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

UNIT I **5 Hours**

ELECTRIC CHARGE

Properties of charge, additivity of charges, quantization of charge, conservation of charge, Forces between multiple charges, Electric charge in conductors, Drift of Electrons, Charges in Clouds.

UNIT II **7 Hours**

ELECTRIC FIELD

Electric field due to system of charges, Significance of Electric field line. Electric Dipole and its significance, Continuous charge distribution, Field in infinite long uniform straight conductors, field in uniform charged uniform infinite plane sheet, field due to uniform thin spherical sheet.

UNIT III **7 Hours**

MAGNETIC FIELDS

Concept of magnetic field, magnetic fields in infinitely long straight wire, straight and toroidal solenoids, Magnetic dipole moment of a revolving electron, Magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to axis, Induced Electric field due to changing Magnetic Field.

UNIT IV **6 Hours**

FORCE ON CHARGES

Force on a moving charge in uniform magnetic and electric fields, Force on a current carrying conductor in a uniform magnetic field, Force between two parallel current carrying conductors.

UNIT V **5 Hours**

ELECTRO MECHANICAL ENERGY CONVERSION

Energy transfer in electromagnetic fields, Energy storage in magnetic field, Electromagnetic induction, induced emf, Eddy currents. Self and mutual inductance Linear Momentum and Angular Momentum carried by Electromagnetic Fields.

EXPERIMENT 1 **15 Hours**

Analyze and design of electromechanical energy conversion system.

EXPERIMENT 2 **15 Hours**

Develop an electrical machine and analyze its performance with supplied input of AC from 0V to 230V.

Total: 60 Hours

Reference(s)

1. Mathew N. O. Sadiku, Principles of Electromagnetics, 6th Edition, Oxford University 2020.
2. William H. Hayt and John A. Buck, Engineering Electromagnetics, McGraw Hill, 2020.
3. Kraus and Fleisch, Electromagnetics with Applications, McGraw Hill International Editions, 2017.
4. S.P.Ghosh, Lipika Datta, Electromagnetic Field Theory, First Edition, McGraw Hill Education(India) Private Limited 2017.

22GE005 ENGINEERING DRAWING 1 0 2 2

Course Objectives

- To provide knowledge on fundamentals of engineering drawings and conic sections.
- To impart skill on orthographic projections of points and lines.
- To familiarize on projection of planes and simple solids.
- To provide knowledge on section of solids and development of surfaces of simple solids.
- To impart skill on conversion of isometric view to orthographic projection and vice versa.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO10: 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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.

Course Outcomes (COs)

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

Articulation Matrix

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

UNIT I **7 Hours**

FUNDAMENTALS OF ENGINEERING DRAWING

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

UNIT II **9 Hours**

PROJECTION OF POINTS AND LINES

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

UNIT III **9 Hours**

PROJECTION OF PLANES AND SOLIDS

Projection of simple planes and projection of simple solids - parallel - perpendicular and inclined to one plane using change of position method - inclined to both the planes

UNIT IV **9 Hours**

SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES

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

UNIT V **11 Hours**

ORTHOGRAPHIC PROJECTIONS AND ISOMETRIC VIEW

Orthographic projections and isometric view of components used in engineering applications.

Total: 45 Hours

Reference(s)

1. N. D. Bhatt and V. M. Panchal, Engineering Drawing, Charotar Publishing House Pvt. Limited, 2019.
2. K.V. Natarajan, A Text Book of Engineering Graphics, Dhanalakshmi Publishers, 2013.
3. K Venugopal, Engineering Drawing and Graphics, Sixth edition, New Age International, 2013.
4. Basant Agarwal, Mechanical drawing, Tata McGraw-Hill Education, 2013.
5. Engineering Drawing Practice for Schools & Colleges, Bureau of Indian Standards - Sp46, 2013.

22HS003 HERITAGE OF TAMILS **1 0 0 1**

Course Objectives

1. Describe the linguistic diversity in India, highlighting Dravidian languages and their features.
2. Summarize the evolution of art, highlighting key transitions from rock art to modern sculptures.
3. Examine the role of sports and games in promoting cultural values and community bonding.
4. Discuss the education and literacy systems during the Sangam Age and their impact.
5. Outline the importance of inscriptions, manuscripts, and the print history of Tamil books in preserving knowledge and culture.

Programme Outcomes (POs)

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. Analyze d the concept of language families in India, with a focus on Dravidian languages.
2. Assess the evolution of art from ancient rock art to modern sculptures in Tamil heritage.
3. Analyze and differentiate various forms of folk and martial arts in Tamil heritage.
4. Apply the concepts of Flora and Fauna in Tamil culture and literature.
5. Evaluate the contributions of Tamils to the Indian Freedom Struggle.

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	3	-	-	-	-
4	-	-	-	-	-	-	-	-	2	3	-	-	-	-
5	-	-	-	-	-	-	-	-	2	3	-	-	-	-

UNIT I **3 Hours**

LANGUAGE AND LITERATURE

Language Families in India - Dravidian Languages – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II **3 Hours**

HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE

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

UNIT III **3 Hours**

FOLK AND MARTIAL ARTS

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV **3 Hours**

THINAI CONCEPT OF TAMILS

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V **3 Hours**

CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE

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

Total: 15 Hours

Reference(s)

1. Dr.K.K.Pillay , Social Life of Tamils, A joint publication of TNTB & ESC and RMRL.
2. Dr.S.Singaravelu, Social Life of the Tamils - The Classical Period, International Institute of Tamil Studies.
3. Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu, Historical Heritage of the Tamils, International Institute of Tamil Studies.
4. Dr.M.Valarmathi, The Contributions of the Tamils to Indian Culture, International Institute of Tamil Studies.
5. Keeladi, Sangam City Civilization on the banks of river Vaigai, Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu
6. Dr.K.K.Pillay, Studies in the History of India with Special Reference to Tamil Nadu.
7. Porunai Civilization, Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu
8. R.Balakrishnan, Journey of Civilization Indus to Vaigai, RMRL.

பாடத்திட்டத்தின் நோக்கம்

1. இந்திய மொழிக்குடும்பத்துள் திராவிட மொழிகள் தனித்து இயங்கும் தன்மையை அதன் சிறப்புகள் வழி அறிதல்.
2. தொன்றுதொட்டு தமிழர், கலையில் அடைந்த வளர்ச்சியை இயம்புதல்.
3. சங்ககால தமிழரின் கற்றல் திறத்தை இலக்கியங்கள் வழி ஆராய்தல்.

கற்றலின் விளைவு

1. இந்திய மொழிக்குடும்பத்துள் திராவிட மொழிகள் தனித்து இயங்கும் தன்மையை அதன் சிறப்புகள் வழி அறிதல்.
2. தொன்றுதொட்டு தமிழர், கலையில் அடைந்த வளர்ச்சியை இயம்புதல்.
3. சங்ககால தமிழரின் கற்றல் திறத்தை இலக்கியங்கள் வழி ஆராய்தல்.
4. தமிழ் மொழியின் சிறப்புகளை அதன் படைப்பிலக்கியங்கள் மூலம் அறிந்து கொள்ளுதல்.
5. கற்காலம் தொடங்கி, இக்காலம் வரை சிற்பக்கலை அடைந்த வளர்ச்சியை கண்டுகொள்ளல் .
6. தமிழர் தம் வாழ்வில் எங்கனம் இயற்கையை வணங்கி போற்றினர் என்பதை திணை கோட்பாட்டின் வழி தெளிதல்.
7. இந்திய விடுதலை போரில் தமிழர் ஆற்றிய பங்கினை தெரிந்து கொள்ளுதல்.

அலகு I மொழி மற்றும் இலக்கியம்: **3**

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

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

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

அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: 3

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

அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்: 3

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

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

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

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

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

22MA201 ENGINEERING MATHEMATICS II 3 1 0 4

Course Objectives

- To impart and analyze the concepts of differential equations to describe in real-world phenomena
- To provide basic understanding on differential equation models and vector field models.
- Summarize and apply the methodologies involved in framing the real world problems related to fundamental principles of complex functions.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Apply the concept of differential equations through mathematical modeling and analyze its applications in engineering.
2. Apply the real world problems as second order linear differential equations and give solutions for the same.
3. Demonstrate the real-world phenomena with magnitude and direction in the form of vector functions.
4. Apply the concept of vector fields and line integrals through mathematical modeling in engineering.
5. Determine complex functions and apply them to formulate problems arising in engineering.

Articulation Matrix

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

UNIT I **9 Hours**

FIRST ORDER LINEAR DIFFERENTIAL EQUATIONS

Formation of differential equations- Solutions of first order linear ODE: Leibnitzs and method of separation of variables - Cooling/Heating of an object - A falling object - Modeling of electric circuits: RL and RC circuits - Modeling of population dynamics: Exponential growth and decay - Logistic growth model.

UNIT II **9 Hours**

SECOND ORDER LINEAR DIFFERENTIAL EQUATIONS

Methods of solving second order linear ordinary differential equations - Models for linear oscillators: Simple harmonic motion - Mechanical vibrations with and without damping - Electric circuit system: RLC circuits

UNIT III **9 Hours**

VECTOR DIFFERENTIAL CALCULUS

Vector and scalar functions - Fields - Derivative of a vector function and geometrical interpretation - Velocity and acceleration - Gradient and its properties - Tangent and normal vectors - Directional derivative - Divergence of a vector field - Curl of a vector field - Projectile motion

UNIT IV **9 Hours**

VECTOR INTEGRAL CALCULUS

Line integrals of vector point functions - Surface integral of vector point functions - Applications of line and surface integrals - Greens theorem in a plane - Stokes theorem - Gauss divergence theorem

UNIT V **9 Hours**

COMPLEX FUNCTIONS

Basic concepts of Complex numbers Geometrical representation of complex number - Analytic functions and its properties - Construction of Analytic functions: Fluid flow Electric flow - Mapping of complex functions

Total: 45+15=60 Hours

Reference(s)

1. Richard E. Williamson, Introduction to Differential Equations and Dynamical Systems, McGraw Hill Companies. Inc, 1997.
2. Michael Greenberg Advanced Engineering Mathematics, Second Edition, Pearson Education, 2018.
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, Thirteenth Edition, Pearson Education, 2013.
4. Erwin Kreyszig, Advanced Engineering Mathematics, Tenth Edition, Wiley, 2015.
5. J. Stewart, Essential Calculus, Second Edition, Cengage, 2017.

22PH202 ELECTROMAGNETISM AND MODERN PHYSICS **2 0 2 3**

Course Objectives

- Understand the principles and mechanisms of electricity and magnetism.
- Infer the classification of electromagnetic waves.
- Analyze the theory of relativity and energy bands.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO9: 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 principles and mechanism of electrostatics and current.
2. Assess the principles and mechanism of magneto statics.
3. Assess electromagnetic waves and infer the characteristics of visible light.
4. Analyze the importance of theory of relativity and analyze the wave nature of particles.
5. Analyze the electrical properties of semiconductor based on the band theory.

Articulation Matrix

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

UNIT I **6 Hours**
ELECTRICITY
Electric monopoles - Electric field - Electric flux - Electric potential - Electrical energy- Capacitor- Conductors and Insulators - Electric dipole and polarization - Electric current - Voltage sources – Resistance.

UNIT II **6 Hours**
MAGNETISM
Sources of magnetism - Monopoles - Magnetic field and force - magnetic field and current distribution - Magnetic dipole - Magnetic potential energy - Inductor - Electric and magnetic field comparison.

UNIT III **6 Hours**
ELECTROMAGNETIC WAVES AND LIGHT
Electromagnetism: Basic laws - Electromagnetic energy - radiation. Electromagnetic waves: Origin, nature and spectrum - Visible light. Principle of least time - Geometrical optics-Human eye - Diffraction - Interference - Polarization – LASER.

UNIT IV **6 Hours**

MODERN PHYSICS

Special theory of relativity - Simultaneity and time dilation - Length contraction - Relativistic mass variation. Matter waves - De-Broglie hypothesis - Wave nature of particles

UNIT V **6 Hours**

ENERGY BANDS IN SOLIDS

Band theory of solids - Classification of materials - Semiconductors - Direct and indirect semiconductor Fermi energy - Intrinsic and extrinsic semiconductor - Carrier concentration - Electrical conductivity

EXPERIMENT 1 **5 Hours**

Analysis of I-V characteristics of a solar cell for domestic applications.

EXPERIMENT 2 **5 Hours**

Investigate the photonic behavior of laser source for photo copier device.

EXPERIMENT 3 **5 Hours**

Implement the principle of stimulated emission of laser for grain size distribution in sediment samples.

EXPERIMENT 4 **4 Hours**

Assess the variation of refractive index of glass and water for optical communication.

EXPERIMENT 5 **3 Hours**

Evaluate the band gap energy of semiconducting materials for display device applications.

EXPERIMENT 6 **8 Hours**

Determine the carrier concentration of charge carriers in semiconductors for automotive applications.

Total: 60 Hours

Reference(s)

1. C J Fischer, The energy of Physics Part II: Electricity and Magnetism, Cognella Academic Publishing, 2019.
2. P G Hewitt, Conceptual Physics, Pearson education, 2017.
3. R A Serway and J W Jewitt, Physics for Scientists and Engineers, Thomson Brooks/Cole, 2019.
4. J Walker, D Halliday and R Resnick, Principles of Physics, John Wiley and Sons, Inc, 2018.
5. H C Verma, Concepts of Physics (Vol I & II), Bharathi Bhawan Publishers & Distributors, New Delhi, 2017.

22CH203 ENGINEERING CHEMISTRY II 2 0 2 3

Course Objectives

- Understand the concept of electrochemistry for determination of electrode potential, pH and applications as energy storage devices.
- Outline the chemistry of metal corrosion and analyze the methods of corrosion control.
- Understand the role of catalyst in the rate of reaction.
- Summarize the variation in properties and reactivity of isotopes.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO7: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. Apply the electrochemical concepts to determine the electrode potential of a metal.
2. Analyze the working of batteries for the energy storage devices.
3. Analyze the mechanism of corrosion and suggest a method to control the corrosion.
4. Analyze reaction mechanisms and assess the role of catalyst in a chemical reaction.
5. Analyze various types of nuclear transmutation including decay reactions.

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 **6 Hours**

ELECTROCHEMISTRY

Origin of potential - Electromotive force - Electrical double layer - Transport of charge within the cell - Cell description - Prediction of cell potentials

UNIT II **6 Hours**

ENERGY STORING DEVICES

Relation between electrical energy and energy content of a cell - Reversible and irreversible cell - Charging and discharging reactions in a reversible cell - Current challenges in energy storage technologies

UNIT III **6 Hours**

METAL CORROSION AND ITS PREVENTION

Oxidation of metals: Electrochemical origin of corrosion - Electromigration - Electron transfer in the presence and absence of moisture - Galvanic series. Strategies for corrosion control: Galvanic anode and impressed current.

UNIT IV **6 Hours**

CATALYSIS

Energy profile diagram for a chemical reaction - activation energy - role of catalyst - homogeneous and heterogeneous catalysis - types

UNIT V **6 Hours**

NUCLEAR REACTIONS

Radioactive and stable isotopes - Variation in properties between isotopes - Radioactive decay (alpha, beta and gamma) - Half-life period - Nuclear reactions - Radiocarbon dating

EXPERIMENT 1 **4 Hours**

Measure industrial effluent water pH and assess water quality against allowed standards.

EXPERIMENT 2 **4 Hours**

Iron (Fe^{2+}) in Bhavani River water: Potentiometric Analysis & Pollution Assessment (CPCB Standards).

EXPERIMENT 3 **4 Hours**

Construct a Zn-Cu electrochemical cell and validate the output by connecting the LED light.

EXPERIMENT 4 **5 Hours**

Evaluate the corrosion percentage in concrete TMT bars.

EXPERIMENT 5 **4 Hours**

Determination of the percentage of corrosion inhibition in plain-carbon steel using natural inhibitors using natural inhibitors.

EXPERIMENT 6 **4 Hours**

Electroplating of copper metal on iron vessels for domestic application.

EXPERIMENT 7 **5 Hours**

Determination of acid-catalyzed hydrolysis kinetics in locally sourced fruit extracts.

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Total: 60 Hours

Reference(s)

1. Jain and Jain, Engineering Chemistry, 16th Edition, Dhanpat Rai Publishing Company, New Delhi, 2013.
2. P.H. Rieger, Electrochemistry, Second Edition (Reprint), Springer, Netherland, 2012.
3. E. McCafferty, Introduction to Corrosion Science, Springer; 2010 Edition, January 2010.
4. S. Vairam, Engineering Chemistry, John Wiley & Sons, 2014.
5. H.J. Arnikar, Essentials of Nuclear Chemistry, 4th edition, (revised) New Age International Publishers, 2011.
6. U. Hanefeld, L. Lefferts, Catalysis: An Integrated Textbook for Students, Wiley- VCH, 2017.

22GE002 COMPUTATIONAL PROBLEM SOLVING 3 0 0 3

Course Objectives

- Analyze the algorithm design techniques and development principles in solving the real-life problems.
- Illustrate the different ways of organizing and storing the data in computing systems.
- Understand the basic network configuration and setup connections among different device systems.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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. Analyze a problem and formulate algorithms, pseudocodes and flowcharts.
2. Execute algorithmic solutions to simple computational problems and explore algorithmic approaches to problem solving.
3. Design and apply appropriate data structures for solving computing problems.
4. Compare the various storage devices used in a computer system.
5. Analyze the requirements for a given organizational structure and establish the connection between two or more computers to form a network.

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 **6 Hours**

VISUAL PROCESS MODELING

Scenario decomposition - Logical sequencing - Drawing flowchart - Preparation of visual process model.

UNIT II **12 Hours**

ALGORITHMIC DESIGN THINKING

Analysis - Verification - Brute force - Divide and conquer - Greedy - Backtracking.

UNIT III **12 Hours**

DATA ORGANIZATION

Elementary Data Organization - Abstract Data Types - Fundamentals of Linear and Non Linear Data Structures.

UNIT IV **7 Hours**

DATA STORAGE

Flat File and Relational database - Data Read & Write in Local Storage, Server Storage and Cloud storage - Database Query Methods.

UNIT V **8 Hours**

NETWORKING ESSENTIALS

Networking Components and Services - IP Addressing - Configuring and Managing the Campus Network - Network Security - Firewalls.

Total: 45 Hours

Reference(s)

1. David D. Riley, Kennya. Hunt, "Computational thinking for the modern problem Solver", CRC Press Taylor & Francis Group, 2014.
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education Asia, 2011.
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2016.
4. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, "Database System Concepts", McGraw Hill, 2015.
5. Behrouz A.Forouzan, "Data Communication and Networking", 5th Edition, Tata McGraw-Hill, 2014.

22GE004 BASICS OF ELECTRONICS ENGINEERING

2 0 2 3

Course Objectives

- To understand the concept of energy transmission through mechanical, electrical and electromagnetic form.
- To analyze the use of PN Junction Diode and BJT for signal conditioning.
- To apply the working principle of PN Junction Diode and BJT for the design of basic Digital Logic.
- To analyze the working and characteristics of Special Purpose Semiconductor Electronic Devices.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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

PO4: 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. Assess the need for electrical and electromagnetic signal transmission.
2. Analyze the working principle and characteristics of PN junction diode.
3. Analyze the working principle and characteristics of Bipolar Junction Transistor.
4. Apply the working principle of PN Junction diode and BJT for designing basic Digital Logic functions.
5. Analyze the energy conversion needs and working principle of Special purpose electronic devices.

Articulation Matrix

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

UNIT I **6 Hours**

ENERGY TRANSFER AND SIGNALS

Energy Transmission through Mechanical, Electrical and Electromagnetic means, Signal as Energy Transmission, Complexity in signal transmission (Volume of Information, Distance and Time taken), Limitations of Mechanical Energy Transmission, Electrical and Electromagnetic Signal Transmission, Need for Conversion between Electrical and Mechanical Signals.

UNIT II **8 Hours**

SIGNAL CONDITIONING USING DIODE

Need for Vacuum Tubes in the Evolution of Electronics, Overview of Vacuum Tubes, Diode and Triode, Limitations of Vacuum Tubes. Semiconductor Group in Periodic Table, Overview of Semiconductor Materials, Flow of electrical energy through PN Junction Diode, Signal Clipping, Signal Clamping and Signal Multiplication using PN Junction Diode, Limitations of PN Junction Diode.

UNIT III **6 Hours**

SIGNAL CONDITIONING USING TRANSISTOR

Need for controlling electrical signals, Principle of Bipolar Junction Transistor operation, Signal Switching and Amplification using BJT, Limitations of BJT, Principle of Field Effect Transistor operation.

UNIT IV **6 Hours**

LOGIC SYNTHESIS USING DIODE AND TRANSISTORS

Overview of Logic Gates, PN Junction and BJT as electronic switches, Digital Logic Synthesis using Diode and Transistor: Diode Logic, Resistor Transistor Logic, Diode Transistor Logic, Transistor Logic.

UNIT V **4 Hours**

DEVICES FOR SPECIAL REQUIREMENTS

Voltage Regulation using Zener Diode, Variable Capacitance using Varactor Diode, Electrical Energy to Light Energy conversion using Light Emitting Diode, Light to Energy to Electrical Energy conversion using Solar Cell.

EXPERIMENT 1 **4 Hours**

Design a voltage multiplier to convert the low voltage from the mains power supply to the high voltage to operate the microwave oven.

EXPERIMENT 2 **14 Hours**

Design and construct regulated DC power supply for Mobile phone charger.

EXPERIMENT 3 **4 Hours**

Design and construct an audio amplifier circuit to play the mobile music in a huge speaker.

EXPERIMENT 4 **4 Hours**

Design and construct Switching circuit for the Pump to control over flow and drain condition for overhead tank using PN junction diode.

EXPERIMENT 5 **4 Hours**

Design and construct BJT based circuit to implement two-way connection for stair case light application.

Total: 60 Hours

Reference(s)

1. Thomas L. Floyd, Electronic Devices: Electron Flow Version, Ninth Edition, Prentice Hall, 2012.
2. J Millman, C. Halkias & Satyabrata JIT, Electronic Devices and Circuits, Tata McGraw-Hill, 2007.
3. L Robert Boylestead, Louis Nashelsky, Electronic Devices and Circuit Theory, Pearson Education 2006.
4. David A. Bell, Electronic Devices and Circuits, Prentice Hall of India, 2003.
5. Adel S. Sedra & Kenneth C. Smith, Micro Electronic Circuits Theory and Applications, 6th Edition, Oxford University Press, 2013.
6. Behzad Razavi, Microelectronics, Wiley India Pvt. Ltd.; 2nd edition, 2018.

22HS002 STARTUP MANAGEMENT 1 0 2 2

Course Objectives

- Promote entrepreneurial spirit and motivate to build start-ups.
- Provide insights on markets and the dynamics of buyer behaviour.
- Train to develop prototypes and refine them to a viable market offering.
- Support in developing marketing strategies and financial outlay.
- Enable to scale up the porotypes to commercial market offering.

Programme Outcomes (POs)

PO7: 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.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Create valid and feasible business ideas.
2. Create Business Model Canvas and formulate positioning statement.
3. Show prototypes that fulfills an unmet market need.
4. Assess business strategies and create pitch decks.
5. Find appropriate strategies for commercialization.

Articulation Matrix

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

UNIT I **3 Hours**

BUSINESS MODELS AND IDEATION

Startups: Introduction, Types of Business Modes for Startups. Ideation: Sources of Ideas, Assessing Ideas, Validating Ideas, Tools for validating ideas, Role of Innovation and Design Thinking.

UNIT II **3 Hours**

UNDERSTANDING CUSTOMERS

Buyer Decision Process, Buyer Behaviour, Building Buyer Personas, Segmenting, Targeting and Positioning, Value Proposition (Business Model Canvas), Information Sourcing on Markets, Customer Validation

UNIT III **3 Hours**

DEVELOPING PROTOTYPES

Prototyping: Methods - Paper and Digital, Customer Involvement in Prototyping, Product Design Sprints, Refining Prototypes

UNIT IV **3 Hours**

BUSINESS STRATEGIES AND PITCHING

Design of Marketing Strategies and Campaigns, Go-To-Market Strategy, Financial KPIs Financial Planning and Budgeting, Assessing Funding Alternatives, Pitching, Preparing Pitch Decks

UNIT V **3 Hours**

COMMERCIALIZATION

Implementation: Prototype to Commercialization, Test Markets, Institutional Support, Registration Process, IP Laws and Protection, Legal Requirements, Type of Ownership, Building and Managing Teams, Defining role of investors

EXPERIMENT 1 **1 Hour**

Analysis of various business sectors

EXPERIMENT 2 **2 Hours**

Developing a Design Thinking Output Chart

EXPERIMENT 3 **1 Hour**

Creating Buyer Personas

EXPERIMENT 4 **3 Hours**

Undertake Market Study to understand market needs and assess market potential

EXPERIMENT 5 **2 Hours**

Preparation of Business Model Canvas

EXPERIMENT 6 **15 Hours**

Developing Prototypes

EXPERIMENT 7 **2 Hours**

Organizing Product Design Sprints

EXPERIMENT 8 **2 Hours**

Preparation of Business Plans

2 Hours

EXPERIMENT 9

Preparation of Pitch Decks

Total: 45 Hours

Reference(s)

1. Rashmi Bansal, Connect the Dots, Westland and Tranquebar Press, 2012.
2. Pavan Soni, Design Your Thinking: The Mindsets, Toolsets and Skill Sets for Creative Problem-solving, Penguin Random House India, 2020.
3. Ronnie Screwvala, Dream with Your Eyes Open: An Entrepreneurial Journey, Rupa Publications, 2015.
4. Stephen Carter, The Seed Tree: Money Management and Wealth Building Lessons for Teens, Seed Tree Group, 2021.
5. Kotler Philip, Marketing Management, Pearson Education India, 15th Edition.
6. Elizabeth Verkey and Jithin Saji Isaac, Intellectual Property, Eastern Book Company, 2nd Edition, 2021.

22HS006 TAMILS AND TECHNOLOGY 1 0 0 1

Course Objectives

1. Analyse graffiti on potteries as a form of historical and cultural documentation during the Sangam Age.
2. Investigate the building materials and the historical context of Hero stones during the Sangam Age by Analysing the details of stage constructions in Silappathikaram and their cultural significance.
3. Examine ancient knowledge of oceans and its impact on Tamil society.

Programme Outcomes (POs)

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. Assess the significance of the weaving industry during the Sangam Age and its cultural importance.
2. Assess the significance of dams, tanks, ponds, and sluices in the agricultural and irrigation practices of the Chola Period.
3. Analyze the architectural designs and structural construction methods used in household materials during the Sangam Age.
4. Analyze the art of shipbuilding in ancient Tamil culture and its role in maritime trade and transportation.
5. Analyze the development of scientific terminology and vocabulary in Tamil language.

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	3	-	-	-	-
4	-	-	-	-	-	-	-	-	2	3	-	-	-	-
5	-	-	-	-	-	-	-	-	2	3	-	-	-	-

UNIT I **3 Hours**

WEAVING AND CERAMIC TECHNOLOGY

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

UNIT II **3 Hours**

DESIGN AND CONSTRUCTION TECHNOLOGY

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

UNIT III **3 Hours**

MANUFACTURING TECHNOLOGY

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

UNIT IV **3 Hours**

AGRICULTURE AND IRRIGATION TECHNOLOGY

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V **3 Hours**

SCIENTIFIC TAMIL & TAMIL COMPUTING

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

Total: 15 Hours

Reference(s)

1. Dr.K.K.Pillay , Social Life of Tamils , A joint publication of TNTB & ESC and RMRL.
2. Dr.S.Singaravelu , Social Life of the Tamils - The Classical Period, International Institute of Tamil Studies.
3. Dr.S.V.Subatamanian , Dr.K.D. Thirunavukkarasu, Historical Heritage of the Tamils, International Institute of Tamil Studies.
4. Dr.M.Valarmathi , The Contributions of the Tamils to Indian Culture, International Institute of Tamil Studies
5. Keeladi - „Sangam City Civilization on the banks of river Vaigai" , Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu
6. Dr.K.K.Pillay, Studies in the History of India with Special Reference to Tamil Nadu.
7. Porunai Civilization, Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu
8. R.Balakrishnan , Journey of Civilization Indus to Vaigai, RMRL.

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

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

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

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

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

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

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

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

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

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

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

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

22FT301 NUMERICAL METHODS AND OPERATIONS RESEARCH

3 1 0 4

Course Objectives

- To understand the methods to solve polynomial equations and implement the mathematical ideas for interpolation numerically
- To apply knowledge of operations research techniques to industrial situations for optimum decisions

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Apply the equations into algebraic, transcendental or simultaneous and apply the techniques to solve them numerically.
2. Apply numerical techniques to find missing data using interpolation and find the numerical solution of engineering problem using differentiation and integration techniques.
3. Apply various optimization methods to find solutions of transportation and assignment problems.
4. Analyse the optimization techniques under limited resources for the engineering and business problems.
5. Analyse the appropriate inventory techniques in domain-specific situations.

Articulation Matrix

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

UNIT I **9 Hours**

NUMERICAL SOLUTION OF EQUATIONS AND INTERPOLATION

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- Eigenvalues of a matrix by Power method - Interpolation: Lagranges interpolation formula - Numerical Differentiation: Approximation of derivatives using interpolation polynomials.

UNIT II **9 Hours**

NUMERICAL INTEGRATION AND DIFFERENTIAL EQUATIONS

Numerical integration: Simpsons rules - Solution of first-order ordinary differential equations: Fourth order Runge- Kutta method - Solution of partial differential equations: Parabolic equations by Crank Nicholson method- Hyperbolic equations by explicit finite difference method - Elliptic equations.

UNIT III **9 Hours**

ASSIGNMENT AND TRANSPORTATION MODEL

The transportation problems: VAM and MODI method - Unbalanced transportation problems - Assignment problems: Assignment algorithm - Optimum solutions - Unbalanced assignment problems.

UNIT IV **9 Hours**

GAME THEORY AND NETWORK ANALYSIS

Game Theory: Two-person zero-sum game -The Maximin and Minimax principles - Solution of 2 x 2 rectangular Games - Domination Property - 2 x n and m x 2 graphical method - Network scheduling by PERT and CPM - Introduction - Network and basic components - Rules of network construction - Time calculation in networks - CPM - PERT calculations - Cost Analysis - Crashing the network.

UNIT V **9 Hours**

INVENTRORY

Inventory control - Types of inventories - Inventory costs - EOQ Problem with no shortages - Production problem with no shortages - EOQ with shortages - Production problem with shortages - EOQ with price breaks.

Total: 45+15=60 Hours

Reference(s)

1. Operations Research - H.A.Taha, Pearson, 7th Edition, June 2002
2. Operations Research - Prem Kumar Gupta, D. S. Hira, S. Chand, 3rd Edition, 2002.
3. Operations Research: Theory, Methods and Applications, Sharma, S. D, Kedar Nath Ram Nath, 11th Edition, 1996.
4. Numerical Methods for Engineers and Scientists, J. N. Sharma, Narosa Publishing. 2nd edition, 2007.
5. Numerical Methods in Engineering and Science. B. S. Grewal, Khanna Publishers. 10th edition, 2015.

22FT302 FASHION LANGUAGE AND TECHNIQUES 3 0 2 4

Course Objectives

- Explain the significance of design fundamentals using elements, principles, and color in design.
- Classify the perspective sketching based on the ideation techniques towards the creative design process.
- Summarize the art movement reflection in traditional folk arts of print patterns.

Programme Outcomes (POs)

PO3: 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.
PO6: 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.
PO10: 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.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Implement different form of design fundamentals based on the illustration of each concept to enhance the design value and thoughts.
2. Differentiate the design representation styles with different form of perspective approach.
3. Generate the influence of art movement in every period of travel to current runways.
4. Attribute the inspired trends due to the folk art of India with its stylization and related features.
5. Planning of ideation techniques to develop the design process like worst to best.

Articulation Matrix

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

UNIT I **9 Hours**

DESIGN FUNDAMENTALS

Characteristics of good design: Elements of design, principles of design, Gestalt theory of Perception. Colour in design: Attributes of colour- hue, tone, tint and shade, colour schemes- Monochromatic, analogues, complementary, split complimentary and triad colour schemes, colour psychology.

UNIT II **9 Hours**

PICTORIAL DESIGN REPRESENTATIONS

Design representation styles: realistic, stylized and abstract, 3D representations: Foreshortening, Overlapping, shadows and highlights. Perspective drawing: 1 point perspective, 2-point perspective, 3- point perspective and 5-point perspective, Birds eye view, Ant's eye view.

UNIT III **9 Hours**

ART MOVEMENTS

Aesthetics of visual art: Subject view, content view, context view. Visual art movements: Neo classism, Art nouveau, Art deco, Surrealism, Modern art, abstract expressionism, cubism, pop art and post-modern art. Fashion runway inspired by above artforms.

UNIT IV **9 Hours**

FOLK ART OF INDIA

Folk of India: Understanding each art's stylization, motifs, subject, colour and contemporizing. Madhubani, Pattachitra, Kalamkari, Gond art, Warli Painting, Kerala mural painting.

UNIT V **9 Hours**

CREATIVE DEIGN PROCESS

Design process, Ideation techniques: SCAMPER, Mind map, Worst possible idea. Dilation, Rotation, Radiation.

EXPERIMENT 1 **6 Hours**

Analyze characteristics of different types of motifs design in sarees.

EXPERIMENT 2 **4 Hours**

Study the color theory in the designed garment in party wear lehenga.

EXPERIMENT 3 **8 Hours**

Analyze the pictorial representation of designs in skirts.

EXPERIMENT 4 **8 Hours**

Analyze the Indian cultures in the women's maxi gown.

EXPERIMENT 5 **4 Hours**

Create a design process in ballgowns.

Total: 75 Hours

Reference(s)

1. Fiona Dieffenbacher, Fashion Thinking, Creative Approaches to the Design Process, Bloomsbury Publishing, 10 December 2020.
2. Andrew Graham Dixon and Ian Chilvers, ART: The definitive visual guide, DK publishers, 2018.
3. Jeff Davis, Foundations of Design, Tempe Digital, 2016.
4. Deborah Velesquez, Drawing in Black and White: Creative exercises, Art techniques and Explorations in positive and negative design, Quarry books, 2016.
5. Fiona Dieffenbacher, Creative Approaches to the Design Process, AVA Publishing, February 2013.
6. Celia Stall- Meadows, Fashion now: A global perspective, Prentice Hall, 2010.

22FT303 FIBRE AND YARN MANUFACTURING 3 0 2 4

Course Objectives

- To learn and acquaint with the basics of fibre and yarn to fostering innovative activities that support and promote the sustainable economic development of the society.
- To supplement the subsequent learning of garment making and fashion portfolio development
- To learn the physical, mechanical and thermal properties of fibers
- To learn and acquaint with the basics of yarn formation.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.

Course Outcomes (COs)

1. Analyze the physical and chemical properties of textile fibers, production techniques (Both natural &manmade fibers) and its applications.
2. Assess the different types of mechanical, thermal and comfort properties of fibers and its measuring techniques
3. Analyze fiber and yarn numbering system (count).
4. Analyze the principles of preparatory process in spinning and comprehend their production and quality parameters.
5. Analyze the principles of modern spinning systems and comprehend their production and quality parameters.

Articulation Matrix

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

UNIT I **9 Hours**

TEXTILE FIBERS

Classification of textile fibres; Essential and desirable requirements of fibre forming polymers; Gross and fine structures of natural fibres like cotton, wool, silk; Properties; uses of natural and man-made fibres including modal, carbon, aramid and ultra-high molecular weight polyethylene fibres; Physical and chemical methods of fibre and blend identification and blend analysis.

UNIT II **9 Hours**

POLYMERIZATION AND SPINNING METHOD

Molecular architecture, amorphous and crystalline phases, glass transition, plasticization, crystallization, melting, factors affecting Tg and Tm; Polymerization of nylon-6, nylon-66, poly (ethylene terephthalate) and polyacrylonitrile; Melt spinning processes for PET and polyamide; Preparation of spinning dope; Principles of wet spinning, dry spinning, dry-jet-wet spinning and gel spinning; Spinning of acrylic, viscose and other regenerated cellulosic fibres such as polynosic and lyocell; Post spinning operations such as drawing, heat setting, tow-to-top conversion; Spin finish composition and applications; Different texturing methods.

UNIT III **9 Hours**

MECHANICAL AND THERMAL PROPERTIES

Methods of investigating fibre structure such as density, x-ray diffraction, birefringence, optical and electron microscopy such as SEM and TEM, I.R. spectroscopy, thermal methods such as DSC, DMA, TMA and TGA; Structure and morphology of man-made fibres; Mechanical properties of fibres; Definitions: humidity - Absolute humidity - Relative humidity - Moisture content, moisture regain. Factors influencing moisture regain -Conditioning of fibres; Static electricity, causes, problems and its elimination techniques; Moisture sorption of fibres; Fibre structure-property correlation; Definitions: breaking strength, breaking extension, yield point, initial modulus, work of rupture and work factor; Stress-strain curves for various textile fibres and their significance.

UNIT IV **9 Hours**

YARN MANUFACTURING-I

Fiber and yarn numbering system (count); Principles of ginning; Principles of opening, cleaning and blending; Working principles of modern blow room machines; Fundamentals of carding; Conventional vs. modern carding machine; Card setting; Card clothing; Principles of roller drawing; Roller arrangements in drafting systems; Draw frame Autoleveller; Principles of cotton combing; Combing cycle and mechanisms; Recent developments in combing machine; Principles of drafting, twisting, and bobbin building in roving formation; Modern developments in roving machine; Principles of drafting and twisting in ring spinning.

UNIT V **9 Hours**

YARN MANUFACTURING-II

Modern developments in ring spinning machine; Causes of end breakages; Working principles of ring doubler and two-for-one twister; Relationship between single yarn twist and folded yarn twist; Modern spinning systems: Definition and Classification; Principles of new spinning-compact, rotor, air-jet, air-vortex, friction, core, wrap and twist-less spinning processes; Spinnability; Structure-property relationship in ring, compact, rotor, air-jet and friction spun yarns; Specialized yarn and their applications- Slub yarn, Siro yarn, Eli twist , Eli core yarn, Melange yarn and fancy yarns.

EXPERIMENT 1 **3 Hours**

Analyze the physical and chemical techniques for identifying cotton fibre for Men‟s shirt.

EXPERIMENT 2 **3 Hours**

Analyze the physical and chemical techniques for identifying wool and silk fibres for women‟s clothing.

EXPERIMENT 3 **6 Hours**

Analyze the physical and chemical techniques for identifying nylon and polyester fibers for Industrial applications.

EXPERIMENT 4 **3 Hours**
Analyze the physical and chemical techniques for identifying cotton and polyester blended fibres for men‟s trousers.

EXPERIMENT 5 **3 Hours**
Analyze the moisture management characteristics of cotton fiber for summer wear.

EXPERIMENT 6 **6 Hours**
Analyze the twist and crimp properties of yarns for Men‟s apparel manufacturing.

EXPERIMENT 7 **6 Hours**
Analyze the bending rigidity and count characteristics of fabrics for women‟s clothing.

Total: 75 Hours

Reference(s)

1. J.W.S. Hearle & W.E. Morton Physical Properties of Textile Fibers, Woodhead publishing, 4th Edition, ISBN 9781845694425, 2008.
2. Vaidya A A, "Production of Synthetic Fibres", 1st Edition, Prentice Hall of India, New Delhi, 1988.
3. Gupta V B and Kothari V K, "Manufactured Fibre Technology", 1st Edition, Chapman and Hall, London, 1997.
4. Mark H F, Atlas S M and Cernia E, "Man Made Fibre Science and Technology", Vol. 1, 2, 3, 1st Ed., Willey Inter Science Publishers, New York, 1967.
5. Macintyre J E, "Synthetic Fibres", Woodhead Fibre Science Series, UK, 2003.
6. Fourne F, "Synthetic Fibres: Machines and Equipment, Manufacture, Properties", Hanser Publisher, Munich, 1999.

22FT304 FABRIC FORMATION TECHNOLOGY 3 0 2 4

Course Objectives

- To understand the basics of weaving preparatory process.
- To import knowledge and advantages of using shuttle less loom.
- To understand the knitting machine parameters for producing various knitted structures.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO3: 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.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Compare between warp and weft winding and explain the principle of warp and sizing.
2. Assess the primary, secondary and auxiliary motions of weaving and working principles of different looms.
3. Analyze the working principles of weft knitting machines and the pattern of fabric formation.
4. Analyze the working principles of warp knitting machines and the pattern of fabric formation.
5. Assess different bonding methods used in non-woven manufacturing process.

Articulation Matrix

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

UNIT I **9 Hours**

WEAVING PREPARATORY

Sequence of processes involved in Weaving preparatory with objectives - winding, warping, sizing - Features of Autoconer - Functions of Tensioners, Slub catchers, Electronic Clearers and Splicer - Comparison between Knotting and Splicing.

UNIT II **9 Hours**

WOVEN FABRIC FORMATION

Looms - Classification - Passage of Warp in a conventional Plain loom - Objects of Primary, Secondary & Auxiliary motions in a Plain loom - Features of Tappet, Dobby, Jacquard looms. Shuttle less looms-Classification (Flexible Rapier, Projectile, Air jet and Water jet) and its advantages

UNIT III **9 Hours**

WEFT KNIT FABRIC

Introduction to knitting, Comparison of weaving and knitting, classification of knitting, machines and fabrics. Representation of stitches. Elements of weft knitting machine, Working principle of knitting machines. Formation of knit, tuck and float stitches. Effect of loop length, Production of weft knitted fabric structures -Single jersey, Rib, Purl, Interlock. Applications of weft knit fabric.

UNIT IV **9 Hours**

WARP KNIT FABRIC

Elements of Tricot and Raschel warp knitting machines - warp beam, guide bar, needle, needle bar, sinker, presser bar, links, and trick plate. Knitting cycle and working principles of Tricot and Raschel knitting machine. Pattern controlling mechanism - pattern wheels, pattern chains links, Electronic Jacquard. Representation of warp knit structures. Applications of warp knit fabric

UNIT V **9 Hours**

NON WOVEN FABRIC

Non-Woven fabrics - definition - uses - classification of Non-Woven Fabrics. Web Formation Techniques -Staple Fibre Webs- Wet laid webs, Dry laid webs, Parallel, Cross and Random laid webs - Continuous Filament webs - Spun laid webs and Melt blown webs. Non-Woven Fabric Formations Techniques- Adhesive bonding, Thermal Bonding, Needle punching and bonding of spun laid webs.

EXPERIMENT 1 **4 Hours**

Analyze the physical properties of the shirt fabric.

EXPERIMENT 2 **4 Hours**

Analyze the physical properties of the T shirt.

EXPERIMENT 3 **4 Hours**

Analyze the physical properties of the Trouser fabric.

EXPERIMENT 4 **4 Hours**

Analyze the physical properties of the bed sheet fabric.

EXPERIMENT 5 **4 Hours**

Analyze the fabric absorbency of the shirt fabric.

EXPERIMENT 6 **5 Hours**

Analyze the tensile properties of the yarn before and after sized yarn.

EXPERIMENT 7 **5 Hours**

Analyze the yarn fault in cone and cheese package.

Total: 75 Hours

Reference(s)

1. Sabit Adanur, Handbook of Weaving, CRC press, Washington 2001.
2. J. J. Vincent, Shuttleless Loom, The Textile Institute, 1980.
3. Anbumani N, Knitting Fundamentals, Machines, Structures and Developments, New Age International Private Limited, New Delhi, 2007.
4. D Spencer, Knitting Technology, 3rd Edition, A Comprehensive Handbook and Practical Guide, Apr 2001,Woodhead Publishing, ISBN :9781855733336.
5. Wilhelm Albrecht, Nonwoven Fabrics, WILEY-VCH Verlag GMBH & Company, Germany, 2003.
6. S. Russell, Handbook of Nonwovens, The Textile Institute Publication, 2007.

22FT305 APPAREL DESIGN AND DEVELOPMENT I 3 0 2 4

Course Objectives

- Acquire knowledge on spreading, cutting, planning and parts and functions of SNLS & O/L.
- Develop commercial pattern with design aspect by manipulating the basic pattern by pattern making and draping.
- To impart knowledge on the kids wear design and construction along with seam defects and remedies.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Analyze the basic concept of spreading process, nuances of laying process, pattern making process and classifications of seams and stitches used.
2. Analyse the all-garmenting techniques with the specifications, different types of components and parts and functions of SNLS sewing machine.
3. Analyze the pattern making and draping techniques and terminologies applied in them.
4. Apply the method for drafting patterns and construction procedure for kids wear (Boys).
5. Apply the method for drafting patterns and construction procedure for kids wear (Girls).

Articulation Matrix

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

UNIT I **9 Hours**

BASIC CONCEPTS AND SEAMS

Define Spreading, laying, cutting, pattern making and marker making process, Method of fabric spreading process, Symmetrical and Asymmetrical patterns, Define seam, stitches. Classification of stitches.

UNIT II **9 Hours**

GARMENTING TECHNIQUES

Define fullness, darts, tucks, pleats. Types of collars, placket, sleeves, pockets, yokes, cuffs. Machineries-Parts and functions of SNLS, O/L, F/L, embroidery machine.

UNIT III **9 Hours**

PATTERN MAKING

Pattern making - definition and types of pattern making- drafting, draping, flat pattern techniques. Pattern making - Tools and functions. Pattern Details, Trueing, pattern grain line, notches, seam allowance, dart points, pleats, gather. Draping - Tools used, Basic blocks for Kid - Front Bodice, Back bodice, Sleeve.

UNIT IV **9 Hours**

KIDS WEAR BOYS

Developing the design for kids wear (boys), draft and develop the garment with the components, front bodice, back bodice, sleeve, yoke if required, development of teck pack for the garment, construction process of the garment.

UNIT V **9 Hours**

KIDS WEAR GIRLS

Developing the design for kids wear (girls), draft and develop the garment with the components, front bodice, back bodice, sleeve, yoke if required, development of teck pack for the garment, construction process of the garment.

EXPERIMENT 1 **3 Hours**

Analyze the seams used in collar.

EXPERIMENT 2 **3 Hours**

Analyze the stitches used in collar.

EXPERIMENT 3 **3 Hours**

Analyze the seams and stitches used in kid‟s wear- Jabla

EXPERIMENT 4 **3 Hours**

Analyze the difference between the plain sleeve and puff at bottom sleeve

EXPERIMENT 5 **3 Hours**

Prepare knife pleats in kids wear frock.

EXPERIMENT 6 **6 Hours**

Draft and construct the puff at top and bottom using suitable stitches and seams.

EXPERIMENT 7 **9 Hours**

Draft and construct the Jabla for kids using suitable stitches and seams.

Total: 75 Hours

Reference(s)

1. Helen Joseph Armstrong, -Pattern Making for Fashion Design Pearson Education (Singapore)Pvt. Ltd., 2005.
2. Amaden-Crawford Connie, -The Art of Fashion Draping (3rd edition) Om Books International Publications, 2005.
3. R.Rathinamoorthy & R.Surjit, Apparel Machinery and Equipment, Woodhead Publishing India in Textiles, New Delhi, 2015.
4. Marie Clayton, Ultimate Sewing Bible, A Complete Reference with Step-by-Step Techniques. Collins & Brown, London, 2008.
5. Marry Mathew, Practical Clothing Construction Part I and II Basic Sewing Process, Cosmic Press, Chennai, 1999.
6. Claire Shaeffer, Sewing for Apparel Industry. Prentice Hall, 2000.

22HS004 HUMAN VALUES AND ETHICS 2 0 0 2

Course Objectives

- Understand the concept of good values and comprehend the importance of value-based living.
- Recognize the culture of peace through education.
- Identify and apply the practices for value development and clarification.

Programme Outcomes (POs)

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. Assess the importance of human values and ethics in life.
2. Execute the importance of harmonious living in a diverse society.
3. Analyze the sensitivity to the crying needs of society such as ungodliness, corruption, poverty, and suffering, and play a vital role in eradicating them.
4. Plan intellectually mature, morally upright, ethically correct, and spiritually inspired decisions.
5. Execute a correct balance between professional excellence and social commitment.

Articulation Matrix

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

UNIT I **6 Hours**

COURSE INTRODUCTION - NEED, BASIC GUIDELINES AND ANALYSIS

Importance of Human Values & Ethics in 21st Century - Understanding the theory of basic human values and ethics - Openness to change - Self enhancement - Conservation - Self transcendence - Schwartz Value Survey: Self-Assessment

UNIT II **6 Hours**

EMBRACING THE COMMON ETIQUETTE

Altruism- Integrity - Freedom - Justice - Honesty - Truthfulness - Responsibility – Compassion.

UNIT III **6 Hours**

CONTINUOUS HAPPINESS AND PROSPERITY

An overview on basic Human Aspirations - Understanding and living in harmony at various levels of life - Embracing self-love and wellness - Understanding harmony in the family and society.

UNIT IV **6 Hours**

UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS

Reflection on growing global multifold problems: poverty, pollution, hunger, disease, unemployment, caste system, child labour, gender equality, politics and violence. Understanding the challenges in cultural, personal, social, political, and economic environment.

UNIT V **6 Hours**

UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS CO- EXISTENCE

Understanding the harmony in Nature - Holistic perception of harmony at all levels of existence - Practice Exercises and Case Studies will be taken up in Practice Sessions.

Total: 30 Hours

Reference(s)

1. Martin, G. The Little Book of Ethics: A Human Values Approach. Australia: G.P. Martin. 2011.
2. Gupta, N. L. Human Values for The 21St Century. India: Anmol Publications Pvt. Limited. 2002.
3. Mishra, A. Happiness Is All We Want. India: Bloomsbury Publishing, 2017.
4. Universal Human Values. (n.p.): Books clinic Publishing, 2023.
5. A Textbook on Professional Ethics and Human Values. India: New Age International (P) Limited, 2007.

22HS005 SOFT SKILLS AND EFFECTIVE COMMUNICATION

0 0 2 1

Course Objectives

- Communicate proficiently in formal discussions at the workplace.
- Describe experiences and events, and briefly give reasons and explanations for opinions and plans.
- Interact with a degree of fluency and spontaneity that results in efficacious communication.
- Convey agreement and disagreement in a polite but firm manner.
- Communicate with coherence and imagination in both written and spoken formats.

Programme Outcomes (POs)

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. Enhance confidence in expressing thoughts in grammatically proper language and etiquette in waiting for the opportunity to provide input
2. Effectively communicate in English on formal occasions and proficiency in the use of link words and other discourse markers
3. Provide constructive feedback and file logical complaints
4. Analyse the understanding of oral and written communication in real-world situations.
5. Apply the improved spelling and punctuation in writing and heightened understanding of tone, pitch and stress in oral formats.

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	3	-	-	-	-
4	-	-	-	-	-	-	-	-	2	3	-	-	-	-
5	-	-	-	-	-	-	-	-	2	3	-	-	-	-

UNIT – I **10 Hours**

SELF-EXPRESSION

Group discussion/ Peer discussion - Communicating decisions and opinions - Tone, Pitch, Stress - Agreeing, Disagreeing, Suggesting, Speculating - Comparing and Contrasting - Comparatives and Superlatives - Discourse markers – Interjections - Decision making - Synthesis - Higher order thinking Group discussion/Peer discussion - Effective Communication Types of communication - Written vs Spoken - Contractions Intonation Stress Active voice - Question tags - Confidence and body language Guided writing- Outlining Main Points - Group discussion/Peer discussion - Avoiding common errors Reduction of MTI - Common errors - Barriers to communication Accent.

UNIT – II **10 Hours**

CREATIVE EXPRESSION

JAM, Debate, Review writing, Social media posts Synonyms - Antonyms Cloze test Phrasal verbs spotting errors Collocation - Commonly mispronounced

UNIT – III **10 Hours**

FORMAL EXPRESSION

Writing: Giving written feedback, Review writing, and Letter of complaint. Speaking: Giving constructive feedback and offering suggestions, asking for inputs, commenting politely on appropriate phrases - Giving written feedback, Review writing, and Letter of complaint. Critical reasoning - Modal verbs - Polite ways to express negatives

Total: 30 Hours

Reference(s)

1. Word Power Made Easy by Norman Lewis, W. R. Goyal Pub. & Distributors, 2009.
2. Sasikumar, V, et al., A Course in Listening & Speaking Foundation Books, 2005.
3. Murphy, Raymond. English Grammar in Use: A Self-Study Reference and Practice Book for Intermediate Students: with Answers. Cambridge: Cambridge University Press, 1985.
4. Prasad, Hari Mohan. A Handbook of Spotting Errors, McGraw Hill Education, 2010.
5. Personality Development & Soft Skills, BarunK.Mitra, Oxford University Press, 2012.
6. Business English by Ken Taylor, Orient Blackswan, 2011.

22FT401 PROBABILITY AND STATISTICS 3 1 0 4

Course Objectives

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

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

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

Articulation Matrix

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

UNIT I **9 Hours**

PROBABILITY THEORY

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

UNIT II **9 Hours**

TWO DIMENSIONAL RANDOM VARIABLES

Joint distributions - Marginal and Conditional distributions -Covariance - Correlation and Regression analysis in textile manufacturing.

UNIT III **9 Hours**

TESTING OF HYPOTHESIS

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

UNIT IV **9 Hours**

DESIGN OF EXPERIMENTS

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

UNIT V **9 Hours**

STATISTICAL QUALITY CONTROL

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

Total: 45+15=60 Hours

Reference(s)

1. Milton J. S. and Arnold Jesse C., Introduction to Probability and Statistics: Principles and Applications for Engineering and The Computing Sciences, McGraw Hill Inc, 3rd Edition, 1995.
2. S.C. Gupta, V. K. Kapoor, Fundamentals of Statistics, Sultan Chand & sons, 1R, 2010.
3. Johnson Richard A, Probability and Statistics for Engineers, 6th Edition, Prentice hall of India, 2002.
4. S. Bhasker, S. Narayana Moorthy, Statistical Quality Control and Reliability Engineering, 1st Edition, ANURADHA AGENCIES, 2000.

22FT402 ADVANCED FASHION CULTURE AND STUDIES

3 0 2 4

Course Objectives

- Explain the impact of fashion body types through fashion illustration principles and texturing techniques.
- Execute the designing silhouettes of fashion history based on the type of silhouette.
- Apply fashion terminologies in real time fashion industry.

Programme Outcomes (POs)

PO3: 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.
PO4: 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.
PO10: 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.
PO12: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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Implementation of body aesthetics to different body shapes and related genre of clothing.
2. Show the influence of fashion illustration to communicate the effect of style creation or development.
3. Differentiate the principles and classification of silhouettes for the ornate of style development.
4. Critiquing the silhouettes of fashion history to learn the inspired creation of popular trends from past to present fashion world.
5. Show the use of fashion terminologies from research to design execution.

Articulation Matrix

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

UNIT I **9 Hours**

FASHION BODY TYPES

Golden mean: Appreciation of body aesthetics, Body types: Ectomorph, Mesomorph and endomorph, Female body types: Triangle, Inverted triangle, Pear shape, Hourglass, Rectangle, Plus size, androgynous. Genre of clothing: Formal wear, Casuals- smart casuals, rugged casuals, Sporty casuals, Dressy casuals, Active casuals, sportswear, Evening wear and lounge wear.

UNIT II **9 Hours**

FASHION ILLUSTRATION AND TECHNIQUES

Fashion illustration principles: 8 head, 10 head and 12 head theory, plum lines, Sketching faces, Hairs. Highlights, shadows, Mid tones. Texturing techniques: Chiffons, sequins, furs, corduroy, knits, Jeans, Lace, printed fabrics. Introduction to flat sketches: Elements of flat sketch, purpose of flat sketch, Details to be present in a flat sketch.

UNIT III **9 Hours**

SILHOUETTES CLASSIFCATIONS

Principles of silhouette: Drape (Gathers, pleats, tucks, flares, flounces), Fall, Stance, fold effects (Half lock, cowl, pipe, zig zag, Spiral, drop, Diaper). Classification of silhouettes: Structured Silhouettes, Tailored silhouette, Compression silhouette, Exaggerated silhouettes, Draped silhouette, Flagging silhouette and layered silhouette.

UNIT IV **9 Hours**

PRINCIPLES OF FASHION SILHOUETTES

Principles of silhouettes: Embellishments, asymmetric forms, Biomorphic forms. Pattern, motifs, textures. Defining silhouettes in fashion history: Victorian dress, Gibson girl look, Flapper dress, Coco Channel's: Women's suit, LBD, Christian Dior: New look, Paul Poiret: Eastern inspired modern silhouettes. Elsa Schiaparelli: Knitted and surrealistic dresses, Paco Rabanne: Seven Unwearable dress, DKNY: Capsule collection.

UNIT V **9 Hours**

FASHION TERMINOLOGIES

Fashion terminologies: Fashion cycle. Categorization of fashion and its elements: Avant Garde, Haute couture, Preto porter, High Street fashion. Fashion runways, Fashion season. Fast fashion, slow fashion and sustainable fashion. Fashion theory: Trickle up, trickle down and trickle across.

EXPERIMENT 1 **8 Hours**

Analysis and illustration of the different fashion Figures (8 ½, 10,12 Head – different proportions) to attain the fit and shape of the garment.

EXPERIMENT 2 **4 Hours**

Design and render different woven textures as well as different fullness of the garment to explore the 3D simulation of the garment. (Added Value and Promotion).

EXPERIMENT 3 **4 Hours**

Design and render different knitted textures as well as different fullness of the garment to explore the 3D simulation of the garment. (Added Value and Promotion).

EXPERIMENT 4 **8 Hours**

Design and render the different silhouettes both runway and Exaggerated to enrich the garment.

EXPERIMENT 5 **2 Hours**

Design and development of fashion flats for women‟s formal and casual wear inspired by Channels women as well as Flapper Dress.

EXPERIMENT 6 **2 Hours**

Design and development of fashion flats for casual wear inspired by Channels women as well as Flapper Dress.

EXPERIMENT 7 **2 Hours**

Design and development of fashion flats for Unisex wear.

Total: 75 Hours

Reference(s)

1. Anna Kiper, Fashion Illustration-Inspiration and Technique, David & Charles publisher, November 2016.
2. C. Melody Edmondson, The Guide Book, Your Fashion Guide Based on Body Shape & the Space of the Waist, CreateSpace Independent Publishing Platform, 12 August 2015.
3. Heather Vaughan Lee, José Blanco F., Mary Doering, Patricia Kay Hunt-Hurst, Clothing and Fashion, ABC-CLIO-publisher, 23 November 2015.
4. Andrew Reilly, Key Concepts for the Fashion Industry, Bloomsbury Publishing, 28 August 2014.
5. Laura Volintesta, language of fashion design: 26 principles every fashion designer should know, Rockport publishers, 2014.
6. Macarena San martin, Fashion Details: 1000 ideas from neckline to waistline, pockets to pleats, Rockport publishers, 2011.
7. Susannah Constantine, Trinny Woodall, The Body Shape Bible-Everything You Need to Know for a Lifetime of Dressing and More, Weidenfeld & Nicolson Publisher, 2007.
8. Joane E. Blair, Fashion Terminology, Prentice Hall publisher, 1992.

22FT403 STRUCTURE AND DESIGN OF WOVEN FABRICS **3 0 2 4**

Course Objectives

- To understand the various types of woven fabric structures.
- To comprehend the design, draft and peg plan for various woven fabric structures.
- To determine the suitability of loom requirements to produce fabrics with different structures.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: 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.
PO10: 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.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess the elements of woven fabric structure and analyze their construction parameters.
2. Assess the special rib and cord woven structures and analyze their construction parameters.
3. Apply the suitable looms to produce the various types of woven fabric structures.
4. Analyze the formation techniques of pile fabric structures.
5. Analyze the formation techniques of pile fabric structures and double cloth.

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

UNIT I **9 Hours**
BASIC WEAVES
Elements of woven design, Construction of elementary weaves - plain, warp rib, weft rib,mat. Twills - modification of twills. Satin - sateen and their derivatives. Ordinary and Brighton honeycomb, Huckaback. Crepe weaves.

UNIT II **9 Hours**
CORD EFFECTS
Bedford cords and Mock leno Plain faced - twill faced. Wadded modifications. Welt - piques: wadded piques - Loose back and fast back welts and piques. Spot figuring-arrangement of figuring for dobby and jacquard.

UNIT III **9 Hours**
COLOR THEORY
Light and pigment theory - modification of color - color combination - application of colors - color and weave effects.

UNIT IV **9 Hours**
EXTRA FIGURED WEAVES AND BACKED FABRICS
Extra warp and extra weft figuring- Extra warp and extra weft figuring with two colors. Warp and weft back - reversible and non-reversible.

UNIT V **9 Hours**
PILE FABRICS
Warp pile - fast wire pile - terry weaves - terry stripe - terry check- Weft pile: plain back - twill back velveteen - Lashed pile corduroy - Weft plush -Length, density and fastness of pile. Method of preparation of self-stitched and centre warp and weft stitched double cloths, their salient feature and uses. Warp and weft Wadded double cloth.

EXPERIMENT 1 **3 Hours**
Analysis of Plain, Twill weave and Satin weaves.

EXPERIMENT 2 **3 Hours**
Analysis of Huck-a-back and Honey Comb weaves

EXPERIMENT 3 **3 Hours**
Design, Draft and Peg plan of Mock Leno, Bedford cords

EXPERIMENT 4 **3 Hours**
Analysis of Extra Warp and Extra Weft Figuring

EXPERIMENT 5 **3 Hours**
Design, Draft and Peg plan of Double cloth, Pile Fabric

EXPERIMENT 6 **3 Hours**
Valuation of Color and Weave Effect

EXPERIMENT 7 **3 Hours**
Design the set of parameters of a woven fabric for the given specific end-use

EXPERIMENT 8 **3 Hours**
Analyze the knitted fabric and state the end-uses

EXPERIMENT 9 **3 Hours**
Sourcing and analysis of the given woven fabrics

EXPERIMENT 10 **3 Hours**
Analyze the knitted fabric and state the end-uses

Total: 75 Hours

Reference(s)

1. Grosicki Z. J. Watson Textile Design and Colour Vol.1, Woodhead Publications, Cambridge England, 2004.
2. E G Gilligan, Woollen and Worsted Woven Fabric Design, Woodhead publication, UK, 2004.
3. Seyam A. M.,Structural Design of Woven Fabrics, Theory and Practice Textile Institute, Manchester, 2002.
4. W. S. Murphy, Textile weaving & Design, Abhishek Publications, 2000.
5. nptel.ac.in/courses/116102005/26.

22FT404 TEXTILE CHEMICAL PROCESSING 3 0 2 4

Course Objectives

- Apply fundamental knowledge on chemical processing of textiles.
- Learn and apply the method of application of pre-treatments / dyes / prints /finishing/ process.
- Demonstrate knowledge of the machinery used for pre-treatment / dyeing/printing/finishing/ process.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

Course Outcomes (COs)

1. Assess the preparatory process and produce desized, scoured, bleached and mercerized fabric.
2. Analyze the various dyeing machines and produce dyed fabrics with different dyes.
3. Differentiate styles of printing, methods of printing and create printed fabrics.
4. Evaluate suitable mechanical and chemical finishing techniques for fabric.
5. Analyze the color matching using spectrophotometer for measuring the quality of dyed material.

Articulation Matrix

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

UNIT I **9 Hours**

PREPARATORY PROCESSES

Introduction - Process sequence of wet processing for woven and knits. Singeing: gas singeing. Desizing: hydrolytic, oxidative and enzymatic. Scouring: alkaline and enzymatic. Bleaching: hypochlorite, peroxide and sodium chlorite bleaching. Optical whitening. Mercerizing: Hot and Cold mercerization, tension, tensionless mercerization.

UNIT II **9 Hours**

DYEING AND DYEING MACHINERY

Classification of dyes. Dyeing of cotton using natural, direct, reactive, vat and Sulphur dyes. Dyeing of polyester using carrier, HTHP and thermo sol. Dyeing of cellulosic blends (one bath and two bath process). Dyeing of silk and wool with Acid and basic dyes. Dyeing equipment - jigger, winch, soft flow, jet dyeing, J-box, padding mangles, package dyeing and garment dyeing machine.

UNIT III **9 Hours**

PRINTING

Ingredients of print paste and their role in printing. Viscosity of print paste, Rheology properties and flow of print paste, Styles of printing - direct, discharge, resist, tie and dye and batik. Methods of printing - block, stencil, roller, rotary, flat bed, transfer and chest printing. Special prints -flock, foam, foil, glitter, khadi, leather, pearl and rubber. After treatments of printed goods. Troubleshooting in textile printing. Different type of printing embellishments

UNIT IV **9 Hours**

FINISHING

Mechanical finishing -raising, shearing, sueding, anti-shrink finish, compacting, decatizing, calendaring, embossing. Chemical finishing - softening, crease resist, biopolishing, flame retardant, water repellent, water proof, soil/ stain release, antimicrobial, UV protection finish. Denim washing - stone washing, acid washing, enzymatic washing and sand blasting.

UNIT V **9 Hours**

COMPUTER COLOR MATCHING

Colour perception, Electromagnetic spectrum - visible range, theories of colour vision, colour measurement. Types of Spectrophotometers- Spectrophotometer performance Parameter. The CIE color specifications. Metamerism & metameric index - Types of metamerism. Quality control using computerized color matching systems, color difference - pass / fail system.

EXPERIMENT 1 **6 Hours**

Preparation of cotton fabric by removing impurities and make it absorbent to pick up dyes and chemicals in dyeing, printing and finishing.

EXPERIMENT 2 **9 Hours**

Production of dyed cotton fabric and evaluation of colour fastness properties to ascertain desirable performance in actual use.

EXPERIMENT 3 **3 Hours**

Dyeing of synthetics and their blends to get enchanting appearance in fashionable fabrics.

EXPERIMENT 4 **3 Hours**

Colouration of silk substrates by synthetic dyes to make the surface attractive.

EXPERIMENT 5 **3 Hours**

Design enhancement of cotton fabric by using different styles of conventional printing by screens and blocks.

EXPERIMENT 6 **6 Hours**

Value addition of cotton fabrics by different chemical finishes with improved performance in wearing.

Total: 75 Hours

Reference(s)

1. D. Gopalakrishnan, Basics of Chemical Processing, Daya Publishing House, New Delhi, 2016.
2. E. R. Trotman, Dyeing and Chemical Technology of Textile Fibres, Charles Griffin and Co. Ltd., London. 1990.
3. V. A. Shenai, Technology of Bleaching and Mercerizing - Vol. III, Sevak Publications, Mumbai 1991.
4. V. A. Shenai, Technology of Dyeing - Vol. VI, Sevak Publications, Mumbai, 2000.
5. V. A. Shenai, Technology of Printing - Vol. IV, Sevak Publications, Mumbai 1996.
6. V. A. Shenai, Technology of Textile Finishing, Sevak Publications, Bombay, 1995.

22FT405 APPAREL DESIGN AND DEVELOPMENT II

3 0 2 4

Course Objectives

- Acquire knowledge on human body measurements and creating pattern from the measurements for male and female.
- Develop commercial pattern with design aspect by manipulating the basic pattern.
- Fabricate patterns of different sizes by grading the basic pattern & develop the products for graded patterns.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO6: 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.
PO7: 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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Resolve the methods for drafting basic block patterns for men & women.
2. Apply the procedure for drafting patterns for top wear garments (Men & Women) and predict the fine changes that need to be incorporated in real production patterns.
3. Apply the procedure for drafting patterns for bottom wear (Men & Women) and predict the fine changes that need to be incorporated in real production patterns.
4. Find the factors affecting garment construction process and resolve the problems of making them.
5. Determine the pattern making adjustments and changes required for manufacturing functional wear.

Articulation Matrix

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

UNIT I **9 Hours**

PATTERN DRAFTING FOR KNIT WEARS AND TECH PACK

Knit Wear: Pattern drafting-factors to be considered. Tech pack: Introduction and development.

UNIT II **9 Hours**

SEWING MACHINERIES

Parts and functions of SNLS, Overlock Lock, Flat Lock, Special purpose sewing machines - Embroidery machine, feed of arm, buttonhole sewing, button sewing, bar tack, blind stitch machines. Adjustments in machine parts. Special attachments in sewing machines - guides, folders, stackers, trimmers, ziggers.

UNIT III **9 Hours**

SEAMS AND GARMENTING TECHNIQUES

Seams and stitches - Classification of seams, stitches and seam finishes. Remedial measures and causes for seam and stitch defects. Garmenting Techniques: Fullness - darts, tucks, pleats, gathers, flare, godets, shirring, frills, flounce. Hemming and neckline finishes.

UNIT IV **9 Hours**

COMPONENTS OF WEAR

Types, pattern making and construction - Sleeves, yokes, collars, placket, sleeves, pockets, cuffs.

UNIT V **9 Hours**

KIDS WEAR

Drafting and Construction: Baby set - jabla, panty, bib and bonnet. Frock, Baba suit, Rompers and Mittens.

EXPERIMENT 1 **3 Hours**

Draft the pattern for Polo neck T- shirt.

EXPERIMENT 2 **3 Hours**

Develop the teck pack for kurtha top women with floral print.

EXPERIMENT 3 **6 Hours**

Determine the threading process for SNLS, Overlock, and Flatlock sewing machine.

EXPERIMENT 4 **3 Hours**

Develop a garment - Pleated skirt with pleated long top using lapped, bound, flat, flat fell, super imposed, French seam.

EXPERIMENT 5 **3 Hours**

Develop a ladies blouse using 3-pointed dart and midriff yoke.

EXPERIMENT 6 **3 Hours**

Develop a pattern and construct the formal shirt- Men"s wear by using seams and garmenting techniques.

EXPERIMENT 7 **3 Hours**

Develop a pattern and construct the party wear – Women"s wear by using seams and garment techniques.

EXPERIMENT 8 **6 Hours**

Develop the tech pack draft the pattern and construct it for the given product Shirt, shorts, gloves, and bip.

Total: 75 Hours

Reference(s)

1. Helen Joseph Armstrong,-Pattern Making for Fashion Design- Pearson Education (Singapore) Pvt. Ltd., 2005.
2. Winifred Aldrich-Metric Pattern Cutting-Blackwell Science Ltd., 1994.
3. B. Claire and Shaeffer, Sewing for Apparel Industry, Pearson's Prentice Hall, New Jersey, 2000.
4. Leila Aitken, Step by Step Dress Making Course, Sterling Publishing Co. Inc. NewYork,1994.
5. Marry Mathew, Practical Clothing Construction Part I, Basic Sewing Process, Cosmic Press, Chennai, 1999.

22HS007 ENVIRONMENTAL SCIENCE 2 0 0 0

Course Objectives

- Understand the interdisciplinary and holistic nature of the environment.
- Identify the significance of natural resources and environment on the quality of life and stimulate the quest for sustainable development.
- Assess the socio-economic, political and ethical issues in environmental science.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO7: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. Show the importance of interdisciplinary nature of environment studies, uses and exploitation of natural resources
2. Demonstrate the different types of ecosystems and biodiversity, its values and also role of professionals in protecting the environment from degradation
3. Assess the existing environmental challenges related to pollution and its management
4. Select suitable strategies for sustainable management of components of environmental science
5. Compare 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	1	2	-	-	-	-	-	-	-	-	-	-	-	-
2	1	1	-	-	-	-	-	-	-	-	-	-	-	-
3	2	2	-	-	-	-	1	-	-	-	-	-	-	-
4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
5	2	-	-	-	-	-	-	-	-	-	-	-	-	-

UNIT I **6 Hours**

NATURAL RESOURCES

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

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 ecosystems: Introduction - characteristic features: desert ecosystem. Biodiversity - value of biodiversity - threats to biodiversity - endangered and endemic species - Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

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 - Noise pollution - Thermal pollution. Disaster management - causes - effects - control measures of floods - Earthquake

UNIT IV **7 Hours**

SOCIAL ISSUES AND ENVIRONMENT

Sustainable development - Definition - Unsustainable to sustainable development - solid waste management - causes - effects - 5R Principles - landfills, incineration, composting. Water conservation - rain water harvesting - watershed management. Climate change - Global warming - acid rain - Ozone layer depletion. E-waste

UNIT V **5 Hours**

HUMAN POPULATION AND ENVIRONMENT

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

Total: 30 Hours

Reference(s)

1. Anubha Kaushik, C.P. Kaushik, Environmental Science and Engineering, 4th Multi Colour Edition, New Age International Publishers, New Delhi, 2014.
2. Raven, P. H. Hassenzahl, D.M. & Berg, L.R. 2012. Environment, 8th edition. John Wiley & Sons
3. T. G. Jr. Miller, S. Spoolman, New Environmental Science, 14th Edition, Wadsworth Publishing Co, New Delhi, 2014.
4. Pepper, I. L, Gerba, C. P. & Brusseau, M. L. 2011, Environmental and Pollution Science, Academic Press.
5. A. K. De, Environmental Chemistry, 7th Edition, New age international publishers, New Delhi, 2014.

22HS008 ADVANCED ENGLISH AND TECHNICAL EXPRESSION 0 0 2 1

Course Objectives

- To enable students to achieve proficiency in academic writing.
- Effectively use the language to persuade others.
- Appreciate the nuances of the language and engage an audience.
- Use advanced tools of language to improve communicative competence.
- Prepare for professional demands at the workplace.
- Give concrete expression to the plans and goals.

Programme Outcomes (POs)

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. Infer the clarity in articulating the objectives and aims and improved proficiency in using the English language.
2. Communicate effectively and with good interpersonal skills; speak in public, engage the audience, and lead a group discussion.
3. Critically evaluate the ethics of persuasive appeals and confidence to influence opinion.
4. Analyse a specific piece of information; take in what is read, and use good writing techniques with proper grammar and syntax in all formal situations.
5. Create awareness and empathy to emotional signals in communication.

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	3	-	-	-	-
4	-	-	-	-	-	-	-	-	2	3	-	-	-	-
5	-	-	-	-	-	-	-	-	2	3	-	-	-	-

UNIT I **15 Hours**

CREATIVE EXPRESSION

Proposals & Grant applications, Argumentative essays & editorials, Sales Pitches, Campaigning, Commercials/advertisements, effectively answering the famous interview question: „Why should we hire you?‟ Sentence and paragraph formation - Rhetorical questions - Emphasis & effective repetition - Empathetic expression, knowing the audience, capturing attention - Creating Memes, Comic Strips, Stand-up comedy, Caption writing, and Limericks, Vocabulary and slang words for comedy - Similes & Metaphors - Homophones, homonyms, alliteration, wordplay

UNIT II **15 Hours**

FORMAL EXPRESSION

Writing: Action plans, Cover letters, Mind-Mapping, Paragraph writing Logical reasoning SVA - Advanced level - Style: Clarity, Concision, Coherence, Evocativeness, Efficacious Vocabulary - Conditional Clause - Be verbs- Tenses- advanced - Opening and closing sentences - Action plans, Anecdotal references, order of communication/ narration, complete communication- Wh-questions - Effective beginning and closing - Rhetorical questions - Appraising target audience - Pronunciation, Enunciation, Tone, Pace and Volume. - Writing: SOPs, Research Objectives, Thesis Statement, Indexing, Scholarly Articles, Academic Writing, Executive Summary, Survey Questionnaires, Citations and Bibliography - Reading: Quantitative & qualitative analysis, Analysis and paraphrasing of reference materials Speaking: Commentate live events, give instructions to operate machines/ conduct experiments Listening: Informational listening, Reflective listening, - Discriminative listening - Connective words - Prefixes and Suffixes - Quoting and paraphrasing Proofreading - Directed writing and writing formats - Note taking - Active verbs

Total: 30 Hours

Reference(s)

1. Sangeeta Sharma et.al. Communication Skills for Engineers and Scientists, PHI Learning Pvt. Ltd, 2011
2. Murphy, Raymond. English Grammar in Use: A Self-Study Reference and Practice Book for Intermediate Students: with Answers. Cambridge: Cambridge University Press, 1985.
3. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, TataMcGraw Hill & Co. Ltd., 2001
4. Personality Development, Harold R. Wallace &L. Ann Masters, Cengage Learning, New Delhi
5. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd.1990, Delhi
6. English Grammar, Composition and Usage by N.K.Agrawal & F.T.Wood, Macmillan India Ltd., New Delhi

22FT501 APPAREL MERCHANDISING AND COST MANAGEMENT 3 1 0 4

Course Objectives

- To understand the apparel merchandising process in apparel business.
- To summarize the process flow in merchandising for order execution.
- To access the sourcing and overall apparel manufacturing costing process in apparel industry.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO7: 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.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Analyse the roles and responsibilities of apparel merchandising processes with the terminologies and abbreviations used in the apparel industry.
2. Access the role of merchandiser in the product development process with the help of Market research.
3. Carry out the order execution activities of merchandiser in the apparel industry with examples.
4. Determine the sourcing process followed in the apparel industry.
5. Determine and compute the cost calculation methods used in apparel industry.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO MERCHANDISING

Introduction to Apparel Industry, Merchandising terminology-supplier, sub-contractor, direct order, merchant export, Evaluation of sub-contractors, CM and CMT. Merchandiser in apparel industry, Roles of a fashion merchandiser, Role of a production merchandiser, Role of a retail merchandiser. Samples in apparel Industry- Sampling process, samples and their importance. Responsibilities of a merchandiser, Merchandiser interface with other departments of apparel industry.

UNIT II **9 Hours**

FORECASTING AND PRODUCT DEVELOPMENT

Line Planning, Line development- Fashion forecasting process, Market research, Fashion research. Product Development- Role of merchandiser in product development process. Line adoption, Apparel analysis Process- style description, positioning strategy, sizing and fit Material specifications, garment component assembly, Final assembly and finishing, style presentation. Customer profiling for apparel merchandisers- customer profiling methods, benefits of customer profiling.

UNIT III **9 Hours**

MERCHANDISING PLANNING AND ORDER EXECUTION

Time and action plan for merchandisers, Development of time and action plan- Gantt chart, network charts. Raw material consumption estimations- Fabric and yarn weight calculations, size wise-colourwise order quantity breakup identification, yarn or fabric consumption calculations, sewing threads-consumption calculations, other raw material consumptions. Factory capacity planning-Sewing department capacity calculation-Line efficiency and capacity, capacity calculation for other departments.

UNIT IV **9 Hours**

SOURCING

Classifications of sourcing process, sourcing strategies for decision making, sourcing process in an apparel industry, Role of merchandiser in sourcing process. Factors affecting sourcing process-Lead time, Minimum order Quantity (MOQ), Logistics facilities, Quality parameters, sourcing costs. Supplier or vendor management- supplier/vendor selection criteria, supplier evaluation process. Types of supplier for apparel industry. Vendor/supplier evaluation, Vendor Evaluation methods.

UNIT V **9 Hours**

APPAREL COSTING

Elements of cost- Material cost, Labour cost, Expenses, Overheads. Factors influencing the costing process. Calculation of fabric cost-yarn cost calculation, process cost calculation. Fabric cost calculation. Cost calculation in apparel production departments- cutting department costs, sewing department costs, Trimming and checking department cost, packing department costs, calculation of shipping and forwarding cost. Calculation of overall apparel manufacturing cost (Cut-Make-Trim/Pack and shipping). Case Study on Merchandising management.

Total: 45+15=60 Hours

Reference(s)

1. Dr. V.R. Sampath, Garment Marketing and Merchandising, Published by Kalaiselvi Pathippakam.
2. Elaine Stone, Fashion Merchandising -An Introduction, Fourth Edition.
3. Virginia Grose, Basics Fashion Management 01: Fashion Merchandising, AVA publisher, Switzerland, 2011.
4. Rathinamoorthy, Surjit, Apparel Merchandising, Woodhead Publishing India Pvt. Ltd., 2018.
5. Vasanth Kothari , A series of Articles on Fashion Merchandising , 2011.

22FT502 APPAREL DESIGN AND DEVELOPMENT III 3 0 2 4

Course Objectives

- Acquire knowledge on human body measurements and creating pattern from the measurements for male and female.
- Develop commercial pattern with design aspect by manipulating the basic pattern.
- Fabricate patterns for different men's and women's wear.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO6: 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.
PO7: 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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess the material selection for woven and knitted fabrics.
2. Create patterns and construct men's knit wear according to the given/ designed wear or tech pack.
3. Create patterns and construct women's knit wear according to the given/ designed wear or tech pack.
4. Create patterns and construct functional wear according to the given/ designed wear or tech pack.
5. Analyze the product development process in apparel industry.

Articulation Matrix

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

UNIT I **9 Hours**

MATERIAL SELECTION

Material selection (Raw Material - Fabric) - Parameters of Fabric - Factors to be considered for pattern making of knitted fabric & woven Fabric. Trims & Accessories selection and properties.

UNIT II **9 Hours**

MEN'S KNIT APPARELS

Drafting and Construction: Top Wear-Polo Shirt, T-Shirt, vests. Bottom wear- Briefs, knickers, boxers, Track pants.

UNIT III **9 Hours**

WOMEN'S KNIT APPARELS

Drafting and Construction: Top Wear-Camisole, Brassiere, corset. Bottom Wear-Panty, leggings, jeggings.

UNIT IV **9 Hours**

FUNCTIONAL WEAR

Drafting and Construction: Surgical gown/ apron, hooded sports jacket, swim suit.

UNIT V **9 Hours**

PRODUCT DEVELOPMENT PLAN

Design analysis-Operation Breakdown-Process flow-Selection of Machine based on style & Process-line balance-calculation of SAM-operation Bulletin.

EXPERIMENT 1 **6 Hours**

Develop the patterns for men's knit top wear. (Polo T- Shirt)

EXPERIMENT 2 **6 Hours**

Develop the pattern and design well-fitted, comfortable garment for women‟s knit top wear

EXPERIMENT 3 **6 Hours**

Develop the pattern and design well-fitted, comfortable garment for men‟s knit Bottom wear

EXPERIMENT 4 **6 Hours**

Develop the pattern and design for surgical gown/ apron / Tech pack

EXPERIMENT 5 **6 Hours**

Develop the pattern and design for sportswear / Tech pack

Total: 75 Hours

Reference(s)

1. Helen Joseph Armstrong-Pattern Making for Fashion Design, Pearson Education (Singapore) Pvt. Ltd., 2005.
2. Winifred Aldrich-Metric Pattern Cutting, Blackwell Science Ltd., 1994.
3. B. Claire and Shaeffer, Sewing for Apparel Industry, Pearson‟s Prentice Hall, New Jersey, 2000.
4. Leila Aitken, Step by Step Dress Making Course, Sterling Publishing Co. Inc. NewYork, 1994.
5. Marry Mathew, Practical Clothing Construction Part I, Basic Sewing Process, Cosmic Press, Chennai, 1999.

22FT503 FASHION PORTFOLIO 3 0 2 4

Course Objectives

- To predict the trends through trend forecasting process and also asses the color forecast the same.
- To impart the knowledge of conceptualizing designs and to develop prototypes for the same.
- To impart knowledge of organizing different elements in a portfolio and bringing out the desired look.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO7: 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.

PO10: 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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Execute trend analysis, identify key concepts: color, style, fabric and prepare trend reports for the chosen apparel category.
2. Apply stages of the design process there by making boards at each stage of the design process.
3. Create design exploration sketches, fashion illustrations and determine fabric specifications for different looks.
4. Determine intended design outcomes by manipulating fabrics and patterns.
5. Create Prototypes and bring out the look desired through photoshoot with a proper presentation.

Articulation Matrix

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

UNIT I **9 Hours**

FASHION TRENDS AND FORECASTING

Fashion trend, trend analysis techniques: trend forecasting platforms, interpreting trends, forecast report, types of forecasting. Color forecasting process - Key colors. Social and Cultural aspects. Consumer segmentation based on Psychographic profiles. Fashion design process: Stages in design thinking, Double diamond approach.

UNIT II **9 Hours**

FASHION DESIGN PROCESS

Fashion design process: Stages in design process, Double diamond approach. Inspiration board: elements to be present, visual arrangements. Mood board: Deriving mood board elements from the trend forecast report, Color board: color story, base color, ascent and descent colors and color proportions.

UNIT III **9 Hours**

CONCEPTUALIZATION AND SILHOUETTE DEVELOPMENT

Design exploration techniques, fashion illustration: poses, rendering different fabrics, flat sketch: seam details, fabric and trim details, accessory board. Development of designs and silhouettes, Design exploration. Types of fashion looks - classic, bohemian, casual, eclectic, minimalistic and sporty.

UNIT IV **9 Hours**

FABRIC PARAMETERS

Classification of fabric types: woven fabric categories and knitted fabric categories. Fabric specification development: color specification, weight specification, drape specification. Fabric manipulation techniques: surface embellishments, different dyeing techniques: batik, tie and dye, vegetable dyeing, marbling. other ornamentation techniques.

UNIT V **9 Hours**

PROTOTYPE DEVELOPMENT

Pattern development processes - draping & alterations, Flat sketches. Story board preparation. Fashion photoshoot. Look book contents. Garment construction: the selection of appropriate needles, seams, stitches. Fit testing. Fashion photoshoot: product and model Photoshoot. Developing theme; Choosing poses, Hair and makeup, accessories, background selection. Arranging elements in the portfolio.

EXPERIMENT 1 **6 Hours**

Develop a trend report for the selected women's wear line for the upcoming spring/summer season.

EXPERIMENT 2 **6 Hours**

Design and develop a mood board for the spring/summer collection based on the inspiration board.

EXPERIMENT 3 **6 Hours**

Develop a prototype for the chosen design with proper fabric and accessories.

EXPERIMENT 4 **6 Hours**

Create suitable styling for the final designed garment.

EXPERIMENT 5 **6 Hours**

Develop a photo shoot portfolio by arranging all the above boards.

Total: 75 Hours

Reference(s)

1. Portfolio Presentation for Fashion Designers, Linda Tain 4th edition. Publication 2018.
2. Anette Fischer and Kiran Gobin, Construction for fashion design, Bloomsbury, 2017.
3. Anna Kiper, Fashion Portfolio-Design and Presentation, Publisher: Botsford, October 2016.
4. Karl Aspelund, The design process, Fairchild, 2015.
5. Designing Your Fashion Portfolio from Concept to Presentation 1st edition, Joanne Barrett, Publication 2014.

22FT504 APPAREL CAD **0 0 4 2**

Course Objectives

- To impart them knowledge in identifying the pattern making tools used in Lectra software and develop efficient patterns.
- To equip them in developing different garment patterns and grading the patterns in efficient manner

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. Find the tools and applications of Lectra software (Pattern making and grading software).
2. Create the Basic Pattern Set patterns in Lectra software.
3. Create the patterns and grade them into different sizes.
4. Create different garment patterns and grading the patterns in efficient manner.

Articulation Matrix

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

EXPERIMENT 1 **8 Hours**

Draft the Men‟s Basic Bodice front, Back and Sleeve pattern using Pattern Making Software.

EXPERIMENT 2 **9 Hours**

Draft the Women‟s Basic Bodice Front and Back and Sleeve pattern using Pattern Making Software

EXPERIMENT 3 **8 Hours**

Draft the Kids wear pattern using Gemini Software.

EXPERIMENT 4 **8 Hours**

Draft the Baba Suit pattern using Pattern Making Software.

EXPERIMENT 5 **9 Hours**

Draft men‟s trouser pattern & Shirt pattern develop three different sizes and seam the patterns and grade them in three inseam lengths. Develop a marker plan for suitable different fabric widths.

EXPERIMENT 6 **9 Hours**

Draft Men‟s Shirt patterns develop three different sizes and seam the patterns and grade them in three inseam lengths. Develop a marker plan for suitable different fabric widths.

EXPERIMENT 7 **9 Hours**

Draft women‟s shirt pattern & Shirt pattern develop three different sizes and seam the patterns and grade them in three inseam lengths. Develop a marker plan for suitable different fabric widths.

Total: 60 Hours

22FT507 MINI PROJECT I 0 0 2 1

Course Objectives

- Identify the problem statement and apply the engineering concepts to find the solution.
- Improve the analysing capability of the students.
- Increase the exuberance in finding the solution to various problems.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Find a real world problem, identify the requirement and develop the design solutions.
2. Analyze technical ideas, strategies and methodologies
3. Assess the new tools, algorithms, and techniques that contribute to obtaining the solution of the project.
4. Analyze and validate through conformance of the developed prototype and analysis of the cost-effectiveness.
5. Create the report and present oral demonstrations.

Articulation Matrix

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

22FT601 APPAREL PRODUCTION PLANNING AND CONTROL

3 1 0 4

Course Objectives

- To understand the Industrial Engineering concepts and their uses.
- To utilize the various Industrial Engineering techniques in apparel manufacturing process.
- To understand the Material movement in the apparel manufacturing process.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO4: 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.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Analyse the objectives of production planning and control system practiced in apparel industry.
2. Evaluate the types of garment production systems followed in the apparel industry.
3. Evaluate labour and machinery requirements for a apparel factory.
4. Analyze production scheduling and line balancing techniques.
5. Analyze the production control forms used in apparel industry.

Articulation Matrix

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

UNIT I **9 Hours**

PRODUCTION PLANNING AND CONTROL

Definition, Objectives and functions of production planning and production control, Function of PPC in garment industry. Pre-production functions, Importance of Preproduction function, Product development - steps from prototype to production sample. Lead Time, Product data management, Order quantity to shipment quantity. Calculate the productivity based on the different measures and production. Analyse and show the critical path and duration that can be taken to do the job.

UNIT II **9 Hours**

APPAREL PRODUCTION SYSTEMS

Section Production systems-whole garment production system, Progressive bundle system, Unit production system, Multiple flow system, modular manufacturing systems-their advantages and disadvantages. Guide lines for choosing suitable production system. Create plant layout for given lot production. Analyze the Operation break down for the particular style (Men's formal shirt).

UNIT III **9 Hours**

FLOW PROCESS GRIDS AND CHARTS

Operation Break Down and Production Sequence, Identification of Bottle Necks and Critical Area, Operation Wise Machinery Allocation, Usage Of Special Attachments And Tools For Operation Simplifications, Production Grid And Flow Chart. Analyze optimized techniques and line sequence for manufacturing apparel products through Methods study (Flow charts based on sequence and time scale). Analyze optimized techniques and line sequence for manufacturing apparel products through Methods study (Diagrams based on movements and motion study).

UNIT IV **9 Hours**

PRINCIPLES OF SCHEDULING AND LINE BALANCING

Scheduling charts-GANTT chart, Scheduling techniques Network representation-CPM and PERT Time & Action calendar Time study predetermined motion time standards (PMTS). Calculation of SAM for different garments, General Sewing Data. Determination and allocation of manpower and machines for balanced production in existing plant for a given target, application of line balancing techniques-balance control. Prepare time and action plan for the particular style of garment. Analyze the performance of the operator for the particular style by using on standard efficiency technique.

UNIT V **9 Hours**

PRODUCTION CONTROL

Production line loading planning, Factory Capacity planning, Determination of machine requirements for a new factory -calculation of labor requirements, Linear programming. Production control forms, Modern Methods in Cut Piece Distribution and Tracking in different Manufacturing Systems, Production planning softwares. Toyota Production System (TPS), Capacity planning, scientific method of training, Value engineering, LEAN manufacturing. Calculate standard allowed minute for the particular style (Men's T shirt). Analyze and perform capacity planning and line balancing.

Total: 45+15= 60 Hours

Reference(s)

1. Johnson Maurice "Introduction of Work Study, International Labour Organization, Geneva, 2005.
2. V.RameshBabu "Industrial Engineering in Apparel Production" Wood head publishing India PVT ltd, 2012.
3. Rajesh Bheda, "Managing Productivity in Apparel Industry" CBS Publishers & Distributors, ISBN8123909217, 9788123909219, 2008.
4. Chuter A. J., "Introduction to Clothing Production Management", Black well Science, U. S. A., 1995.
5. J. K. Akhil, Apparel Engineering: Industrial Engineering Methods for Apparel Industry Create space Independent Pub; 01 edition (20 March 2016) ISBN-10: 1515127125.
6. Dr. Prabir Jana and Dr. Manoj Tiwari. Industrial Engineering in Apparel Manufacturing: Practitioner‟s Handbook Apparel resources Pvt Ltd. ISBN-10: 8193247205.

22FT602 FASHION RETAIL MANAGEMENT 3 0 0 3

Course Objectives

- To understand the Retail management concepts and their uses
- To utilize the strategical knowledge obtained in developing a retail store
- To plan the merchandise assortments and cater to the needs of customers

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Analyze the retail management system in terms of its characteristics and functions.
2. Analyze the retailing strategies and devise an organization structure.
3. Differentiate the types of retailers, attribute its locations and functions.
4. Determine the factors influencing sale and manage information systems.
5. Determine the store planning and retail information.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO RETAIL

Introduction to retail management-characteristics and significance, Types of retailing-single channel and multi-channel, Relationship between retailers and suppliers, Changing trends in retailing. Retail structure and consumer interaction, Emerging forms of retailing.

UNIT II **9 Hours**

RETAIL ORGANIZATION AND ITS STRUCTURE

Retail strategy-building and sustaining relationships, Elements in retail mix -location, merchandise assortment, store display and design, pricing , customer service and communication mix. Retail image and promotional strategy, Retail communication mix, Organizational structure and human resource management

UNIT III **9 Hours**

STORE FORMAT AND LOCATION

Retailer characteristics-Types of retailers -food, general merchandise, non-store, Forms of retailing-ownership based and store-based strategy mix, non-store based, Operational dimensions, Trading area analysis - Geographic information system (GIS), Site selection - computerized trading area analysis models.

UNIT IV **9 Hours**

MERCHANDISING MANAGEMENT

Merchandising philosophy-micro merchandising and cross merchandising, Devising merchandise plans-forecasts, assortment, timing and allocation, Reordering merchandise, Inventory management- basic stock method, Planning purchases-Open-to-buy(OTB), Economic order quantity (EOQ).

UNIT V **9 Hours**

STORE PLANNING AND RETAIL INFORMATION SYSTEM

Store planning - utility of planograms, Merchandise planning - line plan and range plan. Retail information system (RIS) -significance, Universal Product code (UPC), Electronic data interchange (EDI),Information gathering and data base management.

Total: 45 Hours

Reference(s)

1. Retail Management-A strategic approach, Barry Berman, Joel R Evans, Tenth Edition, Pearson Education, Inc, 2007.
2. Fashion Retailing-A multi-channel approach, Ellen Diamond, Jay Diamond and Sheri Litt, Bloomsbury, 2006.
3. Y.P.Singh, Effective Retail Management, Anmol Publications Pvt. Ltd., New Delhi, 2001.
4. Elaine Stone, Fashion Merchandising, Blackwell Science Ltd., 2000.

22FT603 QUALITY ASSURANCE IN GARMENT PRODUCTION

3 1 0 4

Course Objectives

- Students will have fundamental knowledge on quality and quality standards.
- Students will know the methodology of quality assurance in the apparel industry.
- Students will apply statistical tools in the apparel industry.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO10: 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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess the fundamentals of quality concepts and choose quality tools and inspection for each garment manufacturing stage
2. Analyze the specifications of quality standards and resolve the testing requirements of different organization protocols
3. Apply quality inspection system procedures for fabric and accessories and implement them for carry out sample inspections
4. Determine tolerance limits for garment manufacturing processes and design standard operating procedures
5. Compare the costs of quality and determine the product care and safety requirements for different garments.

Articulation Matrix

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

UNIT I **9 Hours**

QUALITY FUNDAMENTALS

Quality: Definition, Dimensions & its importance, Quality Control, Quality Assurance, Quality Management, Operating characteristic curve: Producers risk, Consumers risk, AQL, LTPD, Seven statistical tools of Quality Control and its application

UNIT II **9 Hours**

QUALITY STANDARDS SYSTEMS AND INSPECTION AGENCIES

Quality Standards: AATCC, ASTM, BIS, ISO, CSE. ISO 9001, ISO 14001, OHSAS 18000:2000, GOTS, CPS (Children Protection Standards), Social Compliance. Inspection agencies: Government and private agencies, third party testing / inspection services, AEPC, Textiles Committee, Test and inspection report. KAISON and ISO 13485, QMS, RCA, 8D, CAPA.

UNIT III **9 Hours**

QUALITY ASSURANCE IN FABRICS AND ACCESSORIES

Establishing spec sheet for raw materials and accessories, Inspection: Inspection loop, Systems of inspection, Types of inspection Fabric grading &inspection systems: types, Types of defects in fabrics, major and minor faults, 4 point and 10-point, sampling procedure, prescribing inspection procedure for raw materials and accessories. Tolerance limits and quality standards for fabrics, other raw materials and accessories

UNIT IV **9 Hours**

QUALITY ASSURANCE IN APPAREL PRODUCTION

Standard Operating Procedure (SOP), Quality assurance in Spreading, Pattern Making, Cutting, Bundling, Ticketing, Stitching, Pressing / Finishing. Tolerance limits and quality standards for cutting, sewing and finished garments, prescribing inspection procedures for process and finished garment. Care labelling of apparel: Standards and methods. Safety issues for different accessories in children garment

UNIT V **9 Hours**

QUALITY ASSURANCE IN PACKING AND ORGANIZATION

System and standards for packing, warehousing and shipping. Cost of quality: Cost of conformance, cost of non-conformance. Relationship between various costs, value of tracking quality costs, Reporting quality cost, Product recall, Customer Complaints / Returns and their handling mechanism, Protection and Satisfaction. Quality maturity grid, Quality and profitability, Organization for Quality.

Further Study

MS Excel in Apparel Industry.

Total: 45+15=60 Hours

Reference(s)

1. Janace E. Bubonia, Apparel Quality: A Guide to Evaluating Sewn Products, Bloomsbury Publishing, 2014.
2. Quality Management Handbook for the Apparel Industry, Clothing trade, New Age International Publishers, 2012.
3. Subrata Das, Quality Characterization of apparel-Second Edition, Woodhead Publishing, 2019.
4. Douglas C. Montgomery, Statistical Quality Control: A Modern Introduction, 6th edition, Wiley India Pvt. Limited, 2010.

22FT607 MINI PROJECT II 0 0 2 1

Course Objectives

- Identify the problem statement and apply the engineering concepts to find the solution.
- Improve the analysing capability of the students.
- Increase the exuberance in finding the solution to various problems.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Find a real world problem, identify the requirement and develop the design solutions.
2. Find technical ideas, strategies and methodologies
3. Assess the new tools, algorithms, and techniques that contribute to obtaining the solution of the project.
4. Analyze and validate through conformance of the developed prototype and analysis of the cost-effectiveness.
5. Create the report and present oral demonstrations.

Articulation Matrix

CO No	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	1	2	1	1	2	-	-	2	2	2	-	-	1	1	1
2	1	2	1	1	2	-	-	2	2	2	-	-	1	1	1
3	1	2	1	1	2	-	-	2	2	2	2	-	1	1	1
4	1	2	1	1	2	-	-	2	2	2	2	-	1	1	1
5	1	2	-	-	2	-	-	2	2	2	-	-	1	1	1

22FT701 OPERATIONS RESEARCH AND EXPORT DOCUMENTATION 3 1 0 4

Course Objectives

- To impart knowledge on operational research.
- To know the export documentation procedures.
- To know about export regulations.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO10: 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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Analyze about operations research and linear programming problems.
2. Assess on the classifications of inventory control and the replacement models.
3. Apply the payment formats in processing export orders.
4. Apply export documentation procedures, analyze the export regulations.
5. Apply the suitable schemes during export orders.

Articulation Matrix

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

UNIT I **9 Hours**

OPERATIONS RESEARCH

Origin of Operations Research, Historical Standpoint, Methodology, Different Phases, Characteristics, Scope and Application of Operations Research. Linear Programming Problem: Introduction, Requirement of LP, Basic Assumptions, Formulation of LP, General Statement of LP, Solution techniques of LP: Graphical Methods, Analytical Methods.

UNIT II **9 Hours**

INVENTORY CONTROL

Inventory classification, Different cost associated to Inventory, Economic order quantity, ABC analysis. Models of inventory, operation of inventory system, quantity discount. Replacement, Replacement models: Equipment‟s that deteriorate with time, equipment that fail with time.

UNIT III **9 Hours**

EXPORT DOCUMENTATION

Importance of Export/Import Documentation, Terms of Payment: Letter of Credit - Documentary collection - open account. Terms of Shipments- Inco terms - Essential elements of an export contract, Freight forwarders power of Attorney, Shippers letter of Instructions, Different types of Invoices, Bills of Lading, VOC and NVOCCs, Packing list, Inspection certificates, Dock and Warehouse receipts, Letters of credit, Electronic export information, Air cargo security and C-TPAT, Negotiation of documents - action in the event of discrepancies. Online documentation.

UNIT IV **9 Hours**

EXPORT-IMPORT PROCEDURE

Steps in Export Procedure- Export Contract - Forward Cover -Export Finance -Institutional framework for Export Finance- Excise Clearance - Pre-shipment Inspection - Methods of Pre-shipment Inspection - Marine Insurance - Role of Clearing and Forwarding Agents - Shipping and Customs Formalities - Customs EDI System - Negotiation of Documents.

UNIT V **9 Hours**

POLICY AND INSTITUTIONAL FRAMEWORK FOR EXPORTS

Foreign Trade Policy - Highlights - Special Focus Initiatives - Duty Drawback - Deemed Exports - ASIDE - MAI & MDA - EPCG Scheme - Incentives for Exporters. Apparel Export Promotion Councils And Their Role - Commodity Boards - FIEO - IIFT - EOUs - SEZs - ITPO - ECGC - EXIM Bank.

Total: 45+15=60 Hours

Reference(s)

1. Hamdy A Taha, Operations Research: An Introduction, Pearson Education/PHI, 8/E, 2007.
2. F S Hillier and G J Lieberman, Introduction to Operations Research, TMH, 8/E, 2006.
3. M. I. Mahajan, Export Policy, Procedures and Documentation, Snow-white Publishers, Mumbai, 2007.

22FT702 GARMENT TESTING PERFORMANCE AND SUSTAINABILITY **3 1 0 4**

Course Objectives

- To have fundamental knowledge on garment testing protocol and management of restricted substances.
- To acquire knowledge of the methodology of garment testing in the apparel industry.
- To apply testing of harmful substances as par international regulations to achieve sustainability in the apparel industry.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: 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.
PO7: 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.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

Course Outcomes (COs)

1. Assess on the fundamentals of garment testing and test data management.
2. Analyze on the specifications of quality standards and resolve the testing requirements of different protocols.
3. Apply the testing procedures of fabric and garment for determining care instruction of a garment.
4. Determine limits for restricted substances for achieving sustainability in garment quality.
5. Compare the regulatory requirements of harmful substances in different countries for different garments.

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

UNIT I **9 Hours**

ESSENTIAL ELEMENTS OF GARMENT TESTING

Garment testing and its importance, Protocols of Garment testing, Routine testing, Random testing and Supplier initiated testing, Test data management and analysis, Role of regulatory and special tests, Management of restricted substances for RSL compliance.

UNIT II **9 Hours**

COMMON PROTOCOLS FOR GARMENT TESTING

Label verification, Identification, Washability, Performance, Colour fastness tests for woven, knitted, leather/suede and apparel related accessories such as belts, caps, ear muffs, gloves, hats, neckties, scarves and headbands, Special tests for technical outerwear, rainwear, intimate and sleepwear, sweaters, swimwear, down fill product and wrinkle resistance garment.

UNIT III **9 Hours**

GARMENT TESTING FOR DETERMINING GARMENT CARE

Washing tests: Machine wash at different temperature, Normal cycle, Permanent press and Delicate cycle, Hand wash, Bleaching tests: Chlorine bleach and Non-chlorine bleach, Drying tests: Drip dry, Flat dry, Line dry and Tumble dry, Ironing tests: Cool, Warm and Hot, Dry cleaning: Petroleum, Fluorocarbon and Perchloroethylene, Professional dry cleaning.

UNIT IV **9 Hours**

GARMENT TESTING FOR SUSTAINABILITY

Definition, Sustainable development and its goals, three dimensions of sustainability, Restricted Substances List (RSL), Testing of restricted substances such as carcinogenic and allergenic dyes, azo dyes, formaldehyde, chlorinated and other phenols, Chlorinated organic carriers, chromium VI, lead, cadmium, nickel, APEOs, Organotin compounds, phthalates, PVC, SCCPs, PAH, fluorocarbons, residual pesticides in garments, trims and embellishments, Overview of Manufacturing Restricted Substances List (MRSL) and its scope.

UNIT V **9 Hours**

GLOBAL REGULATORY TESTING REQUIREMENTS ON HARMFUL SUBSTANCES IN TEXTILE AND APPAREL

US regulations: CPSA, CPSIA, FHSA, FIFRA, TSCA, Cal Prop 65, WCSPA, EPA, EU regulations: REACH, BPR, GOTS, OEKO TEX Standard, China regulation, Korea Certification, Japanese regulation, Regulations of Vietnam, Regulations of Taiwan, Regulations of India.

Total: 45+15= 60 Hours

Reference(s)

1. Subrata Das, Product Safety and Restricted Substances in Apparel - 2nd edition, Woodhead Publishing, 2016.
2. Nimkartek Technical Services Private Limited, Guidebook of Chemical Management for Textile and Apparel Industry, 2015.
3. Janace E. Bubonia, Apparel Quality: A Guide to Evaluating Sewn Products, Bloomsbury Publishing,2014.
4. Thomas E. Johnson and Donna L. Bade, Export/Import Procedures and Documentation, 2010.
5. S. K. Bhattacharya & John Dearden, Accounting for Management Text and Cases, Vikas Publishing House, New Delhi, 2000

22FT707 PROJECT WORK I 0 0 4 2

Course Objectives

- Work in teams to propose, formulate, and solve a challenging open-ended design problem of significant scope, depth, and breadth.
- Understand and incorporate engineering standards and multiple realistic constraints, within realistic design time, budget, and performance objectives.
- Develop a prototype of the proposed design and demonstrate the prototype in accordance with the specifications.
- Effectively communicate information relating to all aspects of the design process in written, oral, and graphical form.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: 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.

PO7: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Find a real world problem, identify the requirement and develop the design solutions.
2. Find technical ideas, strategies and methodologies.
3. Assess the new tools, algorithms, techniques that contribute to obtain the solution of the project.
4. Analyze and validate through conformance of the developed prototype and analysis the cost effectiveness.
5. Create a report and present the oral demonstrations.

Articulation Matrix

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

22FT801 PROJECT WORK II 0 0 20 10

Course Objectives

- Work in teams to propose, formulate, and solve a challenging open-ended design problem of significant scope, depth, and breadth.
- Understand and incorporate engineering standards and multiple realistic constraints, within realistic design time, budget, and performance objectives.
- Develop a prototype of the proposed design and demonstrate the prototype in accordance with the specifications.
- Effectively communicate information relating to all aspects of the design process in written, oral, and graphical form.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: 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.
PO7: 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.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Find a real world problem, identify the requirement and develop the design solutions.
2. Find technical ideas, strategies and methodologies.
3. Assess the new tools, algorithms, techniques that contribute to obtain the solution of the project.
4. Analyze and validate through conformance of the developed prototype and analysis the cost effectiveness.
5. Create a report and present the oral demonstrations.

Articulation Matrix

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

22HS201 COMMUNICATIVE ENGLISH II 1 0 2 2

Course Objectives

- Command over the English language for day-to-day transactions.
- Improve listening and reading skills.
- Increase ability to comprehend complex content.
- Enhance confidence in expressing with clarity and elegance.
- Enthusiastic and reflective use of the language through sufficient and focused practice.
- Articulate fluently and confidently in challenging situations.

Programme Outcomes (POs)

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO12:Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Engage with the English language in functional contexts.
2. Express in both descriptive and narrative formats.
3. Interpolate and make effective use of the English Language in Business contexts.
4. Actively read and comprehend authentic text.
5. Express opinions and communicate experiences.

Articulation Matrix

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

UNIT I **15 Hours**

SELF-EXPRESSION

Personal Goals and Values - Being a Team Player-Expressing strengths and Weaknesses-Abstract nouns -Adjectives-Active Listening Skills-Note Making-Pronunciation and Accent Personal goals and values - Reading for Gist and Details-Professional Ethics-Reported Speech- Conjunctions Reading skills - phonemics, word/phrase recognition, sight words Personal Goals and Values-Conditional clauses-Hypothetical questions and Answers-Sentence Structure-Simple Present Tense-Perfect tense.

UNIT II **15 Hours**

CREATIVE EXPRESSION

Instructive and Expository Expression - Creating brochures, catalogues, and manuals for products/ services, Giving directions, Process writing, Sequencing experiments, Concept Explanation-Reported Speech-Voice Sentence Equivalence-Proofreading

UNIT III **15 Hours**

FORMAL EXPRESSION

Notices and Announcements-Writing: Creating notices and circulars for events, announcing college tours and lost and Found-Varied Vocabulary - Gender Sensitive Vocabulary, Non-discriminatory Vocabulary, Concise Vocabulary-Paragraph writing - Effective titles, topics and supporting sentences, calling in registrations and queries. Effective communication- Understanding purpose, reach and target audience, achieving complete communication Punctuation - Capitalization, Numeration, Use of proper nouns and Articles-Spelling-Reading: Analyzing and interpreting notices and Circulars-Understanding the gist of short real-world notices, and messages. Culling out keywords Information words vs Supporting words-Interpreting Abbreviations, Acronyms and Short-forms-Listening: Analyzing and interpreting announcements Decoding - Screening for salient points-Note making-Raising queries for clarification-Speaking: Announcements-Giving complete information-Pronunciation and Enunciation Pace, Intonation, and Pitch-Conducting Events-Speaking: Master of ceremonies, Short speeches - welcome speech, the vote of thanks/ valedictory speech, award-acceptance speech Writing: Invitations, Preparation of script/draft after interviewing someone. Adjectives-Pronunciation/ Punctuation Precision and Concision-Politeness markers

Total: 45 Hours

Reference(s)

1. Sasikumar, V, et.al. A Course in Listening & Speaking Foundation Books, 2005.
2. Murphy, Raymond. English Grammar in Use: A Self-Study Reference and Practice Book for Intermediate Students: with Answers. Cambridge: Cambridge University Press, 1985.
3. Prasad, Hari Mohan. A Handbook of Spotting Errors. McGraw Hill Education, 2010.
4. Reynolds, John. Cambridge First Language English. 2018th ed., Hodder Education, 2018.
5. Wiggins, Grant P., and Jay McTighe. Understanding by Design. Association for Supervision and Curriculum Development, 2008.

22HSH01 HINDI **1 0 2 2**

Course Objectives

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

Programme Outcomes (POs)

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. Construct simple sentences and use vocabulary required for day- to -day conversation.
2. Distinguish and understand the basic sounds of Hindi language.
3. Apply appropriate grammar to write and speak in Hindi language.
4. Comprehend the conversation and give correct meaning.
5. Take up Hindi examinations conducted by Dakshin Bharat Hindi Prachar Sabha.

Articulation Matrix

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

UNIT I **9 Hours**

VOWELS AND CONSONANTS

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

UNIT II **9 Hours**

NOUNS

Nouns: Genders -Masculine & Feminine -Reading Exercises

UNIT III **9 Hours**

PRONOUNS AND TENSES

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

UNIT IV **9 Hours**

CLASSIFIED VOCABULARY

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

UNIT V **9 Hours**

CONVERSATIONS

Speaking - Telling the times -Saying the Numbers from 1 to 50 Speaking practice for various occasions.

Total: 45 Hours

Reference(s)

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

22HSG01 GERMAN 1 0 2 2

Course Objectives

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

Programme Outcomes (POs)

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. Listen and identify individual sounds of German
2. Use basic phonemes and words while speaking
3. Read and understand short passages on familiar topics
4. Use basic sentence structures while writing
5. Illustrate 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	-	-	-	-	-	-	-	-	3	3	-	-	-	-
2	-	-	-	-	-	-	-	-	3	3	-	-	-	-
3	-	-	-	-	-	-	-	-	3	3	-	-	-	-
4	-	-	-	-	-	-	-	-	3	3	-	-	-	-
5	-	-	-	-	-	-	-	-	3	3	-	-	-	-

UNIT I **9 Hours**
INTRODUCTION
Introduction to the German language-Alphabets-Numbers Greetings -Days and Seasons-Working with Dictionary.

UNIT II **9 Hours**
LANGUAGE AND ITS COMMON USE
Nouns -articles-Speaking about oneself-Listening to CD supplied with books-paying special attention to pronunciation

UNIT III **9 Hours**
TECHNICAL DEUTSCHE
Regular &Irregular verbs -Personal pronouns-family-Introduction to types of sentences

UNIT IV **9 Hours**
INTERROGATION
Question words -Types of Questions -Nominative case-Verb Conjugation -country -nationalities

UNIT V **9 Hours**

IMPLEMENTATION

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

Total: 45 Hours

Reference(s)

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

22HSJ01 JAPANESE 1 0 2 2

Course Objectives

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

Programme Outcomes (POs)

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

Course Outcomes (COs)

1. Recognize 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	-	-	-	-	-	-	-	-	3	3	-	-	-	-
2	-	-	-	-	-	-	-	-	3	3	-	-	-	-
3	-	-	-	-	-	-	-	-	3	3	-	-	-	-
4	-	-	-	-	-	-	-	-	3	3	-	-	-	-
5	-	-	-	-	-	-	-	-	3	3	-	-	-	-

UNIT I **9 Hours**

SELF INTRODUCTION / DEMONSTRATIVES / NOUN MODIFIERS

Introduction to Japanese Japanese script - Pronunciation of Japanese (Hiragana (Katakana) Long vowels - Pronunciation of in,tsu,ga -Letters combined with ya,yu,yo - Daily Greetings and Expressions - Numerals. Speaking: Self Introduction- Listening: Listening to Greetings, Listening to specific information: Numbers, Time

UNIT II **9 Hours**

TIME EXPRESSION / VERBS - PAST

Introduction to time -Introduction of verbs -Listening to specific information.

UNIT III **9 Hours**

ADJECTIVES

Word Sentence -Introduction to Adjectives -Technical Japanese Vocabulary -Pair Activity Day to day situational conversation. Listening to Japanese Alphabet Pronunciation -Simple Conversation

UNIT IV **9 Hours**

CONJUGATION OF II ADJECTIVE

Past tense of Noun sentences and Na adjective sentences -Past tense of ii adjective sentences -houga adjective desu -Technical Japanese Vocabulary -Individual Activity - Listening to conversation with related particles.

UNIT V **9 Hours**

CONJUGATION OF VERBS - TE FORM / TA FORM / NAI FORM / PLAIN FORM

N gahoshidesu - V masu form tai desu - Verb te form - Technical Japanese Vocabulary -Listening to different Counters, simple conversations with verbs and adjectives

Total: 45 Hours

Reference(s)

1. Minna no Nihongo Japanese for Everyone Elementary Main Textbook1-1, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007.
2. Minna no Nihongo Japanese for Everyone Elementary Main Textbook 1-2 Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007.

22HSF01 FRENCH 1 0 2 2

Course Objectives

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

Programme Outcomes (POs)

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

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

Articulation Matrix

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

UNIT I **9 Hours**

ENTRER EN CONTACT

La langue franÃƒÂ§aise, alphabets, les numÃƒÂ©ros, les jours, les mois. Grammaire Les verbes s appeler, etre, avoir, les articles definis, indefinis Communication Saluer, s informer sur quelqu un, demander de se presenter Lexique L alphabet, les nationalites, l age, les pays, les couleurs, les jours de la semaine, les mois de l annee, les professions

UNIT II **9 Hours**

PARTAGER SON LIEU DE VIE

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

UNIT III **9 Hours**

VIVRE AU QUOTIDIEN LES LOISIRS DES FRANCAIS, LES GOUTS DES AUTRES, LES ACTIVITES QUOTIDIENNES

Grammaire Articles contractes, verbes vouloir, pouvoir, devoir, adjectifs interrogatifs, future proche Communication Exprimer ses gouts, parler de ses loisirs, justifier un choix, exprimer une envie - Lexique le temps libre et les loisirs, les saisons, les activites quotidiennes, le temps (le matin, le soir, la nuit)

UNIT IV **9 Hours**

COMPRENDRE SON ENVIRONNEMENT SOUVRIR A LA CULTURE

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

UNIT V **9 Hours**

GOUTER A LA CAMPAGNE

Grammaire La forme negative, les verbes acheter, manger, payer, articles partitifs, le pronom en de quantite

Communication Accepter et refuser une invitation, donner des instructions, commander au restaurant Lexique Les services et les commerces, les aliments, les ustensiles, l argent

Total: 45 Hours

Reference(s)

1. Grammaire Progressive du Francais, CLE International, 2010.
2. Saison1, Marie Noelle Cocton et al, Didier, 2014.
3. Preparation a l examen du DELF A1 Hachette.
4. Reussir le DELF A1 Bruno Girardeau
5. Website: Francais Linguaphone Linguaphone Institute Ltd., London, 2000.
6. Francais Harrisonburg : The Rosetta Stone : Fairfield Language Technologies, 2001.

22FT001 TREND ANALYSIS AND FASHION FORECASTING

3 0 0 3

Course Objectives

- Enable students conduct fashion scans and surveys.
- Impart the knowledge of formulating trend capsules.
- Enable students create color palettes.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: 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.

PO7: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess the characteristics of zeitgeist and appraise the fashion trends.
2. Apply the fundamental concepts of fashion forecasting process and formulate research strategies for organizing fashion scans.
3. Show the color story creation process and examine its validating criteria for establishing the color categories.
4. Assess the characteristics of color cycles and resolve the factors affecting sales forecasting.
5. Analyze the trend board preparation techniques and critique the trend reporting process.

Articulation Matrix

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

UNIT I **9 Hours**

ZEITGEIST

Discovering Zeitgeist, fashion scans, media scans, fashion trends, Consumer segmentation - values, attitudes and Lifestyle (VALS), Fashion culture and direction of fashion change.

UNIT II **9 Hours**

COLOR CYCLES

Color cycles, Color relationship areas across product categories, Color groups, Sources of color ideas and palettes. Product life cycle, fashion cycle FAD, Classic. Factors affecting sales forecasting process -exogenous variables, Aggregation and Seasonality. Framework of using colors in color story.

UNIT III **9 Hours**

COLOR STORY DEVELOPMENT

Color story creation process, Sources of inspiration. Color story project steps, factors affecting color palette creation, relevance of patterns and graphics in emphasizing color story, Color validation process, Category prototyping, Analysis of current trends. Spotting new color contrast families.

UNIT IV **9 Hours**

FORECASTING PROCESSES

Long term forecasting process and Short term forecasting process, Trend spotting, Study of Factors affecting forecasting process, Research strategies for Media scan, Interviewing focus groups, Observation of consumer behavior patterns, shopping profiles.

UNIT V **9 Hours**

TREND REPORTING

Trend reporting - Trend labeling, Trend mapping and Trend Quality. Potential of a Trend. Characteristics of Trend board, Ways of creating focal points in trend board. Classical patterns of arrangement of images and text on trend board

Total: 45 Hours

Reference(s)

1. Lorynn Divita, Fashion Forecasting, Fairchild, 2019.
2. Chelsea Roussso and Nancy Kaplan Ostroff, Fashion Forward, Fairchild, 2018.
3. Evelyn L. Brannon & Lorynn R. Divita, Fashion forecasting, Fairchild books, 2015.
4. Eundeok kim & Ann marie fiore, Fashion Trends: Analysis and Forecasting, Berg publications, 2011.
5. Tracy Diane and Tom Cassidy, Color forecasting, John wiley and sons, 2009.
6. Https://www.vogue.com.

22FT002 VISUAL MERCHANDISING 3 0 0 3

Course Objectives

- Enable students conduct visual Merchandising.
- Impart the knowledge of elements of visual merchandising.
- Enable students create store planning.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: 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.
PO7: 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.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess various elements of Visual presentation and understand their significance in visually presenting a display.
2. Analyze and identify the best suitable environment for merchandise including interior, exterior and point of displays.
3. Analyze on various techniques used in presenting merchandise.
4. Plan on optimizing the merchandise and retail space to customers.
5. Assess the various features available in a computer controlled visual merchandising.

Articulation Matrix

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

UNIT I **9 Hours**

FUNDAMENTALS OF VISUAL MERCHANDISING

Visual Merchandising-definition, objectives and scope. Types of display and display settings. Retail stores and approaches of visual merchandising -Types of retail stores, store atmospherics, Approaches in Visual Merchandising in various stores-In house staffing, Department Store Approach, Small Store Approach. Role of Visual Merchandising in changing face of retailing.

UNIT II **9 Hours**

ELEMENTS OF VISUAL PRESENTATION

Overview of the various elements - Color, lighting, line and composition, graphics and signage, store exteriors and interiors, sensory stimulants like scent, sound etc. Application of color schemes and color psychology to create mood in garment display.

UNIT III **9 Hours**

MANNEQUINS AND FIXTURES

Mannequins and other human forms, alternatives to mannequins. Criteria for selection of fixtures, dressing fixtures, modular fixtures. Store exterior - Signs, Marquees, Outdoor Lighting, Banners, Planters, Awnings, Windows in Storefront Design, store fronts.

9 Hours

UNIT IV

STORE INTERIORS AND POINTS OF DISPLAY

Focal points, island displays, risers and platforms, the runway the catwalk, counters and display cases, museum cases, demonstration cubes, ledges, shadow boxes, enclosed displays, fascia, walls. Point of purchase display, industrial display, fashion shows, trade organizations and sources. Display techniques

UNIT V **9 Hours**

STORE PLANNING AND EXECUTION OF A VISUAL PRESENTATION

Store layout planning-grid, racetrack, free form and their direction of flow. Floor plans and reading of floor plans - Plan-o-gram- definition, purpose and planning -theme, ensemble, racks, shelves, bins etc. Assortment planning-Assortment planning, optimize apparel assortments Display calendar and planning a display, scheduling the promotion, budgeting and safety factors in visual merchandising.

Total: 45 Hours

Reference(s)

1. Pegler M.M., "Visual Merchandising and Display", IV Edition, Fair child Publications, NewYork.
2. Diamond.J,Diamond,E.,"Contemporary Visual Merchandising", Prentice Hall Inc. New Jersey.
3. PhillipsP.M. Fashion Sales Promotion, II Edition, Prentice HallInc, NewJersey.
4. CurtisE, Fashion Retail, John Wiley and Sons Ltd, England.

22FT003 ESSENTIALS OF APPAREL MARKETING 3 0 0 3

Course Objectives

- To provide students with a foundational knowledge of apparel marketing concepts and strategies.
- To develop students analytical and critical thinking skills through case studies and real-world applications.
- To prepare students for entry-level positions in the apparel marketing industry.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: 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.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO12: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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess the key players and segments within the global apparel market.
2. Analyze consumer behavior and trends influencing apparel purchasing decisions.
3. Execute effective brand positioning strategies for apparel brands.
4. Analyze on the B2B marketing Strategies.
5. Analyze on the organizational Buying and Buyer behaviour.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO APPAREL MARKETING

Creating Customer Relationships and Value through Marketing, Developing successful Marketing and Organizational Strategies, Understanding the Marketing Environment, Ethical Behavior, and Social Responsibility. Understanding Consumer Behavior, Understanding Organizations as Customers. Types of Marketing.

UNIT II **9 Hours**

MARKET RESEARCH AND CONSUMER BEHAVIOR

Understanding and Reaching Global Consumers and Markets, Marketing Research: From Customer Insights to Actions, Market Segmentation, Targeting, and Positioning, Developing New Products and Services. Managing Successful Products, Services, and Brands, Pricing Products and Services.

UNIT III **9 Hours**

MARKET COMMUNICATION

Managing Marketing Channels and Supply Chains, Retailing and Wholesaling. Integrated Marketing Communications and Direct Marketing, Advertising, Sales Promotion, and Public Relations, Using Social Media to Connect with Consumers. Personal Selling and Sales Management, Implementing Interactive and Multichannel Marketing

UNIT IV **9 Hours**

INTRODUCTION TO B2B MARKETING

Business marketing, Classifying goods for the business market, Business market customers, Market structure, Environment and Characteristics of Business Marketing, Strategic role of marketing, Commercial enterprises, Commercial and institutional customers, B2B vs B2C Marketing.

UNIT V **9 Hours**

ORGANIZATIONAL BUYING AND BUYER BEHAVIOUR

Organizational buyers" decision process - A Stepwise Model and A Process Flow Model, Organizational and business markets - Government as a customer - Commercial enterprises - Commercial and institutional customers, Value analysis, Buy grid framework, Strategic procurement.

Total: 45 Hours

Reference(s)

1. "Essentials of Apparel Marketing" by Marylouise Linton and Elizabeth Cmiel.
2. Essential Apparel Marketing, 2nd Edition by Barbara Ryan and Peter Karlson.
3. Fashion Marketing: Key Strategies and Insights for Success by Mary Rose Sweeney.
4. The Business of Fashion: A Strategic Guide to the Fashion Industry by John Hooks.
5. The Handbook of Marketing and Consumption in the Fashion Industry by Joanne B. Belk and Deborah J. Howard.

22FT004 APPAREL RETAIL MANAGEMENT 3 0 0 3

Course Objectives

- Gain knowledge on the fundamentals of retailing.
- Understand the importance of effective location for retailing.
- Understand the importance of atmospherics and space management of retail outlets.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: 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.
PO7: 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.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess knowledge on Indian and global retailing.
2. Analyze the retail business formats and strategies.
3. Analyze the importance of effective location for retailing.
4. Assess Knowledge on management of merchandise.
5. Assess to outline the benefits of E-commerce business and E marketing.

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

UNIT I **9 Hours**

INTRODUCTION TO RETAILON

Retailing, current global and Indian retail scenario in garment and fashion, key drivers of Indian apparel retail business, growth of organized apparel retail in India; understanding the Indian retail economics, foreign direct investment in Indian apparel retail.

UNIT II **9 Hours**

RETAIL ORGANIZATION AND ITS STRUCTURE

Operational excellence, customer service strategies, pricing strategies, inventory levels and merchandise availability as a strategy, case studies on Indian and International retail stores, retail business formats, retail management information system

UNIT III **9 Hours**

STORE FORMAT AND LOCATION

Objectives of store planning, location, design, retail image mix, layout plan for retail stores. Buying, mark-up and mark-down in merchandise management, private labels; apparel franchising- types, Key success factors.

UNIT IV **9 Hours**

MERCHANDISING MANAGEMENT

Product management, brand management and retailing, merchandise management, model stock plan, constraining factors, types of suppliers and selection criteria, category management, merchandise management planning in retail segments. OTB Planning, sample plan.

UNIT V **9 Hours**

E - BUSINESS

An introduction to fashion e-commerce, apparel and fashion e-business, s-commerce vs. e-business, economic forces - advantages - myths - e-business models, design, develop and management of e- business, web and social networking, mobile commerce - business applications, classifications, and models, payments, security and legal requirements. B2B & B2C Platforms.

Total: 45 Hours

Reference(s)

1. Gibson G. Vedamani., "Retail Management Functional Principles & Practices", Third Edition, Jaico Publishing House, 2003, ISBN -10:81-7992-151-4.
2. Martin.M. Pegler., "Visual Merchandising and Display", (fifth edition), Fair Child Publications, 2011, ISBN 10: 1563674459.
3. Harvey M.Deitel., Paul J.Deitel., and Kate Steinbuhler., "e-business and e-commerce for managers", Pearson, 2011, ISBN: 0130323640 | ISBN-13: 9780130323644.
4. John Fernie, Suzanne Fernie and Christopher Moore, "Principles of Retailing", Reed Elsevier India Private Limited, New Delhi

22FT005 FASHION BRAND MANAGEMENT 3 0 0 3

Course Objectives

- Understand the fundamentals of brand management in the context of the fashion industry.
- Develop a strong understanding of brand identity and its role in consumer engagement.
- Evaluate different distribution channels and marketing communication methods and Gain practical experience through case studies, guest lectures, and projects.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: 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.
PO7: 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.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Demonstrate knowledge about measuring the brand management control functions.
2. Analyze the brand equity parameters and reorganize them to suit the requirement.
3. Resolve the market scenario requirements and formulate strategies for positioning the brand.
4. Determine the marketing and distribution functions for a particular brand position.
5. Analyze the needs for brand extension.

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

UNIT I **9 Hours**

OVERVIEW OF BRAND MANAGEMENT

Significance of branding -brand defined -Difference between a Product and a Brand - rationale for building a brand - types of brands - Branding Challenges -Creating a brand - Strategic planning for the brand -Designing brand Identity -Measuring brand personality - Brand Image - Luxury Brands- Organizational culture and brand performance -Brand Mantras and Internal branding for a successful brand - Case study

UNIT II **9 Hours**

UNDERSTANDING AND MEASURING BRAND EQUITY

Introduction - What is brand equity - Brand equity defined - Need for building brand equity -Steps in building a Brand -Researching for brand equity -Tracking a brand -The brand chain - Research techniques -Quantitative research techniques applied to branding - Measuring brand equity -Need for measuring brand equity -Methods to measure brand equity -Case Study

UNIT III **9 Hours**

UNDERSTANDING CONSUMERS AND MAKETS

Consumer behavior and the role of branding - concept of perception- brand evaluation and perception by customers -Consumer attitude -the Indian Consumer - Model of consumer decision making - Factors affecting consumer behavior - Brand loyalty and Brand commitment - Factors affecting brand loyalty - Concept of brand positioning - Positioning defined -Positioning strategy - Guiding principles for positioning -Repositioning- Case Study

UNIT IV **9 Hours**

MANAGING BRANDS

Branding and the marketing programme - Product Strategy -Pricing Strategy -Distribution Strategy - E- branding: Building the brand online -E-business strategy -Marketing and the internet - Branding and marketing communications -Communication options : Personal selling, sales promotions, Events and compaign marketing, Direct Marketing, Publicity and PR, Word of mouth, Internet marketing - Case Study

UNIT V **9 Hours**

BUILDING RESILIENT BRANDS

Defining branding strategy -Strategies for choosing a brand name -Line extension Category Extension - Brand Sketching - Launching a brand extension - Managing brand architecture - Brand roles in the brand portfolio - Brand relationship spectrum -Managing Brands over time - Brand challenges - Reinforcing brands - Brand revitalization -Brand turnaround -Case Study

Total: 45 Hours

Reference(s)

1. David A. Aaker, Managing Brand Equity, Simon and Schuster, 2009.
2. Kirti Dutta , brand management principles and practices-2012, Oxford University Press.
3. Kevin Lane Keller, Strategic Brand Management: Building, Measuring and Managing, Prentice Hall, 3rd Edition, 2007.
4. Moorthi YLR, Brand Management I edition, Vikas Publishing House 2012.
5. Lan Batey, Asain Branding A Great way to fly, PHI, Singapore, 2002.
6. Paul Tmepoal, Branding in Asia, John Willy, 2000.

22FT006 DIGITAL MARKETING AND E BUSINESS 3 0 0 3

Course Objectives

- Equip students with a comprehensive understanding of digital marketing and its application in E-Business.
- Provide hands-on experience with industry-standard digital marketing tools and platforms.
- Explore the dynamics of E-Business including its models, technologies, and challenges.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO12: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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess the digital fashion marketing and features of E commerce technology.
2. Analyze E commerce business and E marketing.
3. Evaluate social media and digital marketing techniques.
4. Analyze on the strategic decisions using online technology.
5. Assess on the importance of online marketing and E advertising.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION

Fashion and marketing, evolution of digital fashion marketing, marketing channels, digital marketing strategy, building online, social media evolution, fashion marketing communication environment. History of e-commerce, e-commerce vs e-business, unique features of ecommerce technology, commercial use of the internet, growth of the internet mobile and web, e-commerce opportunities for industries.

UNIT II **9 Hours**

FASHION ONLINE AND MARKETING

Website, search engine, email marketing, online advertising, search and display advertising, online branding, finding an audience, analytics, creating website, traditional approach to promotion, marketing communities. Marketing communities environment, fashion advertising and sales promotion, public relations, personal selling, visual marketing, new directions in marketing, various types of promotion and advertising, strategies.

UNIT III **9 Hours**

E-COMMERCE BUSINESS

Social networking and Facebook, Types of e-commerce: business to consumer (B2C), Business to Business (B2B), Consumer to Consumer (C2C), Consumer to Business (C2B), Mobile E- Commerce, Social E-Commerce, Local E-Commerce; e-commerce technology, concepts, approaches.

UNIT IV **9 Hours**

ENABLING TECHNOLOGIES

Internet, Mobile internet access, wireless internet, internet access, web, hypertext markups, emails, messaging, search engine, online forum, cookies, streaming media, online social networks, blogs, wikis, mobile applications. E-Security- Networks and website security, risks, site hack, security and e-mail, firewall concept, phishing, dimensions of good e-commerce security.

UNIT V **9 Hours**

E-MARKETING

Uniqueness of web, satisfying the requirements of website visitors, e-marketing value chain, maintaining a website, online video store, online payment, online marketing, advertising, market research, customer relationship applications, effectiveness of e-advertising, elements of branding, marketing strategy on web.

TOTAL: 45 Hours

TEXT BOOKS:

1. P.T. Joseph , E-Commerce: An Indian Perspective, PHI Learning, 2015.
2. Kenneth C. Laudon, Carol Guercio Traver, E-Commerce 2016: Business, Technology, Society, Pearson; 12^{th} editions, 2016.
3. Clare Harris, The Fundamentals of Digital Fashion Marketing, Bloomsbury Visual Arts, 2017.

22FT007 KNIT WEAR DEVELOPMENT 3 0 0 3

Course Objectives

- To provide students with a comprehensive understanding of the principles of knitting and knitwear technology.
- To equip students with the skills and knowledge necessary to design, develop, and produce knitted garments.
- To develop students" creativity and problem-solving skills in the context of knitwear design and production.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: 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.
PO7: 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.
PO10: 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.
PO12: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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess on the different types of knitted materials and their application.
2. Analyze on the selection of stitches, seams and machine for the construction of children's wear.
3. Analyze on the selection of stitches, seams and machine for the construction of women's wear.
4. Analyze on the selection of stitches, seams and machine for the construction of men's wear.
5. Analyze on the selection of stitches, seams and machine for the construction of intimate apparels.

Articulation Matrix

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

UNIT I **9 Hours**
INTRODUCTION
Introduction to knitted materials types and features; grain, support and shape trims, linings and interlinings; requirements for sewing knitted fabrics; compression garments.

UNIT II **9 Hours**
CHILDREN'S WEAR
Construction of Children's wear - stitches, seams, sewing and special machine selection and assembly operations; Rompers, Creeper, Jumpsuit, legging and skirts.

UNIT III **9 Hours**
WOMEN'S WEAR
Women's wear construction- stitches, seams, sewing and special machine selection and assembly operations - Tunic, Tank Tops, Sports top's, Capri, Legging.

UNIT IV **9 Hours**
MEN'S WEAR
Construction and assembly of men's wear - stitches, seams, sewing and special machine selection and assembly operations; T-Shirts, Polo Shirts, Raglon, Kimono Tee's, Cap's, Active wear, Sweat shirts, Hooded and non-hooded jackets.

UNIT V **9 Hours**
INTIMATE APPARELS
Construction of Intimate apparels of men's and women's-assembly of men's wear - stitches, seams, sewing and special machine selection and assembly operations; Vests, Briefs, women's Hipster, panties, bikini, thong, brassier and trunks. Decoding a Tech pack.

Further Studies
Practical exposure to feel the different types of knit fabrics

Total: 45 Hours

Reference(s)

1. Harrold Carr., and Barbara Latham., "Technology of Clothing Manufacture", Blackwell Scientific Publications, UK, 2000, ISBN: 0632037482 | ISBN-13: 9780632037483.
2. Ruth E. Glock., and Grace I Kunz., "Apparel Manufacturing Sewn Product Analysis",4th Edition, Prentice Hall, New Jersey,2004, ISBN: 0131119826 | ISBN-13: 9780131119826.
3. Lynn Nottage., "Intimate Apparel / Fabulation", Theatre Communications Group, USA, 2006, ISBN: 1559362790 | ISBN-13: 9781559362795.
4. Singer., "Sewing Lingerie", CyDecosse Incorporated, Mexico, 1991,ISBN: 0865732604 | ISBN- 13: 9780865732605.
5. Ann Haggar., "Pattern Cutting for Lingerie, Beachwear and Leisurewear", Black Well Science Limited, France, 2004, ISBN: 140511858X | ISBN-13: 9781405118583.

22FT008 CLOTHING COMFORT 3 0 0 3

Course Objectives

- To understand the fiber, yarn and fabric properties that influence the fabric comfort.
- To enrich the knowledge on testing, analyzing and predicting the comfort properties of textiles.
- To exemplify the thermal comfort, sensorial comfort and movement comfort.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
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PO6: 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.
PO7: 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.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
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PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess the functions of comfort in clothing.
2. Analyze the material composition that contributes to comfort.
3. Evaluate the contribution of fiber properties to comfort.
4. Assess the tactile and body movement comfort.
5. Determine comfort requirements in intimate apparel.

Articulation Matrix

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

UNIT I **9 Hours**

HUMAN PHYSIOLOGY AND THE ROLE OF CLOTHING

Definition of comfort, Human physiological aspect of comfort, Energy metabolism and physical work, Human heat balance, Clothing as near environment, Various aspects of clothing comfort, Comfort variables, Effective temperature and comfort chart, Response to extreme temperature, Development of heat stress and its control, Protective clothing. Role of Clothing comfort.

UNIT II **9 Hours**

PROPERTIES OF FIBERS AND FABRICS THAT CONTRIBUTE TO HUMAN COMFORT

Comfort properties of fibers, Physical modification of fibers, Comfort properties of yarns, Comfort properties of fabric structures. Improving moisture management in apparel: Transport of perspiration, Fundamentals of moisture transfer between human body and environment, Factors influencing moisture transport, Improving moisture transport, and Clothing requirements for different environmental conditions.

UNIT III **9 Hours**

TESTING, ANALYZING AND PREDICTING THE COMFORT PROPERTIES OF TEXTILES

Measurement of thermo-physiological comfort: Thermo-physiological comfort, Thermal resistance, Water vapour transport, Air permeability, wicking, buffering and absorbency. Characterization of comfort, Testing, analyzing and predicting neurophysiologic comfort, Testing, analyzing and predicting thermo physiological comfort, Design-oriented comfort model.

UNIT IV **9 Hours**

GARMENT PATTERN DESIGN AND COMFORT

Fundamental principles of fit in apparel, Clothing comfort and fit, Manual and mechanical stretch testing, Stretch pattern. Improving body movement comfort in apparel: Fundamental principles of movement in apparel, fashion and functional apparel: aesthetics, protection, performance and movement, Materials and design strategies to provide appropriate movement performance, Movement and garment, stretch/pressure/compression

UNIT V **9 Hours**

ACHIEVING COMFORT IN INTIMATE APPAREL

Sensorial comfort for intimate apparel, Thermal comfort for intimate apparel, Motion comfort for intimate apparel, Aesthetical comfort for intimate apparel, Hygienic comfort for intimate apparel

Total: 45 Hours

Reference(s)

1. Textile Science and Engineering by D. J. Millington and P. H. Darwent.
2. Clothing Comfort by Lucien A. Tetreault.
3. The Science of Clothing by P. V. Bhattacharjee.
4. The American Society for Testing and Materials (ASTM).
5. The International Textile and Apparel Association (ITAA).
6. The Textile Exchange.

22FT009 FASHION ACCESSORIES 3 0 0 3

Course Objectives

- Identify and analyze the key design elements and principles used in creating various types of accessories.
- Explore the materials, production techniques, and ethical considerations involved in the fashion accessories industry.
- Appreciate the diverse expressions of personal identity and cultural background conveyed through fashion accessories.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: 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.
PO7: 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.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Generate the basic sketching for the fashion accessory designs.
2. Evaluate the functional and aesthetic performances of the designed garment accessories.
3. Design leather accessories and apply the concepts of pattern making techniques.
4. Design ornamental accessories by analyzing their functional and aesthetic performances.
5. Design special accessories for fashion styles.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO ACCESSORIES

Definition and importance of accessories in fashion design, classification of accessories, Definition of trims, Difference between trims and accessories, Sketching of basic shapes of various accessories, Concepts of three- dimensional sketching.

UNIT II **9 Hours**

GARMENT ACCESSORIES

Selection of materials, design, functional and aesthetic performance of Ribbons, Laces, appliques, Woven labels, Buttons, Zippers, Hooks and Eyes, Velcro, Scarves, Socks, Stockings, Veils

UNIT III **9 Hours**

LEATHER ACCESSORIES

Selection of materials, design, functional and aesthetic performance and various styles of footwear, belts, gloves, hand bags, hats, wallets. Concepts of pattern making techniques, basic machineries used for stitching.

UNIT IV **9 Hours**

ORNAMENTAL ACCESSORIES

Selection of materials, design, functional and aesthetic performance of Pendants, Necklaces and types of necklaces, Rings, Ear rings and types of Earrings, Bangles, Bracelets, Anklets.

UNIT V **9 Hours**

SPECIAL ACCESSORIES

Neck gaiters, Tie clips, walking sticks, wigs, mask, handkerchiefs, Occasion gloves, Electronic gadgets, Earmuffs.

Total: 45 Hours

Reference(s)

1. "Accessories of Fashion" by Nancy Davis.
2. "The Fashion Accessory Designer‟s Handbook" by Lisa Gaudet.
3. Fashion Jewelry: From Antiquity to the Present" by Rita Kosinsky.
4. "Bags: A History of Handbags and Clutches" by Judith Brown.
5. "Hats: A History of Fashion Headwear" by Juliet Barnes.

22FT010 GARMENT FINISHING AND CARE 3 0 0 3

Course Objectives

- To enable the students to learn techniques and machinery for dyeing and finishing of garments and to impart knowledge on different garment care techniques.
- Understand the suitability of different finishing techniques for various fabrics and garments.
- Understand the importance of proper garment care and maintenance.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
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PO7: 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.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO12: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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Apply basic garment dyeing and washing techniques with appropriate machineries.
2. Assess the functional and aesthetic effects of laundering and finishing processes.
3. Select appropriate finishing techniques for different fabrics and garments.
4. Analyze on the stain removal procedures.
5. Analyze and implement a proper garment care and maintenance routine.

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

UNIT I **9 Hours**

GARMENT DYEING AND FINISHING

Garment dyeing, dye selection, garment-dyeing machinery. Washing: Stone washing, acid washing, enzyme washing, biopolishing, laser fading and ozone fading- principle, machinery used.

UNIT II **9 Hours**

LAUNDERING AND FINISHING

Principles of laundering; Laundry equipment and reagents-soaps - detergents - cleaning action of soaps, Modern and industrial cleaning agents. Finishing- Optical brightening, stiffening, softening, crease resistant and crease retentive finish, anti-static, anti-bacterial, UV protection, water proofing, flame proofing, soil release finish, mildew and moth proofing; silicone finishing.

UNIT III **9 Hours**

FINISHING TECHNIQUES

Garment finishing room equipment - steam iron - steam busters - vacuum ironing tables- form finishing equipment - trouser topper, shirt press, collar/cuff press, form finisher for jackets and coats - study of boiler and related equipment for finishing room.

UNIT IV **9 Hours**

STAIN REMOVAL PROCEDURES

Stain removal - characteristics of stain and method of stain removal-blood, tea, rust, oil/grease, colour matter, chemicals. Different methods of washing.

UNIT V **9 Hours**

CARE AND MAINTENANCE

Laundering procedures and care instructions adopted for cellulosic, protein and synthetic materials, storage of household linen and apparel laundries, care labeling. Use of care labels and standards / norms for care labels. Different types of house hold/industrial washing machines - rotary, swirling, pressure, tumble wash. Genetex and FTC regulations

Total: 45 Hours

Reference(s)

1. Dantyagi S., "Fundamentals of Textile and their care", Oriental longmans Ltd, New Delhi.
2. Denlkar, "Household Textiles & laundry work", Atma Ram & Sons, Delhi
3. Sustainable Textiles: The Role of Life Cycle Assessment by Kate Fletcherinishing: Processes and Equipment by William R. Roy.
4. American Society for Testing and Materials (ASTM) textile standards.
5. Association for Textile and Apparel Professionals (ATAP).
6. Sustainable Apparel Coalition (SAC).

22FT011 HOME FURNISHING 3 0 0 3

Course Objectives

- Students will have fundamental knowledge on home furnishings.
- Students will know the various designs / styles of bed linen, bath linen, kitchen linen, table linen and living room furnishings.
- Students will acquire knowledge on various flammability requirements of home furnishings.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

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PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: 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.

PO7: 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.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Differentiate the home furnishing on the basis of performance requirements.
2. Assess the quality parameters of home furnishing and clients requirements.
3. Demonstrate different home furnishing products by their design value.
4. Analyze bedroom, kitchen and bathroom furnishings by their design and style.
5. Assess flammability requirements of home furnishings.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION

Concept of home furnishing, Classification, Fibres and fabrics used in various home furnishing, Performance specifications of different home furnishings: Importance of performance specification, Performance requirements of US, UK and Canada market, Special performance requirements: Wrinkle resistance, Stain Repellency, Stain Resistance, Stain Release, Anti-allergen, Moisture wicking, Water repellency and Water resistance, Labelling issues of home textiles.

UNIT II **9 Hours**

BED LINEN

Types -Bed Skirt, Bed Cover, Bed Sheet, Bed Spread, Mattress, Mattress Pad, Mattress Protector, Throw (Small blanket), Duvet, Duvet Cover, Comforter, Comforter Cover, Quilt, Quilt Cover, Blanket, Blanket Cover, Pillow, Pillow Cover, Sham , Mosquito Net. Recommended care of bed linen.

UNIT III **9 Hours**

BATH LINEN AND KITCHEN LINEN

Bath linen: Types, Shower Curtain, Bath Robe, Bath Towels, Bath Mats, Bath Rugs, Face Towels and Hand Towels. Kitchen Linen: Apron, Mitten, Napkin, Dish Cloth, Pot Holder, Place Mat, Kitchen Towel, Coaster, Tea Coyz, Placemat. Recommended care of bath and kitchen linen.

UNIT IV **9 Hours**

TABLE LINEN AND LIVING ROOM FURNISHINGS

Table Pad, Table Protector, Table Cloth, Table Runner, Table Skirt, Table Mat, Chair Cover, Chair Mat, Chair Pad, Sofa Cover, Cushion, Cushion Cover, Teapoy cover, Bolster, Wall coverings. Floor covering: Classification, Hard floor covering Resilient, Manmade and natural stone flooring, Soft floor covering carpets and rugs. Recommended care of table linen and living room furnishings.

UNIT V **9 Hours**

FLAMMABILITY OF HOME FURNISHINGS

Introduction, Flammability regulations for different home furnishings: Resilient cellular material, Bean bags, Man-made and Non Man-made filling materials, Cigarette Test, Smouldering screening test, Flammability test of carpets, rugs, blankets, towels, mattress and mattress pad, bed-clothing and curtains. Care instructions for home furnishings during export business.

Total: 45 Hours

Reference(s)

1. Subrata Das, Performance of Home Textiles Second Edition, Woodhead Publishing Pvt. Ltd, 2018.
2. T Rowe, Interior textiles- Design and Developments, Woodhead Publishing Pvt. Ltd, 2009.
3. Jay Diamond and Ellen Diamond, Fashion Apparel, Accessories, Home Furnishings, Pearson Prentice Hall, New Jersey, 2007.
4. Elsasser and Virginia Hencken, Know Your Home Furnishings, Fairchild Books & Visuals, September, 2003.
5. Hamlym, Bed and Table linen, Octopus Publishing Group Ltd, Newyork, 2001.

22FT012 ADVANCED PRODUCT DEVELOPMENT 3 0 0 3

Course Objectives

- Acquire knowledge on Fashion concept and able to classify apparel products.
- Understand Development of Visualization and communication design on to manufacturability.
- Introduce students to the various stages of the apparel product development process, including: Ideation and concept development, Material selection and sourcing, Patternmaking and grading, Prototyping and sampling, Costing and pricing, Production and quality control.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess a creative concept for an apparel product.
2. Analyze Functional Apparel Design and Engineering.
3. Analyze Line Development and Presentation.
4. Analyze of Product Development.
5. Create basic patterns and grade them to different sizes and develop Garment Prototype.

Articulation Matrix

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

UNIT I **9 Hours**

DEVELOPING FASHION CONCEPT FOR APPAREL

Definition and classification of apparel products. Design logic of apparel products, concept generation, concept screening. Line concept - Synthesize current issues, describe fashion trends, establish line direction, describe materials, identify group concepts and analyze current line. Principles of creative fashion ideas. Manipulation of Design Elements - silhouette, proportion, pattern, garment details, accessories, texture, prints, colour, fabric.

UNIT II **9 Hours**

FUNCTIONAL APPAREL DESIGN AND ENGINEERING

Introduction to apparel design & its types - aesthetic, functional, exploratory, incremental. Requirements for functional clothing design and engineering- physiological, biomechanical, ergonomic, psychological requirements. Process involved in functional clothing design - material selection, clothing design and evaluation for functionality.

UNIT III **9 Hours**

LINE DEVELOPMENT AND PRESENTATION

Creative design - Develop designs, Create prototype. Line adoption - Determining styles and balancing assortments. Technical design - perfect styling and fit, engineer production patterns, samples, costing and grade patterns. Presentation: Review for adoption, line review, line / style release.

UNIT IV **9 Hours**

ANALYSIS OF PRODUCT DEVELOPMENT

Product Positioning Strategy - Sizing and fit in material selection - Final assembly and finishing - Garment presentation.

UNIT V **9 Hours**

PROTO DEVELOPMENT

Fabric Sourcing and Selection. Analysis of functional and aesthetic characteristics of fabrics and trims - Co-ordinating with availability, ability to enhance product aesthetics and functionality and cost. Visualization and Communication design into manufacturability. Overview to E-proto development and rapid proto development.

Total: 45 Hours

Reference(s)

1. Maurice J. Johnson and Evelyn C.Moore, "Apparel Product Development", Second Edition, Prentice Hall Upper saddle river, New Jersey, 2001.
2. Ruth E Glock and Grace I Kunz, "Apparel Manufacturing - Sewn Product Analysis", Prentice Hall, New Jersey, Fourth Edition, 2005.
3. Kathryn McKelvey and Janine Munslow, "Fashion Design: Process, Innovation and Practice", Blackwell Publishing, USA, 2005.
4. Mastudaira T and Suresh M.N., "Design Logic of Textile Products", Textile Progress, Textile Institute, Manchester, 2007.

22FT013/22FTH13/22FTM13 ADVANCED TECHNOLOGIES FOR APPAREL INDUSTRY

3 0 0 3

Course Objectives

- Understand the major technological trends impacting the apparel industry.
- Explore the application of artificial intelligence and data analytics in apparel retail.
- Discuss the ethical and sustainability considerations of using advanced technologies in the apparel industry.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
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Course Outcomes (COs)

1. Apply the advancements in apparel designing using CAD.
2. Analyze the developments in garment sizing and fabric draping.
3. Evaluate the alternative techniques to stitches and seams.
4. Assess the applications of AI in apparel industry.
5. Analyze the automations in garment manufacturing process.

Articulation Matrix

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

UNIT I **9 Hours**

APPLICATIONS OF CAD IN GARMENT INDUSTRY

Computer aided garment design using three dimensional body models, computerized made-to measure systems, technological advances in fabric designing, embroidery designing; consumer based virtual pattern and garment panels designing.

UNIT II **9 Hours**

ADVANCEMENTS IN GARMENT SIZING AND FABRIC DRAPE

Apparel sizing and garment fit - key issues, technological advancements in virtual fitting; digital body measurement techniques, virtual measurements, AI powered body measuring; 3D body scanning types-light based, laser based, sound wave and microwave-based systems; modelling fabric and garment drape- geometrical and physical, 2D and 3D garment drape modelling.

UNIT III **9 Hours**

TECHNOLOGICAL ADVANCEMENTS IN SEWING GARMENTS

Seamless technologies: seamless techniques and seamless knitting machine, 3D seamless knitting, application of seamless garments; advancements in technologies for fabric joining, seam sealing, welding technology, bonding, methods of joining fabrics to accessories; applications, advantages and disadvantages.

UNIT IV **9 Hours**

ARTIFICAL INTELLIGENCE IN APPAREL INDUSTRY

Introduction to AI - Neural networks (NN) in apparel industry; application of AI in garment designing, production planning, manufacturing, inspection, supply chain and retail. Challenges and future trends AI in garment Industry.

UNIT V **9 Hours**

ADVANCEMENTS IN GARMENT MANUFACTURING

Automations in material handling - gripping technologies, conveyor systems and digital tracking; automation in sewing machines - under bed trimmers, bobbin changers; automation in pressing and fusing; automation in garment inspection and packing.

Total: 45 Hours

Reference(s)

1. Alison Beazley & Terry Bond, "Computer Aided Pattern Design and Product Development", Blackwell Science Publisher, USA, 2004.
2. Aldrich Winfred, "CAD in Clothing and Textiles", Blackwell Science Ltd., 2009.
3. Catherine Fairhurst, "Advances in Apparel Production", Woodhead Publishing Ltd, 2008.

22FT014/22FTH14/22FTM14 SUPPLY CHAIN MANAGEMENT FOR APPAREL INDUSTRY

3 0 0 3

Course Objectives

- Understand the critical role of supply chain management in the apparel industry.
- Analyze the key components of an apparel supply chain, including sourcing, production, logistics, and distribution.
- Develop effective strategies for optimizing apparel supply chain performance.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

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PO6: 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.

PO7: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

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PO10: 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.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess on basics of Supply chain Management.
2. Analyze the framework and scope of supply chain networks and functions.
3. Analyze the importance of logistics in supply chain.
4. Analyze skills on sourcing and coordination in supply chain.
5. Analyze the knowledge on role of information technology in supply chain.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION

Role of Logistics and Supply chain Management: Scope and Importance- Evolution of Supply Chain- Decision Phases in Supply Chain - Competitive and Supply chain Strategies- Drivers of Supply Chain Performance and Obstacles.

UNIT II **9 Hours**

SUPPLY CHAIN NETWORK DESIGN

Role of Distribution in Supply Chain-Factors influencing Distribution network design-Design options for Distribution Network Distribution Network in Practice-Role of network Design in Supply Chain- Framework for network Decisions.

UNIT III **9 Hours**

LOGISTICS IN SUPPLY CHAIN

Role of transportation in supply chain-factors affecting transportations decision-Design option for transportation network-Tailored transportation - Routing and scheduling in transportation.

UNIT IV **9 Hours**

SOURCING AND COORDINATION IN SUPPLY CHAIN

Role of sourcing supply chain supplier selection assessment and contracts- Design collaboration sourcing planning and analysis-supply chain co-ordination-Bull whip effect-Effect of lack of coordination in supply chain and obstacles-Building strategic partnerships and trust within a supply chain.

UNIT V **9 Hours**

SUPPLY CHAIN AND INFORMATION TECHNOLOGY

The role IT in supply chain-The supply chain IT frame work Customer Relationship Management- Internal supply chain management-supplier relationship management-future of IT in supply chain- E- Business in supply chain.

Total: 45 Hours

Reference(s)

1. Sunil Chopra, Peter Meindl and Kalra, "Supply Chain Management, Strategy, Planning, and operation", Pearson Education, 2010.
2. David Simchi-Levi., Philip Kaminsky., and Edith Simchi-Levi., "Designing and Managing the Supply Chain: Concepts, Strategies, and Cases", 3rd Edition, Tata McGraw-Hill, 2012, ISBN: 0073341525 / ISBN: 978-0073341521.
3. Srinivasan G.S, "Quantitative models in Operations and Supply Chain Management", PHI, 2010.
4. Jeremy F.Shapiro, "Modeling the supply chain", Thomson Duxbury, 2002.

22FT015/22FTH15/22FTM15 **3 0 0 3**
LEAN MANUFACTURING

Course Objectives

- Develop analytical and problem-solving skills for optimizing production processes and increasing efficiency.
- Enable students to identify and eliminate waste in manufacturing environments.
- Foster the ability to implement and sustain Lean improvements within organizations.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: 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.

PO7: 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.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess the principles and elements of lean manufacture.
2. Analyze on JIT, TPM and 5S principles.
3. Apply the application of lean concepts and tools in inventory and production control.
4. Assess on the TQM Tools and Techniques.
5. Apply the application of Six Sigma concepts for manufacturing and process control.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO LEAN MANUFACTURING

Conventional Manufacturing versus Lean Manufacturing - Principles of Lean Manufacturing - Basic elements of lean manufacturing - Introduction to LM Tools. Cellular Manufacturing - Types of Layout, Principles of Cell layout, Implementation.

UNIT II **9 Hours**

JIT, TPM, 5S CONCEPTS

JIT - Principles of JIT and Implementation of Kanban. Application of KANBAN Cards for production planning and control for traceability and identification. Continuous Improvement - application of KAIZEN in reducing rejections. TPM - Pillars of TPM, Principles and implementation of TPM. 5S Principles and implementation - Value stream mapping - Procedure and principles.

UNIT III **9 Hours**

LEAN CONCEPTS IN INVENTORY CONTROL

Lean concepts applied in transparent flow of information and production between processes and customers. Takt Time - Calculation of time for producing exactly quantity required. Reduction of inventory using simple Economic Order Quantity (EOQ) and Batch Production Models.

UNIT IV **9 Hours**

TQM TOOLS AND TECHNIQUES

The seven traditional tools of quality, New management tools, and Six sigma: Concepts, methodology, applications to manufacturing, service sector including IT, Bench marking, Reason to bench mark, Bench marking process, FMEA, Stages, and Types. Quality circles, Quality Function Deployment (QFD), Taguchi quality loss function, Concepts, improvement needs, Cost of Quality, Performance measures.

UNIT V **9 Hours**

SIX SIGMA

Six Sigma - Definition, statistical considerations, variability reduction, design of experiments - Six Sigma implementation.

Total: 45 Hours

Reference(s)

1. Askin Ronald G; Goldberg Jeffrey B, "Design and Analysis of Lean Production Systems", JohnWiley & Sons Inc, 2003.
2. Rajmanohar T P, "Lean Product Development: Concept and Models", ICFAI Press, 2009.
3. Desai, Aruna, "Lean manufacturing: Perspectives and Applications", ICFAI Press, 2008
4. Besterfield, D H, "Total Quality Management", 3rd Edition, Pearson Education, 2008

22FT016/22FTH16/22FTM16
SOCIAL COMPLIANCES AND QUALITY ASSURANCE IN APPAREL INDUSTRY

3 0 0 3

Course Objectives

- To impart knowledge on the concepts of social compliance
- To provide insight on compliance norms for apparel manufacture and industry
- To impart knowledge on concepts of ethical trading and international compliance for apparel Business

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: 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.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO12: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.
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess the concepts of social compliance and its importance in the apparel industry.
2. Analyze on the general norms on labour and safety.
3. Analyze on health and environment compliance in apparel industry.
4. Analyze wage compliance norms for the industry.
5. Evaluate and practice concepts of ethical trading and international compliance for apparel Business.

Articulation Matrix

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

UNIT I **9 Hours**

SCOPE AND NEED OF SOCIAL COMPLIANCE

Social Compliance - concept, need, benefits for industry, workers, society. Social accountability and Corporate Social responsibility - scope and need. Social Compliance in supply chain management.

UNIT II **12 Hours**

GENERAL NORMS ON LABOUR AND SAFETY

Conventions on discrimination, forced labour, child labour- Direction and risk in the supply chain. ILO convention on child labour, worst Form of child labour, Hazardous child labour, Environment and climate, health and safety-safety norms and measures to been forced for safe working Environment, working hours-norms, remuneration-minimum wages Conventions on Acquired Immune Deficiency Syndrome (AIDS) and Gender.

UNIT III **8 Hours**

HEALTH AND ENVIRONMENT COMPLIANCE

Minimum age Convention, freedom of association, collective bargaining, corruption and bribery- effect and risk in the supply chain. Global Reporting Initiatives (GRI) sustainability reporting guide line. Organization for Economics Co-operation and Development (OECD) guide lines for multinational discrimination.

UNIT IV **9 Hours**

WAGE COMPLIANCE

Freedom of association, collective bargaining agreements (C87, C98-ILO) compensation-norms applicable in India. Working hours-code of conduct.

UNIT V **7 Hours**

ETHICAL TRADING AND INTERNATIONAL COMPLIANCE

Ethical Trading Initiative (ETI). Basic code of labour practice. Worldwide Responsible Apparel Production (WRAP) purposes, WRAP Principle, certification process, SA8000. National and international regulating organizations - OSHA, WRAP, GOTS, OEKO TEX. Corporate Social Responsibility (CSR) - mandatory requirements - benefits to company, labour and society.

Total: 45 Hours

Reference(s)

1. Rajesh Chhabara, "Social Accountability", Avasoftech Pvt.Ltd.2005.
2. Rebocak Leifziger, "SA 8000: The first decade", Greech Leaf Publishers, 2009.
3. Venkatesh Selvaraj, "Handbook for social compliance audit: a step-by-step approach", Kindle Store, 2021.
4. Muhammad Azizul Islam, "Social Compliance Accounting", Springer, 2015.

22FT017/22FTH17/22FTM17 COMPUTER APPLICATIONS IN APPAREL MANUFACTURING

3 0 0 3

Course Objectives

- To introduce students to the basic concepts of computer-aided design (CAD) and computer- aided manufacturing (CAM).
- To give students hands-on experience with popular apparel industry software programs.
- To teach students how to use computer technology to improve efficiency, accuracy, and quality in apparel manufacturing.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: 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.
PO7: 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.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess Computer based systems and techniques used in apparel manufacturing.
2. Analyze the features available in different textile design software.
3. Analyze the features available in different garment design and production software.
4. Apply 3D body scanning technologies to develop size charts and evaluate clothing fit.
5. Apply 3D modelling and virtual garmenting features for apparel and textile product design using CAD.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION

Introduction to terminology - CAM, CAD, CIM, EDI, CAA, Block Chain, Artificial System, Expert System, E-Proto typing, Rapid Prototyping; techniques for 3D garment design - sketch-based garment design, surface flattening for virtual garments; Online garment shopping system: problems and solutions.

UNIT II **9 Hours**

COMPUTER AIDED TEXTILE DESIGN SOFTWARE

Features and modules of Textile designing software - image editing, woven, knits, embroidery; digital printing technology for textiles and apparel; computerized colour matching

UNIT III **9 Hours**

COMPUTER AIDED GARMENT DESIGN SOFTWARE

Application of computers in each stage of apparel design- market research, fashion tend forecasting, fashion and garment designing- Illustration software, pattern making, grading, marker making, laying & spreading, fabric defect checking, cutting, ticketing and assembling, production planning, production systems, customization, warehouse, ERP and MIS, retail and EXIM procedures.

UNIT IV **9 Hours**

SIZE AND FIT

Importance and development of Size Chart, key issues affecting apparel size and fit, objective evaluation of clothing fit; types of body scanning - light based, laser based, microwave based, advantage and disadvantage of body scanning; tools and features of virtual garmenting software used to evaluate clothing fit.

UNIT V **9 Hours**

3D TECHNOLOGIES FOR VIRTUAL APPAREL AND TEXTILE DESIGN

Model development, Simulation of garment appearance based on fabric construction, technologies of human body modelling in 3D, development of the body surface, animation, generic vs. individualized body models, applications of 3D human body modelling, virtual try on technologies in apparel Retailing.

Total: 45 Hours

Reference(s)

1. Jinlian Hu, "Computer Technology for Textiles and Apparel", Woodhead Publishing, 2011.
2. M.Stott, "Pattern Cutting for Clothing using CAD", Woodhead Publishing, 2012.
3. Inga Dabolina, AusmaVilumsone, "The Role of the Latest Clothing CAD/CAM System Applications in the Educational Process", Material Science. Textile and Clothing Technology, Vol.7, pp. 63-68, 2012.
4. Joyce AdwoaOppong, Eunice Antiaye and Vivian Biney-Aidoo, "Appraising the Use of Computer Technology in Garment Production Firms in Accra/Tema Metropolis", Arts and Design Studies, Vol.17, pp. 25 - 33, 2014.

22FT018/22FTH18/22FTM18
AUTOMATIONS IN APPAREL MANUFACTURING **3 0 0 3**

Course Objectives

- To provide students with a thorough understanding of the different types of automation used in apparel manufacturing.
- To equip students with the knowledge and skills needed to evaluate and implement automation solutions in apparel production.
- To analyze the impact of automation on the apparel industry, including its effect on jobs, productivity, and sustainability.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: 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.
PO7: 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.
PO12: 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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories.
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess automation in apparel industry and its importance.
2. Analyze and describe the different types of automation used in fabric inspection.
3. Analyze and describe the different types of automation used in cutting and spreading.
4. Analyze and describe the different types of automation used in material handling and production systems.
5. Analyze and describe the different types of automation used in sewing operations.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION

Introduction to Automations in Manufacturing; Global scenario of Automation- Requirements and Fundamentals; Various automation systems and Technologies in Apparel Manufacturing; Prerequisites for adopting automation in Garment Manufacturing; Advantages and Challenges faced during and after adoption of automation; Case studies.

UNIT II **9 Hours**

AUTOMATIONS IN FABRIC INSPECTION

Conventional fabric inspection vs. Automatic fabric inspection, Automatic fabric inspection techniques - Statistical approach, Spectral Approach, Model-based approach; Commercial automated Fabric inspection systems.

UNIT III **9 Hours**

AUTOMATIONS IN CUTTING AND SPREADING

Role of automations in spreading and cutting in garment manufacturing; Automated spreading methods and machines; Automatic Fabric pattern matching; Automations in Cutting methods and systems, automated laser cutting; Advanced technologies for fusing cut components.

UNIT IV **9 Hours**

AUTOMATIONS IN MATERIAL HANDLING AND PRODUCTION SYSTEMS

Automations in material handling; Gripping Technologies for textile material handling; ETON systems; Strategies and key principles for automation in garment production systems, USA principle; Case studies on commercialized automated production systems in Apparel Industry for material handling.

UNIT V **9 Hours**

AUTOMATIONS IN SEWING OPERATIONS

Automation and Robotics for sewing; 3D sewing operations using sewing automats; Sewing preparatory machines with automatic control system; Applications of sewing automats for various garment constructions; Challenges associated with sewing operations automation.

Total: 45 Hours

Reference(s)

1. Rajkishore Nayak and Rajiv Padhye, "Automations in Apparel Manufacturing", Woodhead Publishing, 2018.
2. M.Stott, "Pattern Cutting for Clothing using CAD", Woodhead Publishing, 2012.
3. Jinlian Hu, "Computer Technology for Textiles and Apparel", Woodhead Publishing, 2011.

22FT019 TECHNICAL DESIGN FOR GARMENT MANUFACTURING

3 0 0 3

Course Objectives

- Students will have fundamental knowledge about technical design.
- Students will understand the technical requirements of fabrics.
- Students will acquire knowledge on determining the product care specifications.

Programme Outcomes (POs)

PO1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PSO2: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Differentiate the components of tech pack.
2. Determine the technical requirements of fabrics.
3. Assess the seam specifications with reference to the product type.
4. Analyze the product care requirements.
5. Assess trim specifications and their standard performance characteristics.

Articulation Matrix

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

UNIT 1 **7 Hours**

COMPONENTS OF TECH PACK

Introduction to Technical design, Tech pack – Flat sketch, Sewing Details, Points of Measurement (or POM), Wash Description (if any), Labels and Hangtag Placement, Bill of Materials (or BOM), Packaging Instructions.

UNIT II **11 Hours**

TECHNICAL REQUIREMENTS OF FABRICS

Understanding fabric specifications for apparel design – fabric weight categories & drapability for different silhouettes, fabric fitness for seasonal weather, Tailorability of Apparel fabrics.

UNIT III **10 Hours**

DEVELOPMENT OF SEAM SPECIFICATION

Woven garments – Top wear: Edge finishing seams, Seams for coordinating garment parts, Assembly seams, Top stitching seams. Bottom wear: Edge finishing seams, Seams for coordinating garment parts, Assembly seams, Top stitching seams. Knitted garments – Edge finishing seams, Seams for attaching trims, Assembly seams, Top stitching seams.

UNIT IV **8 Hours**

PRODUCT CARE

Determination of washing parameters for regular product care- Shrinkage, fastness, Appearance. Material specific Ironing temperature specifications, Dry cleaning conditions. Flammability regulations.

UNIT V **9 Hours**

FRAMING TRIM SPECIFICATIONS

Introduction to different types of trims, Trim performance standards- Buttons, Zippers, Velcro, Hook & Eye fasteners, Interlinings. Seams for Trims – labels, tags, fasteners.

Total: 45 Hours

Reference(s)

1. Subrata Das, Quality characterization of Apparels – Second Edition, Woodhead Publishing Pvt. Ltd, 2019.
2. David J Tyler, Carr and Latham"s Technology of clothing manufacture, Blackwell science, 2nd edition, 2000.
3. Ruth E Glock and Grace I Hunz, Apparel Manufacturing: Sewn product analysis, 4rth edition, Pearson, 2004.
4. Kathleen Fasanella, Entrepreneur"s guide to sewn product manufacturing, Apparel technical Svcs, 1998.
5. Jacob Solinger, Apparel manufacturing handbook, Bobbin media corporation, 1998.
6. https// http://www.garmenco.org/index.html.

22FT020 OPERATIONS RESEARCH IN APPAREL INDUSTRY

3 0 0 3

Course Objectives

- To understand the basic concepts of operations research.
- To be able to identify and formulate decision making problems in the apparel industry.
- To understand the limitations of OR models and the importance of ethical considerations.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Design Operations Research problems from the cases arising in the apparel Industry and determine solution for linear programming problems.
2. Construct and solve transportation problems.
3. Construct and solve assignment problems and understand decision making under different conditions.
4. Carryout replacement analysis and inventory control.
5. Construct and solve project scheduling by PERT and CPM techniques and resource levelling.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO OPERATION RESEARCH

Introduction - History of Operations Research, Scope of Operation Research, applications and limitations: Linear programming problem -construction , solution by graphical method, the Simplex method and its extension by the Big M method; integer programming- introduction; application of the LP technique in the field of apparel technology

UNIT II **9 Hours**

TRANSPORTATION MODELS

Transportation problem - construction, initial basic feasible solution - North West Corner rule, lowest cost entry method, Vogel's Approximation Method; the optimality test - Modified Distribution method, stepping stone method; transshipment problem

UNIT III **9 Hours**

ASSIGNMENT MODELS

The Assignment problem - construction, solution by Hungarian method, application in the apparel industry; sequencing problems from apparel industry; Decisions theory - decisions under assumed certainty, decision under risk, decision under uncertainty, illustrations from apparel industry

UNIT IV **9 Hours**

INVENTORY CONTROL

Replacement analysis; inventory control - ABC, VED analysis, EOQ - application in apparel industry, simulation-introduction, Monte Carlo method.

UNIT V **9 Hours**

PROJECT MANAGEMENT

Project planning and control models: CPM, PERT - network representation, determining critical path, project duration; crashing of project duration; resource levelling

Total: 45 Hours

Reference(s)

1. Hillier, F. S., & Lieberman, G. J. (2010). Introduction to operations research (9th ed.). McGraw-Hill.
2. Taha, H. A. (2016). Operations research: An introduction (10th ed.). Pearson.
3. J. George Shrock & James T. Blackburn (2008) Quantitative Operations Management, Prentice Hall
4. Randolph, A. B. (2009). Logistics engineering and management: Planning and controlling the flow of goods and services (5th ed.). Taylor & Francis.
5. Tersine, R. (2018). Principles of inventory and logistics management (7th ed.). Springer.

22FT021 ENTERPRISE RESOURCE PLANNING IN APPAREL INDUSTRY

3 0 0 3

Course Objectives

- To understand the fundamental concepts of ERP systems and their relevance to the apparel industry.
- Analyze the key modules of an ERP system and their applications in various apparel business functions.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO12: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.

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess and explain key terms related to ERP systems and the apparel industry
2. Analyze the core modules of an ERP system and their functionalities within the apparel business context
3. Analyze the potential benefits and challenges of implementing ERP in an apparel company
4. Develop a plan for successful ERP implementation in a specific apparel industry scenario
5. Evaluate the impact of ERP on various aspects of the apparel business, such as supply chain management, production planning, and financial control.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO ERP AND APPAREL INDUSTRY

Introduction to ERP-Definition, history, evolution, and benefits. Overview of the Apparel Industry: Structure, value chain, and challenges. The Role of ERP in the Apparel Industry- Aligning business processes and improving efficiency. Case Studies: Examples of successful ERP implementations in apparel companies

UNIT II **9 Hours**

CORE ERP MODULES

Finance and Accounting-General ledger, accounts payable/receivable, payroll, budgeting, and cost accounting. Supply Chain Management- Procurement, inventory management, production planning, and logistics. Customer Relationship Management (CRM) -Sales order processing, customer service, and marketing automation. Human Resource Management (HRM) - Payroll, benefits administration, recruitment, and performance management. Product Lifecycle Management (PLM) - Design, sourcing, development, and production

UNIT III **9 Hours**

IMPLEMENTATION AND CHALLENGES

ERP Implementation Strategies: Waterfall, Agile, and phased approaches. Data Migration and System Integration. Change Management and User Training. Security and Compliance Considerations. Common Challenges and Risks of ERP Implementation in the Apparel Industry

UNIT IV **9 Hours**

INDUSTRY-SPECIFIC APPLICATIONS

Demand Forecasting and Inventory Optimization. Quality Management and Compliance. Sustainability and Supply Chain Transparency. Multi-Channel Retail and E-commerce Integration. Data Analytics and Business Intelligence

UNIT V **9 Hours**

THE FUTURE OF ERP IN THE APPAREL INDUSTRY

Emerging Technologies: Artificial Intelligence, Machine Learning, Big Data, and Internet of Things (IoT). Industry Trends: Sustainability, Customization, On-demand Manufacturing, and Block chain. The Impact of ERP on the Future of the Apparel Industry

Total: 45 Hours

Reference(s)

1. Sadagopan. S., "ERP-A Managerial Perspective", Tata McGraw-Hill, New Delhi, 2001.
2. Jose Antonio Hernandez, "The SAP R/3 Handbook", Tata McGraw-Hill, New Delhi, 2001.
3. Vinod Kumar Crag and Bharat Vakharia, "Enterprise Resource Planning Strategy", Jaico Publishing house, Mumbai, 1999.
4. Garg and Venkitakrishnan, "ERPWARE, ERP Implementation Framework", Prentice Hall of India, New Delhi, 1999.
5. Vinod Kumar Grag and Venkitakrishnan N.K., "Enterprise Resource Planning", Prentice Hall of India, New Delhi, 2001.

22FT022 INTERNATIONAL BUSINESS IN APPAREL INDUSTRY

3 0 0 3

Course Objectives

- Understand the key drivers and trends shaping the global apparel industry.
- Analyze the impact of international trade policies, regulations, and agreements on apparel businesses.
- Evaluate different sourcing strategies and their implications for cost, quality, and ethical sourcing.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO6: 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.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team,to manage projects and in multidisciplinary environments.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Evaluate the factors influencing the internationalization of the apparel industry.
2. Develop and implement effective sourcing strategies for global apparel businesses.
3. Design and execute marketing and distribution plans for international apparel markets.
4. Analyze the ethical and social responsibility issues within the global apparel supply chain and propose solutions for improvement.
5. Assess and Effectively communicate their understanding of international apparel business through written and oral presentations.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO THE GLOBAL APPAREL INDUSTRY

Overview of the global apparel market size, scope, and key players. Drivers of globalization in the apparel industry. Impact of technology and innovation on the global apparel industry.

UNIT II **9 Hours**

INTERNATIONAL TRADE AND THE APPAREL INDUSTRY

Trade policies and agreements affecting the apparel industry (e.g., WTO, GSP, FTA). Trade barriers and their impact on apparel businesses. Free trade agreements and their implications for the apparel industry.

UNIT III **9 Hours**

SOURCING STRATEGIES IN THE GLOBAL APPAREL INDUSTRY

Factors influencing sourcing decisions (e.g., cost, quality, lead time, ethical considerations).Different sourcing models (e.g., nearshoring, offshoring, outsourcing).Supplier selection and evaluation criteria.

UNIT IV **9 Hours**

MARKETING AND DISTRIBUTION IN INTERNATIONAL APPAREL MARKETS

Understanding cultural differences and consumer preferences in international markets. Developing effective marketing strategies for different regions and segments. Distribution channels and logistics management in the global apparel industry.

UNIT V **9 Hours**

ETHICAL AND SOCIAL RESPONSIBILITY IN THE GLOBAL APPAREL INDUSTRY

Labor standards and working conditions in the apparel industry. Environmental impact of the apparel industry. Ethical sourcing practices and corporate social responsibility.

Total: 45 Hours

Reference(s)

1. Fashion, Globalization and Sustainability: A Critical Introduction by Juliet Ashdown (2022).
2. The Handbook of Global Fashion Management edited by Christina Birtwistle and Peter Cooke (2023).
3. Sourcing Strategies in the Fashion Industry by Marie-Sophie Jones (2020).
4. Marketing Fashion Globally by Peter J. Davis (2019).
5. Fashion and Sustainability: A Critical Thinking Approach by Sandy Black (2022).

22FT023 ENTREPRENEURSHIP IN APPAREL MANUFACTURING 3 0 0 3

Course Objectives

- Develop an understanding of the apparel manufacturing industry and its entrepreneurial landscape.
- Identify and evaluate potential business opportunities in the apparel sector.
- Formulate a comprehensive business plan for an apparel manufacturing startup.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO7: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO10: 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.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Analyze the feasibility of potential apparel business ideas.
2. Assess different stages involved in launching and operating an apparel manufacturing business.
3. Analyze essential business skills such as market research, financial analysis, and operations management.
4. Analyze and effectively communicate their business ideas to potential investors and partners.
5. Create and develop a strong awareness of the ethical and social responsibility considerations within the apparel industry.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO ENTREPRENEURSHIP IN APPAREL MANUFACTURING

Overview of the apparel industry-Trends and drivers of the apparel market-Identifying entrepreneurial opportunities in apparel-The entrepreneurial mindset and skillset

UNIT II **9 Hours**

BUSINESS PLANNING FOR APPAREL STARTUPS

Developing a business concept-Conducting market research-Competitive analysis-Financial projections and business models-Writing a business plan

UNIT III **9 Hours**

PRODUCTION AND OPERATIONS MANAGEMENT

Sourcing materials and fabrics-Garment production processes. Quality control and assurance-Supply chain management

UNIT IV **9 Hours**

MARKETING AND BRANDING FOR APPAREL BUSINESSES

Target market identification and segmentation-Branding and brand positioning-Product development and pricing strategies-Marketing channels and communication strategies

UNIT V **9 Hours**

FINANCIAL MANAGEMENT FOR APPAREL STARTUPS

Financial statements and analysis-Funding options for apparel businesses-Cost control and profitability management-Risk management and mitigation strategies

Total: 45 Hours

Reference(s)

1. Fashion Entrepreneurship: The Essential Guide to Starting and Growing a Fashion Business by Peter Marino (2023).
2. The Business of Fashion: A Strategic Guide to the Fashion Industry by Christine M. Kenneally (2022).
3. Start, Run and Grow Your Fashion Business: The Complete Guide to Success in the Fashion Industry by Susan Gregg (2021).
4. Sustainable Fashion and Textiles: Design, Economics, and Policy by Kate Fletcher (2020).
5. The Fashion Entrepreneur: A Guide to Launching and Growing a Fashion Business by Sarah Kritikos (2019).

22FT024 SUSTAINABLE APPAREL BUSINESS MANAGEMENT

3 0 0 3

Course Objectives

- Understand the key concepts and principles of sustainable apparel business.
- Analyze the environmental and social impacts of the apparel industry.
- Identify and evaluate sustainable practices throughout the apparel supply chain.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

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PO6: 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.

PO7: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO10: 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.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess and discuss the key concepts of sustainable apparel business.
2. Analyze the environmental and social impacts of the apparel industry.
3. Evaluate sustainable practices throughout the apparel supply chain.
4. Develop and implement a sustainability plan for an apparel business.
5. Develop marketing and communication strategies for sustainable apparel brands.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO SUSTAINABLE APPAREL BUSINESS

Definition and scope of sustainable apparel business-The environmental and social impacts of the apparel industry -The business case for sustainability-Drivers and challenges of sustainable apparel

UNIT II **9 Hours**

SUSTAINABLE SOURCING AND PRODUCTION

Sustainable fiber and material choices-Organic and recycled materials-Sustainable manufacturing processes-Fair trade and labor practices

UNIT III **9 Hours**

SUSTAINABLE SUPPLY CHAIN MANAGEMENT

Supply chain mapping and analysis-Supplier selection and collaboration-Traceability and transparency-Circular economy principles

UNIT IV **9 Hours**

SUSTAINABLE PRODUCT DESIGN AND DEVELOPMENT

Eco-design principles-Life cycle assessment-Durability and repairability-End-of-life options

UNIT V **9 Hours**

SUSTAINABLE MARKETING AND BRANDING

Communicating sustainability to consumers-Greenwashing and transparency-Building a sustainable brand identity-Marketing channels and strategies

Total: 45 Hours

Reference(s)

1. Fletcher, Kate. Sustainable Fashion and Textiles: Design for Change. Routledge, 2014.
2. Hardin, Cate. Sustainable Fashion: Practical Strategies for Change. Thames & Hudson, 2017.
3. Gewering, Lisa, and Stephen Jones. Fashion & Sustainability: Design for Change. Laurence King Publishing, 2020.
4. Clapp, Jennifer. How We Make Clothes: A Journey Through the Global Textile Industry. New Press, 2014.
5. Fletcher, Kate, and Lynda Grose. Fashion and Sustainability: Design for Change: 2nd Edition. Routledge, 2023.

22FT025 APPAREL PRODUCTION MANAGEMENT 3 0 0 3

Course Objectives

- To understand the key concepts and theories of apparel production management.
- To be able to apply these concepts and theories to real-world apparel production problems.
- To develop critical thinking and problem-solving skills in the context of apparel production.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO7: 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.

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PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess the process of PPC in apparel Industry.
2. Apply the procedure of fabric utilization in cutting department.
3. Analyze about the garment production systems.
4. Show about the flow process grids in Apparel production.
5. Evaluate the Plant Loading and Capacity Planning for apparel production.

Articulation Matrix

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

UNIT I **9 Hours**

PRODUCTION PLANNING AND CONTROL IN GARMENT INDUSTRY

Production Strategies in Garment Industry-Roles of PPC Department in Garment Industry-Standard Allowed Minute-Performance Measurement Parameters in Production Planning-Production Planning Software for Apparel Industry

UNIT II **9 Hours**

FABRIC UTILISATION IN CUTTING ROOM

Cut Order Planning-Roll Allocation-Fabric Grouping-Performance Measurement Parameters in Cutting Section

UNIT III **9 Hours**

GARMENT PRODUCTION SYSTEMS

Make through System-Whole Garment Production System-Assembly Line System-Modular Production System-Evaluation of Garment Production Systems

UNIT IV **9 Hours**

FLOW PROCESS GRID

Flow Process Grids and Charts-Construction of Flow Process Grids-Operation Breakdown-Control Forms in Production Department

UNIT V **9 Hours**

PLANT LOADING AND CAPACITY PLANNING

Setting Up of a Garment Industry-Plant Layout-Influencing Factors of Plant Layout-Types of Layout-Line Balancing-Determination of Machinery Requirements for a New Factory-Estimation of Production Capacity of a Garment. Factory-Sewing Room Capacity-Determination of Operator Efficiency-Determination of Efficiency of a Production Line-Line Loading Plan for Garment Production

Total: 45 Hours

Reference(s)

1. T Karthik, P. Ganesan, D.Gopalakrishnan ,"Apparel Manufacturing Technology", CRC Press, Taylor and Francis Group, 2017.
2. Paula J. Myers-McDevitt, "Apparel Production Management and the Technical Package", Fairchild Books, 2010.
3. A.J. Chuter., " Introduction to Clothing Production Management ", Blackwell Scientific Publications.
4. Jacob Solinger, Apparel Manufacturing Handbook, Bobbin Blenheim Media Corporation, Nashville, USA, 1988.
5. David J. Tyler., " Materials Management in Clothing Production ", Blackwell Scientific Publications Professional Books.

22FT026 TECHNOLOGY OF NON-WOVENS 3 0 0 3

Course Objectives

- To understand the fundamental principles and processes involved in the production of non- woven fabrics.
- To acquire knowledge of various non-woven fabric structures and their properties.
- To gain insights into the applications of non-woven fabrics in diverse fields.
- To develop skills in the characterization and evaluation of non-woven fabrics.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

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PO6: 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.

PO7: 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.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess the basic concepts and terminology related to non-wovens.
2. Analyze the production methods for various types of non-woven fabrics, including web formation, bonding, and finishing.
3. Select appropriate non-woven fabrics for specific applications based on their properties and performance requirements.
4. Analyze the properties of non-woven fabrics, such as strength, permeability, and flammability.
5. Find the applications of non-woven fabrics in various industries, such as apparel, automotive, filtration, and medical textiles.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO NON-WOVENS

Definition and historical development of non-wovens-Classification of non-wovens based on fiber type, structure, and bonding methods. Applications of non-wovens in diverse fields. Comparison of non-wovens with woven and knitted fabrics

UNIT II **9 Hours**

FIBER PREPARATION AND WEB FORMATION

Natural and synthetic fibers used in non-wovens. Opening, cleaning, and blending of fibers. Carding, combing, and other web formation techniques. Factors affecting web uniformity and quality

UNIT III **9 Hours**

BONDING AND FINISHING PROCESSES

Chemical bonding methods: adhesive bonding, resin bonding, powder bonding. Mechanical bonding methods: needle punching, stitch bonding, thermal bonding. Other bonding techniques: flame bonding, ultrasonic bonding, water-jet bonding. Finishing processes: calendaring, brushing, coating, and printing

UNIT IV **9 Hours**

PROPERTIES OF NON-WOVENS

Mechanical properties: tensile strength, tear strength, puncture resistance. Physical properties: weight, thickness, porosity, air permeability. Thermal properties: heat insulation, flame retardancy. Chemical properties: resistance to acids, alkalis, and solvents

UNIT V **9 Hours**

APPLICATIONS OF NON-WOVENS

Apparel and home textiles: interlinings, wipes, disposable garments. Automotive textiles: headliners, floor mats, sound insulation. Filtration textiles: air filters, liquid filters, medical masks. Medical textiles: surgical gowns, wound dressings, hygiene products. Other applications: geotextiles, agricultural textiles, packaging materials

Total: 45 Hours

Reference(s)

1. "Non-Woven Fabrics: Technology, Design, and Applications" by Peter R. Lord.
2. "Handbook of Nonwoven Fabrics" by George J. Fielsch.
3. "Non-Woven Textiles: Production, Properties, and Applications" by Alberto Gomez-Martinez.

22FT027 PROTECTIVE GARMENTS 3 0 0 3

Course Objectives

- Understand the various types of protective garments and their applications.
- Analyze the different hazards and risks associated with various work environments.
- Evaluate the selection, use, care, and maintenance of protective garments.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: 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.

PO7: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO10: 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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Identify and describe the various types of protective garments based on their functions and applications.
2. Find the relationship between textile fiber properties, fabric structures, and garment performance in providing protection.
3. Analyze and evaluate the design features and materials used in specific protective garments for different hazards.
4. Apply relevant standards and regulations related to protective garment safety and performance.
5. Design and develop prototypes of protective garments for specific applications, considering material selection, garment construction, and user needs.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO PROTECTIVE GARMENTS

Overview of protective garments and their applications Classification of protective garments based on function and hazard type-Factors influencing garment performance: materials, construction, standards, and testing

UNIT II **9 Hours**

TEXTILE MATERIALS FOR PROTECTION

Fiber properties and their influence on protective performance (e.g., flame retardancy, chemical resistance, water repellency). Fabric structures and their impact on garment function (e.g., breathability, barrier properties, comfort) Non-woven and composite materials for specific applications

UNIT III **9 Hours**

DESIGN AND CONSTRUCTION OF PROTECTIVE GARMENTS

Design principles for different types of protective garments. Ergonomic considerations for comfort and mobility-Seam technology and closures for optimal protection. Finishing and treatment techniques for enhancing garment performance

UNIT IV **9 Hours**

STANDARDS AND REGULATIONS

Introduction to international and national standards for protective garments. Testing methods for evaluating garment performance against different hazards. Certification processes and regulatory requirements for specific applications

UNIT V **9 Hours**

CASE STUDIES AND APPLICATIONS

Analysis of specific types of protective garments used in healthcare, firefighting, military, industrial, and outdoor settings. Emerging trends and innovations in protective garment design and technology

Total: 45 Hours

Reference(s)

1. "Protective Clothing: Materials and Design," by Peter Townsend.
2. "Handbook of Textile Standards," by Hyung Wook Park.
3. "Textiles for Protection," by William C. Groves.
4. "The Science of Protective Clothing," by David A. Pendergrass.

22FT028 INTIMATE APPARELS 3 0 0 3

Course Objectives

- To elucidate the basics of human structure and measurements.
- To develop knowledge about fabric selection and styles for intimate apparels.
- To impart technical knowledge about fabric properties that deals with the functional aspect of intimate apparels.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Compare the different sizing systems of brasseires and identify the differences between them.
2. Construct basic block patterns for Brasseires.
3. Assess the types of girdles and analyze fabric properties role in girdle design.
4. Analyze girdle pressure sensing systems and factors affecting girdle pressure.
5. Determine the functional requirements of knitted and seamless apparels.

Articulation Matrix

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

UNIT I **9 Hours**

BREAST MEASUREMENT AND SIZING

Breast measurement and sizing- measurement of breast dimensions-Control of posture and clothing-Body landmarks-Manual measurements-2D measurements. Latest technologies for breast measurements, breast sizing systems.

UNIT II **9 Hours**

BRA PATTERN TECHNOLOGY

Bra pattern technology - introduction -Basic block of bra pattern -Direct drafting of flat pattern - Direct drafting of soft bra - Direct drafting of wired bra-Direct drafting of push-up bra-Tracing from the sample-Three- dimensional modeling on the mannequin. Computerized 3D Intimate Pattern Design.

UNIT III **9 Hours**

INNOVATIONS OF GIRDLES

Historical development of girdles - classification of modern girdles - innovations of shape-up girdles-inventions of health promoting girdles -new materials for girdles - considerations of fabric properties in girdle design.

UNIT IV **9 Hours**

PRESSURE EVALUATION OF BODY SHAPERS

Physiological effects resulting from clothing pressure - Studies using direct pressure sensing systems - Indirect pressure prediction -Factors affecting girdle pressure absorption . Intimate apparel with special functions - Sports Bra -Pantyhose - Swimwear - Mastectomy Bras - Maternity Underwear.

UNIT V **9 Hours**

KNITTED AND SEAMLESS INTIMATE APPAREL

Functional requirements of knitted underwear -Engineering of knitted underwear fabrics - Performance evaluation of knitted underwear - Properties of commercial knitted underwear fabrics. Process innovation in seamless intimate apparel -Lamination - Moulding - Seamless knitting technology. Intimate apparels for men.

Total: 45 Hours

Reference(s)

1. The Fashion Archive (2020) by Cally Blackman: Explores the history of underwear from a cultural and sociological perspective, featuring stunning visuals.
2. The Secret History of the Bra (2010) by Susannah Frankel: Delves into the evolution of the bra, its social impact, and its role in female empowerment.
3. Intimate Apparel: 500 Years of Fashion Underneath (2015) by Lynn Sherr: A comprehensive overview of undergarments across different cultures and periods, with detailed descriptions and illustrations.

22FT029 SMART TEXTILES AND GARMENTS 3 0 0 3

Course Objectives

- Understand the fundamental concepts of smart textiles and their functionalities.
- Explore the different types of smart materials and their applications in textiles.
- Analyze the various methods of integrating sensors, actuators, and electronics into textiles.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: 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.

PO7: 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.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Analyze different types of smart materials and their potential applications in textiles.
2. Find the various methods of integrating technology into textiles and the challenges involved.
3. Design and develop simple smart textile prototypes.
4. Analyze the benefits and limitations of smart textiles and their impact on society.
5. Create effective communication and research skills related to smart textiles.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO SMART TEXTILES AND GARMENTS

Definition and history of smart textiles-Classification of smart materials-Functional properties of smart textiles-Applications of smart textiles in various fields

UNIT II **9 Hours**

MATERIALS AND TECHNOLOGIES FOR SMART TEXTILES

Polymers, fibers, and yarns for smart textiles-Conductive materials, sensors, and actuators-Energy harvesting and storage technologies-Microfabrication and nanotechnology for smart textiles

UNIT III **9 Hours**

INTEGRATING TECHNOLOGY INTO TEXTILES

Textile finishing and coating techniques-Embroidery and weaving techniques for integrating electronics-3D printing and other additive manufacturing methods-Smart textile design principles and challenges

UNIT IV **9 Hours**

APPLICATIONS OF SMART TEXTILES

Smart garments for healthcare and wellness-Sportswear and protective clothing-Military and emergency response applications-Fashion and design with smart textiles-Architectural and building applications

UNIT V **9 Hours**

ETHICAL AND ENVIRONMENTAL CONSIDERATIONS

Sustainability of smart textiles and materials-E-waste and end-of-life management-Ethical sourcing and production practices- Privacy and security concerns with wearable technology

Total: 45 Hours

Reference(s)

1. "Smart Textiles and Garments for Fashion and Medical Applications" by Theresa McClements and Isik C. Bayraktar.
2. "Intelligent Textiles and Clothing" by Rajesh B. Shrivastava.
3. "Electronic Textiles: Technologies and Applications" by William C. Wilson.
4. "The Handbook of Textile Product Development" by Peter J. Hauser.
5. "Wearable and Implantable Sensors for Personalized Health Monitoring" by Patricia T. Gardner.

22FT030 SPORTS TEXTILES AND GARMENTS 3 0 0 3

Course Objectives

- To learn about the design and construction of sports garments.
- To be able to evaluate the performance of sports apparel.
- To develop an understanding of the sustainability of sports apparel.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: 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.

PO7: 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.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Analyze physiological comfort requirement of sports textile products.
2. Assess development and application of coated and laminated textiles as sports textiles.
3. Design sports garments.
4. Design sports footwear, glove and protective gears.
5. Evaluate sportswear.

Articulation Matrix

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

UNIT I **9 Hours**

SPORTSWEAR - PHYSIOLOGICAL COMFORT

Sportswear - introduction, types; textiles in sportswear; sportswear - comfort and protection from injury, functional requirements; wear comfort of sportswear, measurement of physiological comfort; heat exchange mechanism and heat balance, water resistance, water vapour transfer, condensation problem in waterproof breathable fabrics for sportswear.

UNIT II **9 Hours**

COATED AND LAMINATED TEXTILES IN SPORTSWEAR

Sports products from coated and laminated fabrics; fibre and fabric preparation for coated fabrics; transfer, rotary screen, micro porous coating; determination of coating add-on; lamination in sportswear; finishes for sportswear- mechanism, chemistry and application.

UNIT III **9 Hours**

SPORTS GARMENT DESIGNING

Design of sports garments - selection of fibre, yarn and fabrics for different types of sports, construction of sports garments; advancements in textile materials for active wears

UNIT IV **9 Hours**

OTHER SPORTS PRODUCTS DESIGNING

Design of sports foot wear, protective gears, glove - components, design features, selection of material, construction.

UNIT V **9 Hours**

EVALUATION OF SPORTS TEXTILES

Standards and test methods for sports textiles, testing of coated and laminated sportswear fabrics

Total: 45 Hours

Reference(s)

1. R.Shishoo, "Textiles for sportswear", Woodhead Publishing Series in Textiles, Cambridge, England, 2015.
2. A.R. Horrocks& S.C. Anand (Edrs.), "Handbook of Technical Textiles", The Textile Institute, Manchester, U.K., Woodhead Publishing Ltd., Cambridge, England, 2000.
3. Schindler W.D and Hauser P., "Chemical Finishing of Textiles"., Woodhead Publications, ISBN: 18557390545. Richard. A.Scott, Textiles for Protection, CRC press, Woodhead Publication, USA, 2005.
4. Sports Bras: Science, Technology, and Design by Janice Miller (2012): Explores the design and engineering of sports bras for optimal support and comfort.
5. Protective Clothing for Sports by David I. Newton (2015): Examines the materials and technologies used in protective gear for different sports.

22FT031 MEDICAL TEXTILES AND GARMENTS 3 0 0 3

Course Objectives

- Understand the fundamental principles of textile science and technology as applied to the medical field.
- Learn about the various manufacturing processes and finishing techniques used in medical textiles.
- Explore the regulatory requirements and standards for medical textiles and garments.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO7: 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.

PO10: 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.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess medical textiles and its base material.
2. Analyze wound dressing and bandage textiles and manufacture.
3. Analyze implantable textiles.
4. Compare healthcare and hygiene textiles and manufacture.
5. Evaluate the methods used in medical textiles.

Articulation Matrix

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

UNIT I **9 Hours**

METERIALS IN BIO MEDICAL APPLICATION

Metals, ceramics, polymers used for bio medical applications - manufacture, features and limitations; super absorbent polymers, cell- biomaterial interaction

UNIT II **9 Hours**

WOUND DRESSING BANDAGES AND NON IMPLANTABLES

Non-implantable materials: wound dressing- requirements of wound dressing, types, properties and applications; bandages - types, evaluation and applications; design and manufacture of wound dressings and bandages

UNIT III **9 Hours**

IMPLANTABLE TEXTILES

Implantable biomedical devices: vascular grafts, sutures - types, properties and applications; extra-corporeal devices; scaffolds for tissue engineering: development and characterization

UNIT IV **9 Hours**

HEALTH CARE AND HYGIENE TEXTILES

Healthcare and hygiene products: surgical gowns, masks, respirators, wipes, napkins, antibacterial, antiodour textiles design and manufacture of above products

UNIT V **9 Hours**

STANDARDS IN MEDICAL TEXTILES

Standards; safety, legal and ethical issues involved in conducting trials with medical textile materials; disposal of medical textile products

Total: 45 Hours

Reference(s)

1. Handbook of Medical Textiles.
2. Medical Textiles and Biomaterials for Healthcare.
3. Medical and Healthcare Textiles.
4. Medical Textiles - 1st Edition.

22FT032 FASHION STYLING AND MODELLING 3 0 0 3

Course Objectives

- To enable the Students identify fashion ideas and styling trends.
- To impart the knowledge of formulating different looks.
- To enable the Students derive fashion show presentation concepts.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

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PO6: 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.

PO7: 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.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Demonstrate knowledge of various styling concepts in the history of fashion design.
2. Assess the characteristic features of subcultures.
3. Apply new concepts for style development devise photo shoot techniques for presentation themes.
4. Resolve the model requirements for runway, high fashion and catalogue modelling.
5. Analyze the characteristics of concept photoshoot styling and create new looks inspired from the fashion runways.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO FASHION DESIGN HISTORY

Evolution of fashion from 17th century to the current: major silhouettes, shapes, colors, garment detail and look. Fashion categories and Clothing genres Active wear, swimwear, sportswear separates, dresses, suits, evening wear, outerwear. Core visual fashion concepts ethnic, postmodern, avant-garde, historic, modernity, sexuality and sporty.

UNIT II **9 Hours**

FASHION SUBCULTURES

Review of notable fashion icons - 20 designers and fashion Innovators - 20 designers. Styles from the street, subculture and aesthetics: The Dandy, Hiphop, Skater, Grunge, Punk, Fetish, Goth, steam punk, Japanese style tribes, Minimalist, Classic, romantic, sporty, urban, postmodern, Deconstructivist

UNIT III **9 Hours**

FASHION CHOREOGRAPHY

Fashion choreography concept development, Create visual art plans and presentation themes, Design briefing and content development, Photo shooting, Choosing models, Selection criteria for makeup concept.

UNIT IV **9 Hours**

FASHION MODELING

Fashion modeling types: Editorial fashion modeling, High fashion modeling (runway, ad campaign), catalog modeling. Fashion model size requirements, working on expression and pose, art of posing, posing styles. Enhancing physical features through styling

UNIT V **9 Hours**

PREPARATION OF MODELING AND STYLING PORTFOLIO

Conceptual styling, coordinating with themes, choosing accessories, understanding the recent looks from the runways

Total: 45 Hours

Reference(s)

1. Coco Rocha study of pose: 1000 pose, Coco Rocha, harper design 2014.
2. Alicia Kennedy, Emily stoehrer, Jay calderin, Fashion design referenced, Rockport publishers, 2013.
3. Frank Doorhof, Mastering the Photoshoot, Peachpitpress, 2013.
4. Beverly Massachusetts, Fashion details 1000 ideas from neckline to waistline, pockets to pleats, Mao mao, 2011.
5. Chris gatcum, Light and shoot: 50 fashion photos, Illex, 2011.
6. Nishantbaxi, Farout fashion, NKBs publishing, 2015.

22FT033 HISTORY OF CLOTHING AND FASHION 3 0 0 3

Course Objectives

- To enable students understand and comprehend different fashion theories.
- To enable students, understand the social, cultural and emotional motivations of contemporary dress culture.
- To enable students, interpret and mark gender roles in fashion.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO6: 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.

PO10: 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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess the etymological concepts of fashion clothing and determine the different notions about fashion.
2. Analyze the framework of fashion system and resolve the characteristics of fashion.
3. Assess the anthropological approach and other identities of fashion clothing.
4. Apply the fashion clothing in terms of its gender specific characteristics.
5. Assess to the generational characteristic of segment focused in fashion studies.

Articulation Matrix

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

UNIT I **9 Hours**

ETYMOLOGY OF FASHION

Etymology of fashion - difference between dress, clothing, costume and fashion. Feminization of fashion, Fashion as a Concept and a Phenomenon, Proponents and Opponents of Fashion , Studies of Fashion in Social Science - use of visual materials as evidence.

UNIT II **9 Hours**

FASHION SYSTEMS AND MODELS

Fashion systems model - beginning of fashion system, fashion as a myth, concept. Different approaches to fashion, Institutionalization of French fashion, fashion adoption and consumption - trickle down, trickle across and trickle up theories. Characteristics of fashion - Social changes, Appearance and identity

UNIT III **9 Hours**

ANTHROPOLOGICAL STUDIES OF FASHION

Contemporary dress and culture, Anthropological approach to fashion studies - Social, cultural and emotional motivations. Consumer behavior, Process of fashion change and adoption. Fashion and social identity - role of dressing, social restrictions on clothing and relevant reactions.

UNIT IV **9 Hours**

GENDERING FASHION

Gendering fashion - Beyond binaries, soft assemblages, marking, unmarking and remarking gender, sex. Gender and style fashion dress, feminist deconstruction, theorizing body and style - fashion dress, menswear out of academic closet, Multiple masculinities.

UNIT V **9 Hours**

GENERATION CHARACTERISTICS

Bodies in motion through time and space - Age, generation and place, Time and space, Open intersectionalization, Selfhood and mind, Self-image and Public image, Phenomenon of social media expressions, Generation Z.

Total: 45 Hours

Reference(s)

2. Diana Crane, Fashion and its social agenda: class, gender and identity in clothing, University of Chicago Press, 2012.
3. Susan B Kaiser, Fashion and cultural studies, Berg publishers, 2013.
4. Joanne B eicher and Sandra lee evenson, The visible self: Global perspectives on dress, culture and society, Bloomsbury, 2014.
5. Agnes rocamura and Anneke smelik, Thinking through fashion: a guide to key theorists, I.B. Tauris, 2015.
6. http://www.tandfonline.com.

22FT034 FASHION PHOTOGRAPHY AND CHOREO 3 0 0 3

Course Objectives

- Develop a critical understanding of the history and theory of fashion photography and choreography.
- Explore the use of movement, form, and narrative in fashion photography.
- Analyze the relationship between the body, clothing, and space in fashion imagery.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: 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.
PO7: 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.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO12: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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (Cos)

1. Analyze key concepts in fashion photography.
2. Create mood boards and storyboards for fashion photography projects.
3. Execute a concept for a fashion photography shoot involving choreography.
4. Shoot and edit high-quality fashion photographs using various lighting and camera techniques.
5. Analyze effectively with a team of creative professionals on a fashion photography shoot.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION

Introduction to fashion photography and choreography-The history and evolution of both disciplines-Key figures and influential works-The creative process: from concept to execution

UNIT II **9 Hours**

THE BODY IN MOTION

The body as a canvas in fashion photography-Exploring movement and gesture-Choreography as a tool for storytelling Anatomy for photographers: understanding movement and pose.

UNIT III **9 Hours**

HANDLING COLOUR IN SLIDE PHOTOGRAPHY

Using the changing light, Exploring the light and angle, Angle of view, Light and shade, Monochromatic colour, Dominant colour, A touch of colour, Harmonic and discordant colour, Contrasting colour, Composition and line, Balance, position and scale, Point of interest, Shape and silhouette, Form and modelling, Tone and hue, Texture, Pattern, Perspective, Framing, Existing backgrounds, Planned backgrounds, Movement, High speed photography, Colour in close-ups, Macro-photography, Photographing through microscopes using reflected images.

UNIT IV **9 Hours**

LIGHT AND COMPOSITION

Lighting techniques for fashion photography-Compositional strategies for capturing movement-Working with different shooting locations and environments-Using light and shadow to create drama

UNIT V **9 Hours**

STUDIO PRACTICE

Introduction to studio lighting equipment-Setting up a fashion shoot-Working with models and dancers in the studio-Directing and capturing movement

Total: 45 Hours

Reference(s)

1. Light: Science & Magic for Digital Photography by Fil Hunter (2015).
2. Fashion Photography: The Art of the Image by Michael Freeman (2019).
3. Vogue: The Book of Fashion Photography by Juliet Ashdown (2016).
4. Choreography: An Encyclopedia by Gerald McAvoy (2019).
5. Moving Stories: An Introduction to Choreography by Janis Brenner (2015).

22FT035 FASHION COMMUNICATION 3 0 0 3

Course Objectives

- Equip the students about the fundamental fashion communication concepts.
- Enable the students to choose graphics and presentation concepts for disseminating fashion information
- Acquire the knowledge of writing fashion journal articles.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Apply the fashion communication concepts in design and articulate the framework of process parameters engaged in design.
2. Show the graphic design concepts and resolve the layout & typography requirements for presenting fashion concepts.
3. Resolve the visual merchandising requirements for making an effective visual display in both brick stores and online.
4. Determine the documentation processes and review processes for reporting and publishing in journals.
5. Assess the fashion photography aspects and examine the light settings & camera parameters for organizing fashion photo shoots, choreography and fashion motion photography.

Articulation Matrix

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

UNIT I **9 Hours**

FASHION COMMUNICATION IN DESIGN

Communication concepts and processes - Mood board, Trend board, Sketches, Tech pack, Look book, Styling, Catalogue, Brochure

UNIT II **9 Hours**

GRAPHIC DESIGN FOR PRESENTATION

Grids and formations -columns, grids, modules. Types of grids, Layout design -gestalt principles, reality layouts and representational layouts. Matrices patterns, pixels and pointillism. Typography - anatomy, types.

UNIT III **9 Hours**

VISUAL MERCHANDISING

Different kinds of images, Display types. Display setting types. Elements of Display- Mannequins, dress forms, stands-T stand, 4-way stand, rounder, spiral stands. Color planning for store interiors.

UNIT IV **9 Hours**

FASHION VIEWS

Writing runway reviews, Fashion week reviews, Trend reporting -trend labeling, trend mapping and trend quality. Writing editorials, Framing advertisement contents, Craft documentation, Writing design coverage report, Writing travelogues, lifestyle reporting.

UNIT V **9 Hours**

FASHION PHOTOGRAPHY

Street photography, Choreography for fashion shows, fashion photo shoot, Subject lighting, Guidelines for selecting lighting conditions for different moods. Motion photography.

Total: 45 Hours

Reference(s)

1. Kate Nelson Bet, The history and fashion journalism, Berg publishers, 2017.
2. Harriet Posner, Marketing Fashion: Strategy, Branding and Promotion, Laurence king publishing, 2015. 2nd edition.
3. Alicia Kennedy, Emily stoehrer, Jay calderin, Fashion design referenced, Rockport publishers, 2013.
4. Marian Frances Wolbers, Uncovering fashion: Fashion communications across the media, Fairchild books, 2009.
5. Https://www.globalfashionagenda.com.

22FT036 FASHION VISAGE **3 0 0 3**

Course Objectives

- Explain the impact of fashion in visage through different forms of outcome.
- Execute the fashion visage through illustration and poses by incorporating the features.
- Apply fashion expressions using the blurring, fading, positive vibes or distortion ways of visage

Programme Outcomes (POs)

PO3: 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.

PO4: 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.

PO10: 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.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Show the influence of fashion visage from the past to the current trends.
2. Analyze the types of art forms to express the visage.
3. Differentiate the visages through types of photoshoots.
4. Critiquing the fashion trends using distortion like deconstructionism.
5. Show the use of fashion visages from research to design execution.

Articulation Matrix

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

UNIT I **9 Hours**

FASHION VISAGE IN PAST ERA

Definition - Fashion visage-13th century to 19th century- 20"s modernism-Post Modernism-Haute-couture-Avant-garde-Deconstruction fashion.

UNIT II **9 Hours**

FASHION ART FORMS

Conceptual art-Pop art-Abstract art-Cubism-Performance art-Installation art-Impressionism-Modern art-surrealism-Minimalism-Decorative arts.

UNIT III **9 Hours**

HISTORY OF ART INSPIRED FASHION

Madeleine Vionnet: A Fashion Designer That Channeled Ancient History-Valentino And Hieronymus Bosch-Dolce & Gabbana And The Baroque Of Peter Paul Rubens-History Of Art And Fashion: El Greco's Mannerism And Cristobal Balenciaga-Alexander McQueen And Gustav Klimt's Symbolism-Christian Dior, The Designer Of The Dreams, And Claude Monet's Impressionist Paintings-Yves Saint Laurent- Mondrian And De Stijl-Elsa Schiaparelli And Salvador Dali-Fashion Designers & Pop Art: Gianni Versace And Andy Warhol.

UNIT IV **9 Hours**

DECONSTRUCTION AND DISTORTION FASHION

Deconstructed Visage in Fashion Illustration-Deconstructed Visage of Francis Bacon's Painting-Reconstruction design techniques.

UNIT V **9 Hours**

PHOTOGRAPHY AND ART

Types of photography-High fashion, street wear, Editorial photography, Catalogue photography-Photography and art-Wearing culture-Expressionism of fashion.

Total: 45 Hours

Reference(s)

1. https://www.thecollector.com/9-art-history-inspired-fashion-designers/.
2. https://www.eden-gallery.com/news/7-different-forms-of-art.
3. https://photographycourse.net/the-4-different-types-of-fashion-photography/.
4. https://issuu.com/visageknitwear/docs/visage_aw23_lookbook.
5. https://www.researchgate.net/publication/264174983_An_analysis_on_the_Deconstructed_Visage in Fashion Illustration.
6. https://www.thepinknews.com/2021/02/17/michelle-visage-drag-race-fashion-gender-rulebook-nandos-diversity-inclusion-speakers/.

22FT037 CHRONICLE OF FASHION 3 0 0 3

Course Objectives

- Explain the impact of fashion in fiction through the past and current world.
- Execute the designing silhouettes of fashion history based on the type of silhouette according to the fiction.
- Apply fashion terminologies in real time fashion industry through different modes of fictions.

Programme Outcomes (POs)

PO3: 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.

PO4: 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.

PO10: 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.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Show the influence of fashion fiction from the past during the late 13^{th} to 19^{th} century.
2. Analyse the types of arts and culture from the past period to the current modern world.
3. Differentiate the principles and classification of style development.
4. Critiquing the silhouettes of fashion history to learn the inspired creation of popular trends from past to present fashion world.
5. Show the use of fashion terminologies from research to design execution.

Articulation Matrix

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

UNIT I **9 Hours**

FASHION IN FICTION

Definition - Fashion in fiction-Fiction in Fashion, Fashion - means of communication, Three modes of fiction-Realism, Modernism and Post-modernism.

UNIT II **9 Hours**

FASHION COMMUNICATION

Definition - Communication, Fashion - means of communication, Fashion Journalism, Methods of visual communication-Fashion photography, Fashion magazines, The Catalogue

UNIT III **9 Hours**

FUNCTION OF FASHION CLOTHING

Material function - protection, modesty and concealment, immodesty and attraction. Cultural functions -communication, individuality expressions, social status, social role, economic status, political status, religious status, social rituals.

UNIT IV **9 Hours**

FASHIONING PRIVILEGE

Commodification, Consumption, and Corruption. Margaret Mitchell: Fashioning A-Historical and Anti-Canonical White Modernism. Toni Morrison: Re fashioning white privilege

UNIT V **9 Hours**

FASHION PRESTIGE IN CURRENT FASHION

Fashion and Literature-Expressing ideals of beauty. Fiction world of 201 to 213- Japanese culture, World via sounds emitted by living organisms, complete matching wardrobe, Complementing strangers, Clothing to community, Secondhand gifts-babies clothing, Textural sculptures from textile waste, Feelings and opinions, dating back to 1845, natural resources in place of chemicals, Cotton-to-cloth, Natural year-round textiles thrive, Transparency and traceability the norm. Material Futures-Aesthetic Prophesies-Responsible visions.

Total: 45 Hours

Reference(s)

1. https://www.prestigeonline.com/th/lifestyle/art-plus-design/love-affair-between-fashion-and-literature/.
2. https://www.eurolitnetwork.com/fashion-fiction/.
3. https://www.bloomsburycollections.com/book/fashion-in-fiction-text-and-clothing-in-literature-film-and-television/ch6-the-fashioned-world-of-andrea-zittel.
4. https://www.bbc.com/culture/article/20210602-literatures-greatest-fashion-disasters.
5. https://fashionfictions.org/the-worlds/.
6. https://www.vanartgallery.bc.ca/exhibitions/fashion-fictions.

22FT038 TEXTILE HERITAGE 3 0 0 3

Course Objectives

- Recognize the enduring influence of these ancient cultures on modern societies and thought.
- Analyze and interpret primary sources such as archaeological finds, textual documents, and artistic expressions.
- Identify the interactions, trade networks, and cultural exchanges between traditional textiles.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO3: 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.

PO6: 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.

PO10: 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.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess the evolution of clothing.
2. Analyze and appreciate the various traditional textiles and costumes of Northern India.
3. Analyze and appreciate the various traditional textiles and costumes of Southern India.
4. Analyze and appreciate the various traditional textiles and costumes of Eastern India.
5. Analyze and appreciate the various traditional textiles and costumes of Western India.

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

UNIT I **9 Hours**

INTRODUCTION

Evolution of clothing - Origin & functions of clothing -beginning of civilization - Greek, Roman and Egyptian. Study of Historical designs of different countries - Persian, Mughal, Chinese, Japanese and American.

UNIT II **9 Hours**

NORTHERN TRADITIONAL TEXTILES

Traditional Woven textiles of North India - Brocades of Banaras, Balucheri, Chanderi and Tanchoi. Traditional Embroideries of North India - Kashida, Phulkari, Chambarumal and Chikankari. Traditional costumes of North States of India - Jammu & Kashmir, Punjab, Himachal Pradesh, Haryana, Uttaranchal and Uttar Pradesh.

UNIT III **9 Hours**

SOUTHERN TRADITIONAL TEXTILES

Traditional woven textiles of Southern states of India -Paithani and Pitamber, Pochampalli, Kancheevaram, Himrus, Kalamkari, Pipli, Mysore silk, Aarni Silk. Traditional embroideries of South India - Thoda embroidery, Kasuti of Karnataka and Aari embroidery. Traditional costumes of Southern states of India - Tamil Nadu, Kerala, Karnataka and Andhra Pradesh.

UNIT IV **9 Hours**

EASTERN TRADITIONAL TEXTILES

Traditional woven textiles of Eastern states of India - Dacca muslin, Applique work of Bihar. Traditional embroideries of East India - Kantha of Bengal, Sujaini embroidery, Manipuri embroidery and Nagaland embroidery. Traditional costumes of Eastern states of India - West Bengal, Bihar, Jaharkand, Arunachal Pradesh, Assam, Sikkim, Nagaland, Manipur, Mizoram, Meghalaya and Tirupura

UNIT V **9 Hours**

WESTERN TRADITIONAL TEXTILES

Traditional woven textiles of Western states of India - Maheshwari sarees of Madhya Pradesh, Patola, Bandhini and Amrus. Traditional embroideries of Western India - Sindhi embroidery - Kutch, Ari Bharath, Kanbi Bharath, Mochi Bharath, Shisha embroidery. Traditional costumes of Western states of India - Rajasthan, Gujarat, Maharastra, Madhya Pradesh, Chhattisgarh and Goa.

Total: 45 Hours

Reference(s)

1. John Gillow & Nicholas Barnad, "Traditional Indian Textiles". Thames & Hudson, 1993.
2. Rta Kapur chishti & Amba Sanyal, "Saris of India - Madhya Pradesh," Wiley Eastern Ltd. 1989.
3. Martand Singh, "Saris" of India - Bihar & West Bengal", Wiley Eastern Ltd. 1993.
4. Costumes and textiles of Royal India - Ritu Kumar Published by Christie's Books.
5. Traditional Embroideries of India Shailaja D. Naik.

22FT039 DATA MANAGEMENT TECHNIQUES 3 0 0 3

Course Objectives

- Comprehend the importance of data-driven decision making in the fashion industry.
- Apply data insights to various fashion business aspects, such as product development, marketing, merchandising, and supply chain management.
- Develop critical thinking and problem-solving skills in the context of data analysis.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: 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.

PO10: 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.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Design and implement a data collection plan for a specific fashion business challenge.
2. Analyze and interpret data using relevant statistical methods and visualization tools.
3. Develop data-driven recommendations for improving various aspects of a fashion business.
4. Demonstrate effective communication skills in presenting data insights to a diverse audience.
5. Analyze the ethical considerations of data collection and analysis in the fashion industry.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO DATA MANAGEMENT IN FASHION BUSINESS

The role of data in fashion decision-making-Types of data relevant to fashion businesses-Data-driven vs. intuition-driven approaches

UNIT II **9 Hours**

DATA COLLECTION TECHNIQUES

Market research: primary and secondary sources-Customer surveys and data analysis-Social media analytics and sentiment analysis-Point-of-sale data and transactional analysis

UNIT III **9 Hours**

DATA MANAGEMENT AND ORGANIZATION

Data warehousing and data lakes-Data cleansing and data quality management-Master data management and data governance

UNIT IV **9 Hours**

DATA ANALYSIS TECHNIQUES

Descriptive statistics and data visualization-Data mining and predictive analytics-Regression analysis and forecasting models-Big data and its applications in fashion

UNIT V **9 Hours**

APPLICATIONS OF DATA IN FASHION BUSINESS

Product development and trend forecasting-Marketing and customer segmentation-Merchandising and inventory management Supply chain optimization and logistics-Customer relationship management (CRM)

Total: 45 Hours

Reference(s)

1. Fashion Forecasting: Principles and Practices by Lidewij Edelkoort.
2. Fashion Data Science: How to Use Data Analytics to Win in the Fashion Industry by Anjan Chatterjee and Ashish Dash.
3. The Data-Driven Fashion Entrepreneur: Using Retail Analytics to Build a Thriving Business by Andrea Di Marchi and Paolo Piacenza.
4. Retail Analytics: The New Science of Winning in Fashion by Lorrie Vogelgesang.
5. The Fashion Forecasting Manual: A Comprehensive Guide to Fashion Forecasting Techniques by Laurie Pressman.

22FT040 PRINCIPLES OF WEB DESIGN 3 0 0 3

Course Objectives

- To equip students with the knowledge and skills necessary to design effective and engaging websites for fashion businesses.
- To understand the latest trends and best practices in web design for the fashion industry.
- To develop critical thinking skills for evaluating website usability and user experience.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO12: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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Apply the key principles of web design in the context of the fashion industry.
2. Create user-friendly and visually appealing fashion websites.
3. Create websites for search engines and social media.
4. Analyze website traffic and make data-driven decisions.
5. Evaluate and defend their website design concepts.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO WEB DESIGN FOR FASHION

Fundamentals of web design-Importance of web design for fashion businesses-User experience (UX) and user interface (UI) design principles-Trends and best practices in web design for fashion-Case studies of successful fashion websites

UNIT II **9 Hours**

PLANNING AND CONTENT STRATEGY

Defining target audience and user personas-Setting website goals and objectives-Developing a website content strategy Information architecture and website navigation-Creating compelling visual content for fashion websites

UNIT III **9 Hours**

DESIGN AND DEVELOPMENT

Layout and composition principles-Typography and color theory Use of imagery and video-Responsive design and mobile optimization-Website accessibility guidelines-Introduction to web development tools (e.g., HTML, CSS)

UNIT IV **9 Hours**

E-C OMMERCE FUNCTIONALITY

Integrating e-commerce functionality into websites-Product pages and shopping cart design-Payment gateways and secure checkout process-Customer account management and order tracking-Marketing and analytics for e-commerce websites

UNIT V **9 Hours**

WEBSITE OPTIMIZATION AND MAINTENANCE

Search engine optimization (SEO) principles for fashion websites-Social media integration and marketing-Website analytics and performance tracking

Total: 45 Hours

Reference(s)

1. Web Design for the Real World by Lisa Lopuck and Luke Wroblewski.
2. Fashion Websites: Design and Usability by Envato Tuts+.
3. The Fashion Design Reference & Resource by Marian McEvoy.
4. E-commerce Marketing Strategy by Chris Goward.

22FT041 E COMMERCE IN FASHION 3 0 0 3

Course Objectives

- Apprise the students with the concepts of E-Commerce for solving problems in Fashion Industry.
- Understand the basic concepts of E-Commerce, its function and characteristics.
- To impart knowledge on E-Commerce and implementation in Fashion Industry.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess on the importance of E Commerce in Fashion Industry.
2. Analyze on the concept of web-based E Commerce for consumers.
3. Apply the strategy in electronic exchange of data.
4. Apply the security system in E Commerce for Fashion Industry.
5. Evaluate the issues of E Commerce in Fashion Business requirement.

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

UNIT I **9 Hours**

E-C OMMERCE AND ITS TECHNOLOGICAL ASPECTS

Overview of developments in Information Technology and Defining E-Commerce in Fashion: The scope of E commerce, Electronic Market, Electronic Data Interchange, Internet Commerce, Benefits and limitations of E-Commerce, Produce a generic framework for E-Commerce, Architectural framework of Electronic Commerce, Web based E Commerce Architecture for Fashion Industry. Ratio of E commerce in overall business.

UNIT II **9 Hours**

CONSUMER ORIENTED E COMMERCE

Fashion E-Retailing: Traditional retailing and e retailing, Benefits of e retailing, Key success factors, Models of Fashion e-retailing, Features of e-retailing. E-services: Categories of e-services, Web-enabled services, matchmaking services, Information-selling on the web, e-entertainment, Auctions and other specialized services. Business to Business Electronic Commerce. Highest impact of E commerce business.

UNIT III **9 Hours**

ELECTRONIC DATA INTERCHANGE

Benefits of EDI, EDI technology, EDI standards, EDI communications, EDI Implementation, EDI Agreements, EDI Security in Fashion Business. Electronic Payment Systems, Need of Electronic Payment System: Study and examine the use of Electronic Payment system and the protocols used, Study Electronic Fund Transfer and secure electronic transaction protocol for credit card payment. Digital economy: Identify the methods of payments on the net - Electronic Cash, cheques and credit cards on the Internet. Data Hacking methods.

UNIT IV **9 Hours**

SECURITY IN E COMMERCE FOR FASHION

Threats in Computer Systems in Fashion Industry: Virus, Cyber Crime Network Security: Encryption, Protecting Web server with a Firewall, Firewall and the Security Policy, Network Firewalls and Application Firewalls, Proxy Server

UNIT V **9 Hours**

ISSUES IN E COMMERCE FOR FASHION

Understanding Ethical, Social and Political issues in E-Commerce in Fashion: A model for Organizing the issues, Basic Ethical Concepts, Analyzing Ethical Dilemmas, Candidate Ethical principles Privacy and Information Rights: Information collected at E-Commerce Websites, The Concept of Privacy, Legal protections Intellectual Property Rights: Types of Intellectual Property protection, Governance in Fashion World.

Total: 45 Hours

Reference(s)

1. Elias. M. Awad, " Electronic Commerce", Prentice-Hall of India Pvt Ltd.
2. RaviKalakota, Andrew B. Whinston, "Electronic Commerce-A Manager"s guide", Addison-Wesley.
3. Efraim Turban, Jae Lee, David King, H. Michael Chung, "Electronic Commerce-A Managerial Perspective", Addison-Wesley.
4. Elias M Award, "Electronic Commerce from Vision to Fulfilment", 3rd Edition, PHI, Judy Strauss, Adel El-Ansary, Raymond Frost, "E-Marketing", 3rd Edition, Pearson Education.

22FT042 ERP FOR FASHION BUSINESS 3 0 0 3

Course Objectives

- Acquaint the students with the concepts of ERP for solving problems in Fashion Industry.
- Understand the basic concepts of ERP, its function and characteristics.
- To impart knowledge on enterprise resource planning and implementation in apparel business.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Course Outcomes (COs)

1. Analyse Enterprise resource planning in Fashion Business.
2. Apply the concept of data management in fashion business process.
3. Implement the strategy of ERP in social, security and safety aspects.
4. Apply the important features of ERP in Fashion Industry.
5. Analyze the information type and character in Fashion Business requirement.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION

Enterprise Resource Planning - principle, framework, application and suitability in garment production.

UNIT II **9 Hours**

DATA MANAGEMENT

Client/Server architecture; technology choices; SCM, CRM -concepts, Business Process Re - engineering, Data ware Housing, Data mining, ERP system packages.

UNIT III **9 Hours**

STRATEGY AND IMPLEMENTATION

ERP implementation strategies -organizational and social issues, data safety & security, ERP implementation in a garment production facility. Effect of ERP in different businesses.

UNIT IV **9 Hours**

APPLICATION IN APPAREL PRODUCTION

Time study, cutting, production tracking, cut panel process, garment quality control, order completion, machine repairs and maintenance, reports

UNIT V **9 Hours**

CHARACTERISATION OF INFORMATION

Information - requirements, properties and scope, information economics, types and characteristics.

Total: 45 Hours

Reference(s)

1. Sadagopan. S., "ERP-A Managerial Perspective", Tata McGraw-Hill, New Delhi, 2001.
2. Jose Antonio Hernandez, "The SAP R/3 Handbook", Tata McGraw-Hill, New Delhi, 2001.
3. Vinod Kumar Crag and Bharat Vakharia, "Enterprise Resource Planning Strategy", Jaico Publishing house, Mumbai, 1999.
4. Garg and Venkitakrishnan, "ERPWARE, ERP Implementation Framework", Prentice Hall of India, New Delhi, 1999.
5. Vinod Kumar Grag and Venkitakrishnan N.K., "Enterprise Resource Planning", Prentice Hall of India, New Delhi, 2001.

22FT043 INTRODUCTION TO AI APPLICATION 3 0 0 3

Course Objectives

- To impart knowledge on AI application in apparel production planning and Control.
- Acquire knowledge on the computer-controlled machineries in garment industry.
- Develop critical thinking skills to analyze the potential and limitations of AI in fashion.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Find the AI tools for the implementation in the Fashion industry.
2. Assess the AI tools to develop the new product development.
3. Create the Tools for collecting the customer experience.
4. Analyze the AI tools for the Fashion marketing and Merchandising.
5. Find the impacts of population and human activities on environment.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO ARTIFICIAL INTELLIGENCE IN THE FASHION INDUSTRY

Overview of artificial intelligence and its applications in the fashion industry. Historical background and evolution of AI in fashion. Impact of AI on various aspects of the fashion industry, such as design, production, marketing, and retail Current trends and developments in AI technologies relevant to fashion.

UNIT II **9 Hours**

AI-DRIVEN FASHION DESIGN AND PRODUCT DEVELOPMENT

AI-based design tools and platforms for creating innovative fashion designs. Virtual prototyping and 3D modeling using AI algorithms. Automated pattern generation and garment sizing using machine learning. AI-driven fabric and material selection for enhanced sustainability and performance. Application of AI in supply chain optimization and inventory management.

UNIT III **9 Hours**

AI-POWERED PERSONALIZATION AND CUSTOMER EXPERIENCE

AI algorithms for personalized recommendations and styling advice. Virtual try-on technologies and augmented reality in fashion retail. Natural language processing and chatbots for improved customer interactions. Sentiment analysis and social media monitoring for brand management.AI-driven virtual assistants and personal shoppers in the fashion industry

UNIT IV **9 Hours**

AI IN FASHION MARKETING AND SALES

Predictive analytics and data-driven decision-making in fashion marketing. Customer segmentation and targeting using AI algorithms. Image and video analysis for visual search and product recognition. Pricing optimization and dynamic pricing strategies with AI.AI-driven demand forecasting and inventory management for fashion retailers

UNIT V **9 Hours**

ETHICAL AND SOCIAL IMPLICATIONS OF AI IN FASHION

Ethical considerations and challenges in AI adoption within the fashion industry. Bias and fairness issues in AI algorithms and data collection. Sustainability and environmental impact of AI-driven fashion production. Intellectual property and copyright concerns in AI-generated designs. Future prospects and emerging trends in AI application for fashion

Total: 45 Hours

Reference(s)

1. Thomassey, S., & Huang, H. (2019). Artificial Intelligence for Fashion Industry in the Big Data Era. Springer.
2. Burke, S. (2002). Fashion Computing: Design Techniques and CAD. Fairchild Publications.
3. Luce, L. (2021). Artificial Intelligence in Fashion: A Primer. Independently published.
4. Rinaldi, F., Deserti, A., & Maffei, S. (2020). Fashion 4.0: From Traditional to Digital. Springer.
5. Grigsby, M. (2014). Fashion Retail Analytics: Forecasting and RFID-Driven Planning and Operations. Wiley.
6. Wang, L., & Tong, V. C. H. (2020). Artificial Intelligence in Fashion and Textiles: A Multidisciplinary Approach. CRC Press.

22FT044 IOT IN FASHION 3 0 0 3

Course Objectives

- Understand the core concepts of IoT and its relevance to the fashion industry.
- Identify key applications of IoT in fashion design, production, retail, and consumer experience.
- Analyze the potential benefits and challenges of implementing IoT in fashion.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: 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.

PO7: 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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Assess the landscape of IoT in fashion.
2. Find the ability to critically assess the potential and limitations of IoT applications in specific fashion contexts.
3. Design and present innovative ideas for integrating IoT technologies into fashion products and services.
4. Analyze the value proposition and impact of IoT in fashion to diverse audiences.
5. Analyze in teams to research, analyze, and propose creative solutions related to IoT and fashion.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO IOT AND FASHION

Overview of Internet of Things (IoT) technology-Exploring the emergence of IoT in fashion-Impact of IoT on consumer behavior and preferences-Case studies of existing IoT applications in fashion

UNIT II **9 Hours**

IOT IN FASHION DESIGN AND PRODUCTION

Smart textiles and materials with embedded sensors-Digital design tools and processes for wearable technology-Additive manufacturing and 3D printing in fashion-Supply chain optimization and transparency through IoT

UNIT III **9 Hours**

IOT IN RETAIL AND THE CONSUMER EXPERIENCE

Interactive retail spaces and personalized shopping experiences-Augmented reality and virtual reality applications in fashion-Data analytics and customer insights from connected garments-Wearable tech for health and fitness monitoring

UNIT IV **9 Hours**

ETHICAL AND SUSTAINABILITY CONSIDERATIONS

Privacy concerns and data security in IoT-enabled fashion Environmental impact of smart textiles and production processes-Ethical sourcing and responsible use of technology in fashion-Designing for circularity and end-of-life solutions

UNIT V **9 Hours**

FUTURE TRENDS AND INNOVATION

Emerging technologies and their potential impact on fashion Artificial intelligence and machine learning in fashion design and production-Personalization and customization through advanced IoT platforms-Exploring the ethical frontiers of wearable technology

Total: 45 Hours

Reference(s)

1. "Fashioning the Future: Design for the Digital Age" by Christine Steiner.
2. "Wearable Technology: A Primer" by Suzanne M. Burnstein.
3. The Internet of Things in Fashion" by Francesca Rosella.
4. "Fashion Reimagined: Design for a Sustainable Future" by Dilys Williams.

22FT0XA MOTIF (WOVEN) DEVELOPMENT FOR TRADITIONAL TEXTILES

1 0 0 1

Course Objectives

- To acquire skills in analyzing the basic textile design concepts for Traditional Textiles.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO7: 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.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO12: 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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Apply CAD tools to simulate different types of motifs with multiple colours.
2. Analyze the applications of traditional motifs in the field of Fashion.

Articulation Matrix

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

TRADITIONAL MOTIFS FOR FASHION **15 Hours**

Introduction to traditional Textiles – Woven Fabric Classification – Plain – Twill and its derivatives - dobby designs - jacquard designs - weave, peg plan, draft colour order and yarn type - colour and weave effect designs, stripe and check effect designs based on colour order and yarn type. Extra warp and extra weft design concepts - Two-in-One cloth design concept- Double cloth.

Total: 15 Hours

Reference(s)

1. Z. J. Grosicki, Watson, Advanced Textile Design: Compound Woven Structures, Butterworths London, 2004.
2. D. Goerner, Woven Structure and Design, Part I, WIRA, 1986.
3. D. Goerner, Woven Structure and Design, Part II, BTTG, 1989.
4. J. Hayavadana, Woven Fabric Structure Design Structure Design and Product Planning.

22FT0XB ADVANCED FASHION DIGITAL ILLUSTRATION 1 0 0 1

Course Objectives

- To master in advanced fashion digital illustration techniques by exploring its diverse applications.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO7: 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.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO12: 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.
PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories
PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Design fashion flats and technical drawings for garment construction in illustrations.
2. Develop digital prints and patterns for textiles and accessories.

Articulation Matrix

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

FASHION DIGITAL ILLUSTRATIONS 15 Hours

Introduction to digital illustration platforms and tools: Photoshop, procreate and touch pads. Understanding the concept of anatomy of fashion croquis, understanding the concept of light and shadows, colour mixing and colour overlay. Rendering: Basic principles of rendering, usage of customized brushes, layering, creating highlights. shadows and blending. Creating a digital illustration of the recent runway images in a personalized style. Designing fashion flats and technical drawings.

Total: 15 Hours

Reference(s)

1. Kevin Tallon, Digital Fashion Illustration: With Photoshop and Illustrator, Bats ford Ltd, 2008.
2. Loreto Streeter, Essential Fashion Illustration: Digital, Rockport Publishers, 2010.
3. https://www.skillshare.com/classes/Fashion-Illustration-Digital-Drawing-with-Attitude/1440060062?via=browse-rating-fashion-illustration-layout-grid.
4. https://textlnfo.wordpress.com/2011/11/03/fabric-and-garment-finishing-basic-washes-in-denim-fabric/.

22FT0XC PHOTOGRAPHY ESSENTIALS **1 0 0 1**

Course Objectives

- To understand camera technology for showcasing the fashion designs in terms of portfolio.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO7: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO12: 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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

1. Find the components of a camera and their functions by experimenting different perspectives.
2. Apply the principles of design and composition to create balanced and impactful fashion photographs.

Articulation Matrix

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

ESSENTIALS OF PHOTOGRAPHY **15 Hours**

Purpose of photograph – Illustrations, Visual aid, Research records, Research data. Different focal lenses – wide angle lens, telephoto lens, macro lens, standard lens. Camera – accessories. Specification requirements for the job subject – Sensor size, lighting level, aperture size, lens focal length, Shutter speed, Zoom capacity. Creating of portfolio for a specific theme by photo collage.

Total: 15 Hours

Reference(s)

1. Bruce Barnbaum, The Art of Photography: A Personal Approach to Artistic Expression, 3rd edition, Rocky nook, 2017.
2. David Bate, Photography: Key concepts, 2nd edition, Bloomsbury publishing, 2016.
3. Kindersley Dorling, The Beginner's Photography Guide, Dorling Kindersley ltd, 2016.
4. Mark Galer, Photography foundations for Art and design, 4rth edition, Focal press, 2007.
5. http://www.artofvisuals.com.
6. http://www.glamflame.net.

22FT0XD EXPLORING PRINTING TECHNIQUES FOR STARTUPS IN APPAREL INDUSTRY **1 0 0 1**

Course Objectives

- To learn the concept of printing used in different types of fabrics.
- To understand the different types of printing in varieties of fabrics used in apparel industry.
- To analyse the output or the aesthetic appearance of the finished garment with various styles and types of printing incorporated.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO7: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO12: 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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as member and leader; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

The students will be able to,

1. Create a garment with different styles of printing to have a good aesthetic appearance.
2. Evaluate the quality of the print equipping different types of printing in apparel industry.

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	2	1	-	-	2	2	2
2	2	2	2	2	2	-	2	1	2	-	-	1	2	2

EXPLORING PRINTING TECHNIQUES FOR STARTUPS IN APPAREL INDUSTRY **15 Hours**

Introduction of textile printing - Design Making - Screen Making - Exposing/Screen Processing - Introduction of Binders - Pigments & other Accessories. Printing: Single Color Printing - Double Color Printing - Tri Color Printing - Continue Printing - Reverse Printing - Four Color/ CMYK Printing - Emboss/ Puff Printing - Kadhi/ White Printing - Gold Printing - Glitter Printing - Pearl Printing - Foil Printing - Rubber Printing (For T-Shirt Printing).

Total: 15 Hours

Reference(s)

1. Leslie W C Miles, Textile Printing, Society of dyers and Colourists, 1994.
2. H. Ujiie, Digital printing of textiles, Woodhead Publishing Limited, 2006.
3. Joanna Kinnersly Taylor, Dyeing and Screen Printing, A&C Black Publishers, 2012.

22FT0XE CERTIFICATION FOR PRODUCT AND PROCESS IN THE APPAREL INDUSTRY 1 0 0 1

Course Objectives

- To learn the concept of certification.
- To understand the importance of certification in apparel industry.
- To analyse the output of industrial process based on the products used.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO12: 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.

PSO1: Understand and incorporate: Interpret trends, decipher fashion movements, apply the knowledge of elements of design and Gestalt theory of visual perception; and incorporate sustainable decisions into their design artworks, fashion products and accessories

PSO2: Articulate, collaborate and solve: Articulate design aesthetics, communicate product values, collaborate across disciplines as members and leaders; and envision solutions in fashion systems: design, technology, production and management.

Course Outcomes (COs)

The students will be able to,

1. Evaluate the benefits of using certified materials in the apparel industry.
2. Assess product and process planning with respect to different levels of apparel industry.
3. Analyze the quality of the output produced by using the certified raw materials in apparel industry.

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	2	1
2	2	2	2	-	2	-	-	-	2	-	-	1	2	2
3	2	2	2	-	2	-	-	-	2	-	-	1	1	2

CERTIFICATION FOR PRODUCT AND PROCESS IN THE APPAREL INDUSTRY **15 Hours**

Sustainable Apparel Coalition (SAC) - apparel, textile - manufacturers around the world. SAC - manufacturing ecosystem - environmental damage - positive impact on the communities and people - Higg index. Better Cotton Initiative (BCI) Certification - Bluesign - sustainable processing and manufacturing to fashion brands and industries - Bluesign label - Cradle to Cradle (C2C) Certification - Forward-looking designers, fashion brands, retailers, and manufacturers across the supply value chain - ECOCERT Certification: business entity as eco-friendly - organic textile certification - OEKO-TEX - sustainable purchasing decisions - Leather Standard certificates for leather and textile products. Global Organic Textile Standard (GOTS) - textile processing for organic fibers - standards include criteria on ecological and social factors - United States Department of Agriculture (USDA) Organic Certification - Worldwide Responsible Accredited Production (WRAP) - Supply chains for the apparel, footwear, and sewn products sector.

Total: 15 Hours

Reference(s)

1. Subramanian Senthil Kannan Muthu, Roadmap to Sustainable Textiles and Clothing, Springer Nature Singapore, 2014.
2. Sonia A. Rosen, Maureen Jaffe, Jorge Perez-Lopez, The Apparel Industry and Codes of Conduct, Diane publishing company, 1997.
3. Subramanian Senthil Kannan Muthu, Handbook of Sustainable Apparel Production, CRC Press Limited, 2015.

22OCE01 ENERGY CONSERVATION AND MANAGEMENT 3 0 0 3

Course Objectives

- To develop an understanding and analyze the energy data of industries.
- To carryout energy accounting and balancing.
- To conduct energy audit and suggest methodologies for energy savings.
- To utilize the available resources in optimal ways.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12:Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Analyzing characterize the various energy utilization techniques.
2. Apply suitable technique to provide an energy efficient system.
3. Find the need for thermal systems with latest technologies.
4. Apply suitable techniques doe conserving energy with respect to emerging trends.
5. Assess the impact economics on the conservation of energy.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION

Energy - Power – Past & Present scenario of World; National Energy consumption Data – Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.

UNIT II **9 Hours**

ELECTRICAL SYSTEMS

Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors - Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination.

UNIT III **9 Hours**

THERMAL SYSTEMS

Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and Encon measures. Steam: Distribution &U sage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories

UNIT IV **9 Hours**

ENERGY CONSERVATION IN MAJOR UTILITIES

Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets

UNIT V **9 Hours**

ECONIMICS

Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept .

Total: 45 Hours

Reference(s)

1. Energy Manager Training Manual (4 Volumes) available at www.energymanager training.com,a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.
2. Witte. L.C., P.S. Schmidt, D.R. Brown, “Industrial Energy Management and Utilization” Hemisphere Publishing, Washington, 1988.
3. Callaghn, P.W. “Design and Management for Energy Conservation”, Pergamon Press, Oxford, 1981.
4. Dryden. I.G.C., “The Efficient Use of Energy” Butterworths, London, 1982.
5. Turner. W.C., “Energy Management Hand book”, Wiley, New York, 1982.
6. Murphy. W.R. and G. Mc KAY, “Energy Management”, Butterworths, London 1987.

22OCS01 OBJECT ORIENTED PROGRAMMING 3 0 0 3

Course Objectives

- Understand the concepts of Object-Oriented Programming.
- Study the concepts of objects and classes.
- Familiarize in the types of constructors.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Find the characteristics and data types of C++ language.
2. Create programs using objects and classes for real world applications.
3. Create programs to implement operator overloading and inheritance techniques.
4. Apply Polymorphism and File streams concepts to develop C++ program.
5. Design applications using templates and apply exception handling mechanisms.

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

UNIT I **8 Hours**

INTRODUCTION

Need for object-oriented programming - Procedural Languages vs. Object oriented approach - Characteristics Object oriented programming - C++ Programming Basics: Basic Program Construction - Output Using cout - Input with cin - Data types- Variables and Constants – Operators - Control Statements-Manipulators - Type conversion. Function Prototyping- call by reference, return by reference- Inline function- Default arguments - Function overloading.(sona)

UNIT II **8 Hours**

OBJECTS AND CLASSES

Objects and Classes Simple Class - C++ Objects as Physical Objects - C++ Object as Data types-CONSTRUCTORS: Parameterized Constructors - Multiple Constructors in a Class - Constructors with Default Arguments - Dynamic Initialization of Objects - Copy and Dynamic Constructors - Destructors(PSG) - Structures and Classes - Arrays and Strings

UNIT III **9 Hours**

OPERATOR OVERLOADING AND INHERITANCE

Operator Overloading and Inheritance Need of operator overloading- Overloading Unary Operators-Overloading binary Operators - Overloading Special Operators - Data Conversion Inheritance: Derived Class and Base Class - Derived Class Constructors-Overriding Member Functions-Class Hierarchies- Public and Private Inheritance-Levels of Inheritance-Multiple Inheritance.

UNIT IV **10 Hours**

POLYMORPHISM AND FILE STREAMS

Polymorphism and File Streams Virtual Function - Friend Function - Static Function-Assignment and Copy Initialization- Memory Management: new and delete Pointers to Objects, this Pointer-Streams - String I/O - Character I/O - Object I/O - I/O with Multiple Objects - File Pointers - Disk I/O with Member Functions- Error Handling in File I/O.

UNIT V **10 Hours**

TEMPLATES AND EXCEPTION HANDLING

Templates: Introduction - Function Templates - Overloading Function Templates-, user defined template arguments(sona) - Class Templates - Exception Handling - Syntax, multiple exceptions, exceptions with arguments.

Total: 45 Hours

Reference(s)

1. Deitel & Deitel, C++ How to program, Prentice Hall, 2005.
2. Robert Lafore, Object Oriented Programming in-C++, Galgotia Publication.
3. D.S.Malik, C++ Programming, Thomson, 2007.
4. K.R. Venugopal, Rajkumar and T.Ravishankar, Mastering C++, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2006.
5. E.Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill Publishing.

22OCS02 JAVA FUNDAMENTALS 3 0 0 3

Course Objectives

- Implement applications based on core Java Concepts with examples.
- Construct application using inheritance, packages and exception handling for real time problems.
- Integrate the Java I/O concepts to handle input and output operations.
- Develop programs to perform string manipulation in java.
- Design GUI with Java for event handling and database applications.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Demonstrate applications based on core Java Concepts with examples.
2. Analyze application using inheritance, packages and exception handling for real time problem.
3. Assess the Java I/O concepts to handle input and output operations.
4. Create programs to perform string manipulation in Java.
5. Design GUI with Java for event handling and database applications.

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	2	-	2	-	-	-	-	-	-	-	-	-
3	3	3	3	-	3	-	-	-	-	-	-	-	-	-
4	2	2	2	-	2	-	-	-	-	-	-	-	-	-
5	2	2	2	-	2	-	-	-	-	-	-	-	-	-

UNIT I **9 Hours**
BASICS OF JAVA

The Genesis of Java - Overview of Java - Data Types, Variables, and Arrays - Operators – Control Statements - Introducing Classes - Methods and Classes.

UNIT II **9 Hours**

INHERITANCE, PACKAGES AND EXCEPTIONS

Inheritance: Basics - Using Super - Creating a Multilevel Hierarchy - Method overriding - Using Abstract Classes - Packages and Interfaces: Packages - Access Protection - Importing Packages- Interfaces Definitions and Implementations - Exception Handling: Types - Try and Catch - Throw.

UNIT III **9 Hours**

EXPLORING JAVA I/O

I/O Basics - Reading Console Input -Writing Console output - Native Methods - I/ O Classes and Interfaces - File - The Byte Streams - The Character Streams - Using Stream I/ O - Serialization.

UNIT IV **9 Hours**

JAVA STRINGS

String Handling: Special String operations and Methods - String Buffer - Exploring java.lang: Simple type Wrappers - System - Math - Collections Framework: Collections Interfaces and Classes – Utility Classes: String Tokenizer - Date and Time.

UNIT V **9 Hours**

GUI WITH JAVA

Applet Basics - Applet Architecture - Applet Display Methods - Parameter Passing - Event Handling Mechanisms - Event Classes - Event Listener - Working with Windows, Graphics, Colors and Fonts - AWT Controls - Layout Managers and Menus – JDBC

Total: 45 Hours

Reference(s)

1. Herbert Schildt, Java 2-Complete Reference, Tata Mc Graw Hill, 2015.
2. Deitel & Deitel, Java How to Program, Prentice Hall of India, 2010.
3. Gary Cornell and Cay S.Horstmann, Core Java Vol.1 and Vol.2, Sun Microsystems Press, 2008.

22OCS03 KNOWLEDGE DISCOVERY IN DATABASES 3 0 0 3

Course Objectives

- Introduce the basic concepts of data warehousing.
- Impart knowledge about the data mining functionalities.
- Assess the strengths and weaknesses of association mining and cluster analysis.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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. Assess the concepts of Data Warehousing architecture and business analysis process.
2. Assess the process of Data Mining and preprocessing techniques for data cleansing.
3. Apply the association rules for mining the various kinds of data.
4. Analyze Classification and Clustering algorithms for various problems with high dimensional data.
5. Analyze the various data mining techniques on complex data objects.

Articulation Matrix

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

UNIT I **9 Hours**

DATA WAREHOUSING AND BUSINESS ANALYSIS

Data warehousing Components -Building a Data warehouse -Data Warehouse and DBMS-Metadata-Multidimensional data model - Data Extraction, Cleanup and Transformation Tools - Reporting, Query tools and Applications - OLAP vs OLTP - OLAP operations - Data Warehouse Schemas: Stars, Snowflakes and Fact constellations.

UNIT II **8 Hours**

INTRODUCTION TO DATA MINING

Introduction - Steps in knowledge discovery from databases process - Architecture of a Typical Data Mining Systems - Data Mining Functionalities - Classification of Data Mining Systems - Data mining on different kinds of data - Different kinds of pattern - Task Primitives - Integration of a Data Mining System with a Data Warehouse - Major issues in Data mining.

UNIT III **9 Hours**

ASSOCIATION RULE MINING

Market Basket Analysis- Frequent Item Set Mining methods: Apriori algorithm - Generating Association Rules - A Pattern Growth Approach- Pattern mining in multilevel and multidimensional space - Mining Various Kinds Of Association Rules - Association Analysis to Correlation Analysis - Constraint Based Association Mining.

UNIT IV **9 Hours**

CLASSIFICATION AND CLUSTERING

Decision Tree Induction - Bayesian Classification - Rule Based Classification - Classification by Back propagation - Support Vector Machines - Clustering: Types of data - Partitioning methods: k-means, k- medoid - Hierarchical Methods: distance based agglomerative and divisible clustering, BIRCH – Density Based Method: DBSCAN - Grid Based Method: STING.

UNIT V **10 Hours**

DATA MINING APPLICATIONS

Mining complex data objects - Text Mining - Graph mining - Web mining - Spatial Data mining -Application and trends in data mining - Social impacts of Data mining.

Total: 45 Hours

Reference(s)

1. Jiawei Han, Micheline Kamber and Jian Pai , Data Mining: Concepts and Techniques, Morgan Kauffman, 3rd Edition, 2013.
2. Alex Berson and Stephen J Smith, Data Warehousing, Data Mining, and OLAP, Tata McGraw Hill, 1997.
3. David Hand, Heikki Manila, Padhraic Symth, Principles of Data Mining, MIT Press, 2001.
4. Margaret H.Dunham, Data Mining: Introductory and Advanced Topics, Pearson Education 2003.

22OCS04 E-LEARNING TECHNIQUES 3 0 0 3

Course Objectives

- Understand the technologies involved in e-learning.
- Gain the fundamentals of e-learning techniques.
- Determine the characteristics of Teaching-Learning Process.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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. Assess knowledge about the basic concepts of e-learning.
2. Analyze the technology mediated communication in e-learning.
3. Assess of e-learning and content the process management.
4. Analyze the teaching and learning processes in e-learning environment.
5. Assess the various applications of e-learning.

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	3	-	-	-	-	-	-	-	-	-	-	-
4	2	2	2	-	-	-	-	-	-	-	-	-	-	-
5	2	2	2	-	-	-	-	-	-	-	-	-	-	-

UNIT I **9 Hours**

INTRODUCTION

Evolution of Education - Generations of Distance Educational Technology - Role of E-Learning - Components of e-learning: CBT, WBT, Virtual Classroom - Barriers to e-Learning Roles and Responsibilities: Subject Matter Expert - Instructional Designer - Graphic Designer - Multimedia Author - Programmer - System Administrator - Web Master

UNIT II **9 Hours**

TECHNOLOGIES

Satellite Broadcasting - Interactive Television - Call Centers - Whiteboard Environment - Teleconferencing: Audio Conferencing - Video Conferencing -Computer Conferencing. Internet: E- mail, Instant Messaging, Chat, Discussion Forums, Bulletin Boards, Voice Mail, File Sharing, Streaming Audio and Video.

UNIT III **9 Hours**

MANAGEMENT

Content: E-Content, Dynamic Content, Trends - Technology: Authoring, Delivery, Collaboration - Services: Expert Service, Information Search Service, Knowledge Creation Service - Learning Objects and E-Learning Standards. Process of E-Learning: Knowledge acquisition and creation, Sharing of knowledge, Utilization of knowledge - Knowledge Management in E-Learning.

UNIT IV **9 Hours**

TEACHING-LEARNING PROCESS

Interactions: Teacher-Student - Student-Student - Student-Content - Teacher- Content - Teacher-Teacher - Content-Content Role of Teachers in E-Learning - Blended Learning -Cooperative Learning - Collaborative Learning - Multi Channel learning -Virtual University - Virtual Library.

UNIT V **9 Hours**

APPLICATIONS

Customer service training - Sales training - Customer training - Safety training - IT training – Product training - Healthcare training.

Total: 45 Hours

Reference(s)

1. E-Learning: An Expression of the Knowledge Economy, Gaurav Chadha, S.M. Nafay Kumail, Tata McGraw-Hill Publication, 2002.
2. E-Learning: New Trends and Innovations, P.P. Singh, Sandhir Sharma, Deep & Deep Publications, 2005.
3. E-Learning: Concepts, Trends and Applications, Epignosis LLC, LLC publications, 2014.
4. Michael Allen's Guide to E-Learning, Michael W. Allen, Michael Allen, Wiley Publication, 2002.

22OCS05 SOCIAL TEXT AND MEDIA ANALYTICS

3 0 0 3

Course Objectives

- Understand the basic ideas of Text mining.
- Analyze the methods and approaches used in analytics.
- Gain knowledge on various types of analytics like web, social network, and social media.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Demonstrate the concepts and applications of text mining.
2. Apply Content analysis and Sentiment analysis.
3. Apply web analytics with a suitable model.
4. Apply social network analytics with suitable example.
5. Apply social media analytics with suitable example.

Articulation Matrix

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

UNIT I **7 Hours**
TEXT MINING

Introduction, Core text mining operations, Preprocessing techniques, Categorization, Clustering, Information extraction, Probabilistic models for information extraction, Text mining applications.

UNIT II **9 Hours**

METHODS

Content Analysis-Natural Language Processing-Clustering & Topic Detection-Simple Predictive Modeling-Sentiment Analysis; Sentiment Prediction.

UNIT III **9 Hours**

WEB ANALYTICS

Web analytics tools-Clickstream analysis-A/B testing, online surveys-Web search and retrieval-Search engine optimization-Web crawling and Indexing-Ranking algorithms-Web traffic models.

UNIT IV **10 Hours**

SOCIAL NETWORK ANALYTICS

Social contexts: Affiliation and identity - Social network analysis - Social network and web data and methods. Graphs and Matrices - Basic measures for individuals and networks

UNIT V **10 Hours**

SOCIAL MEDIA ANALYTICS

Information visualization - Making connections: Link analysis - Random graphs and network evolution.

Total: 45 Hours

Reference(s)

1. Ronen Feldman and James Sanger, The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data, Cambridge University Press, 2006.
2. Hansen, Derek, Ben Sheiderman, Marc Smith. Analyzing Social Media Networks with Node XL: Insights from a Connected World, Morgan Kaufmann, 2011.
3. Avinash Kaushik. Web Analytics 2.0: The Art of Online Accountability, 2009.
4. Hanneman, Robert and Mark Riddle. Introduction to Social Network Method, 2005.
5. Wasserman, S. & Faust, K. Social network analysis: Methods and applications. New York: Cambridge University Press, 1994.
6. Monge, P. R. & Contractor, N. S. Theories of communication networks. New York: Oxford University, 2003.

22OEI01 PROGRAMMABLE LOGIC CONTROLLERS 3 0 0 3

Course Objectives

- To impart knowledge about automation and architecture of PLC.
- To understand the PLC programming using timers, counters and advanced PLC functions.
- To familiarize the student with PLC based applications.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO7: 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 fundamental Concepts of Automation.
2. Analyze the architecture, interfacing and communication techniques of PLC.
3. Execute the suitable PLC Programming languages.
4. Analyze the various functions and instruction sets of PLC.
5. Generate a suitable logical programming for given applications.

Articulation Matrix

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

UNIT I **10 Hours**

INTRODUCTION TO AUTOMATION

Evolution of automation -Types of automation - Fixed, flexible and programmable automation - Batch process and continuous process - open loop system and closed loop system - Function of sensors - Proximity sensors: Capacitive and Inductive - Infrared and Laser Push-buttons and toggle switches - Actuators: Solenoid valve - servo motor - electromagnetic relays.

UNIT II **9 Hours**

ARCHITECTURE OF PLC

Components of PLC - sink and source I/O cards - Processor - Memory: Types of memory, Input and Output modules: Discrete, Analog -Scan time of PLC -Interfacing computer and PLC: RS232, RS485, Ethernet - Selection criteria for PLC.

UNIT III **8 Hours**

PLC PROGRAMMING

Programming languages - Ladder logic components: User and bit Instructions, branch instructions, internal relay instruction Boolean logic using ladder logic programming, Latching -Timers: On Delay timer, OFF Delay timer and Retentive timer - Counters: Up Counter and Down Counter.

UNIT IV **10 Hours**

ADVANCED PLC FUNCTONS

Instructions in PLC: Program Control Instructions, Math Instructions, Data Manipulation Instructions: Data compare operations, Data transfer operations - Sequencer and Shift register instructions- Analog Instructions: PID Controller - Scaling Instructions.

UNIT V **8 Hours**

APPLICATIONS OF PLC

Case Studies: Bottle filling system - Pick and place robot - Car Parking - Traffic light control (4 ways with pedestrian signal) -Elevators - Pneumatic stamping system - alarm annunciator system.

Total: 45 Hours

Reference(s)

1. F.D. Petruzella, Programmable Logic Controllers, Tata Mc-Graw Hill, Third edition, 2015.
2. Benjamin C Kuo, Automatic Control Systems, Prentice Hall of India, New Delhi, 2014.
3. John Park, Steve Mackay, Edwin Wright, Practical data communications for instrumentation and control, Newnes, Elsevier, 2015.
4. K. L.S. Sharma, Overview of Industrial Process Automation, Elsevier, 2014.
5. John W Webb and Ronald A Resis, Programmable Logic Controller, Prentice Hall of India Pvt. Ltd., New Delhi, 2013.

22OEI02 SENSOR TECHNOLOGY 3 0 0 3

Course Objectives

- To impart knowledge about various sensors in multidisciplinary engineering domain.
- To familiarize students with different applications and its material handling technology.
- To understand the concept of sensing circuits and its static and dynamic characteristics.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Assess the static and dynamic characteristics of measuring instruments.
2. Compare the characteristics and working principles of Resistance, Inductance and Capacitance type sensors.
3. Construct the interfacing and signal conditioning circuit for measurement system using different types of sensors.
4. Analyze and select the suitable sensor for different industrial applications.
5. Assess the modern technologies and smart materials to design various sensors.

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

UNIT I **8 Hours**

SENSORS FUNDAMENTALS AND CHARACTERISTICS

Sensors: Principles of Sensing - Sensor Classification and terminology- Units of Measurements - Measurands- Sensor Characteristics: Static and Dynamic.

UNIT II **8 Hours**

PHYSICAL PRINCIPLES OF SENSING

Electric Charges, Fields, and Potentials; Capacitance; Magnetism; Induction; Resistance; Piezoelectric Effect; Hall Effect; Temperature and Thermal Properties of Material; Heat Transfer; Light; Dynamic Models of Sensor Elements.

UNIT III **9 Hours**

INTERFACE ELECTRONIC CIRCUITS

Input Characteristics of Interface Circuits, Amplifiers, Excitation Circuits, Analog to Digital Converters, Direct Digitization and Processing, Bridge Circuits, Data Transmission, Batteries for Low Power Sensors.

UNIT IV **10 Hours**

SENSORS IN DIFFERENT APPLICATION AREA

Occupancy and Motion Detectors; Position, Displacement, and Level; Velocity and Acceleration; Force, Strain, and Tactile Sensors; Pressure Sensors, Temperature Sensors.

UNIT V **10 Hours**

SENSOR MATERIALS AND TECHNOLOGIES

Materials, Surface Processing- MEMS microsystem components- Microfluidics microsystem components - Nano Technology- Smart Materials.

Total: 45 Hours

Reference(s)

1. J. Fraden, Handbook of Modern Sensors: Physical, Designs, and Applications, AIP Press, Springer, 2016.
2. D. Patranabis, Sensors and Transducers, 2nd Edition, Prentice Hall India Pvt. Ltd, New Delhi, 2009.
3. Guozhen Shen, Zhiyong Fan, "Flexible Electronics: From Materials to Devices", 1st Edition, World Scientific Publishing Co, Singapore, 2015.
4. Horowitz, P., and W. Hill. The Art of Electronics. 2nd ed. Cambridge University Press, 1989.

22OEI03 FUNDAMENTALS OF VIRTUAL INSTRUMENTATION 3 0 0 3

Course Objectives

- Understand the basic components of Virtual Instrumentation system.
- Learn the developing VIs based on Lab VIEW software.
- To learn to develop applications based on Virtual Instrumentation system.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO10: 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.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Assess the concepts of traditional instruments and virtual instruments.
2. Conclude the overview of modular programming and the structuring concepts in VI programming.
3. Apply the procedure to install DAQ in various OS and its interfacing methods.
4. Implement the VI toolsets for specific applications.
5. Generate the applications using Virtual Instrumentation software.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION

Virtual Instrumentation: Historical perspective - advantages - block diagram and architecture of a virtual instrument - Conventional Instruments versus Traditional Instruments - data-flow techniques, graphical programming in data flow, comparison with conventional programming.

UNIT II **9 Hours**

VI PROGRAMMING TECHNIQUES

VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, State machine, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

UNIT III **9 Hours**

DATA ACQUISITION

Introduction to data acquisition on PC, Sampling fundamentals, Input/output techniques and buses. Latest ADCs, DACs, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements - Issues involved in selection of Data acquisition cards - Data acquisition cards with serial communication - VI Chassis requirements. SCSI, PCI, PXI system controllers, Ethernet control of PXI. Networking basics for office & Industrial applications, VISA and IVI.

UNIT IV **9 Hours**

VI TOOLSETS

Use of Analysis tools, Fourier transforms, power spectrum, correlation methods, windowing and filtering. Application of VI in process control designing of equipment‟s like oscilloscope, Digital multimeter, Design of digital Voltmeters with transducer input Virtual Laboratory, Web based Laboratory.

UNIT V **9 Hours**

APPLICATIONS

Distributed I/O modules- Application of Virtual Instrumentation: Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control. Development of Virtual Instrument using GUI, Real-time systems, Embedded Controller, OPC, HMI / SCADA software, Active X programming.

Total: 45 Hours

Reference(s)

1. Lisa K. wells & Jeffrey Travis, LabVIEW for everyone, Prentice Hall, New Jersey, 1997.
2. Gary Johnson, LabVIEW Graphical Programming, Second edition, McGraw Hill, Newyork, 1997.
3. Kevin James, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Newness, 2000.

22OEI04 OPTOELECTRONICS AND LASER INSTRUMENTATION 3 0 0 3

Course Objectives

- To enhance the student knowledge in fiber optics fundamentals and fabrication.
- To be recognized with industrial applications of fibers.
- To understand the fundamental concepts about lasers.
- To identify and describe various fiber optic imaging and optoelectronic sensor applications.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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. Find the properties of optical fibers, their light sources and detectors.
2. Implement the fiber-optic sensor for the measurement of various physical quantities.
3. Conclude the fundamentals of laser, types of lasers and its working.
4. Analyze the applications of laser for industrial applications.
5. Differentiate the use of laser instruments for various medical applications.

Articulation Matrix

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

UNIT I **9 Hours**

OPTICAL FIBERS AND THEIR PROPERTIES

Introduction to optical fibers - Light guidance - Numerical aperture - Dispersion - Different types of fibers and their properties - Light Sources for fiber optics, Photo detectors, source coupling, splicing and connectors.

UNIT II **9 Hours**

INDUSTRIAL APPLICATION OF OPTICAL FIBERS

Fiber optics instrumentation system - optical fiber sensors, Measurement of pressure, temperature, current, voltage and liquid level - fiber optic communication set up - different types of modulators - detectors.

UNIT III **9 Hours**

LASER FUNDAMENTALS

Fundamental characteristics of lasers: laser rate equation - three level system - four level system - properties of laser beams - laser modes - resonator configuration - Q- switching and mode locking - cavity dumping - types of lasers: gas lasers, solid state lasers, liquid lasers and semiconductor lasers.

UNIT IV **9 Hours**

INDUSTRIAL APPLICATION OF LASERS

Lasers for measurement of distance and length, velocity, acceleration, atmospheric effects, sonic boom, pollutants - material processing: laser heating, melting, welding and trimming of materials - removal and vaporization - calculation of power requirements of laser for material processing.

UNIT V **9 Hours**

HOLOGRAM AND MEDICAL APPLICATIONS

Holography: basic principle, methods - holographic interferometry and application, holography for non-destructive - medical applications of lasers, laser and tissue interactive - laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynecology and oncology.

Total: 45 Hours

Reference(s)

1. John M. Senior, Optical Fiber Communications - Principles and Practice, Prentice Hall of India, 2010.
2. John F. Ready, Industrial Applications of Lasers, Academic Press, 2012.
3. Gerd Keiser, Optical Fiber Communication, Mc Graw Hill, New York, 2013.
4. S.C. Gupta, Textbook on Fiber Optics Communications and its application, Prentice Hall of India, 2012.
5. John Wilson and J.F.B. Hawkes, Introduction to Optoelectronics, Prentice Hall of India, 2011.
6. R. P. Khare, Fiber Optics and Optoelectronics, Oxford University Press, 2011.

22OME01 DIGITAL MANUFACTURING 3 0 0 3

Course Objectives

- To understand the process of generating 3D Computer Aided Design (CAD) model by different method.
- To explain the constructional features and develop simple program for CNC lathe and Milling machines.
- To provide an exhaustive knowledge on various generic process and benefits of Additive Manufacturing.
- To familiarize about materials and process parameters of liquid and solid based AM techniques.
- To educate powder-based methodology and emerging trends with case studies, applications of AM techniques.

Programme Outcomes (POs)

PO1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO5: 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.
PSO1: Design, analyse and evaluate the performance of mechanical systems.
PSO2: Choose the appropriate methodology, materials, tools and machinery to manufacture quality products at economical cost.

Course Outcomes (COs)

1. Design a 3D model from the 2D data.
2. Develop a CNC program for simple components.
3. Generate STL file and manipulate parameters of AM machine
4. Select appropriate liquid or solid materials-based AM process to the respective application
5. Select appropriate process to fabricate a functional/prototype for aerospace, automotive, electronics, manufacturing and medical applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	-	2	-	-	-	-	-	-	-	1	2	-
2	2	2	2	-	2	-	-	-	-	-	-	-	1	2	-
3	2	2	2	-	2	-	-	-	-	-	-	-	1	2	-
4	2	2	2	-	2	-	-	-	-	-	-	-	1	3	-
5	2	2	2	-	2	-	-	-	-	-	-	-	1	2	-

UNIT I **9 Hours**

CAD MODELING

Introduction - Design process - Stages. CAD - Input and Output devices, Modeling methods - Wire frame modelling, Surface modelling, Solid modelling - Constructive Solid Geometry and Boundary Representation Techniques. CAD/CAM data exchange - IGES, STEP. Product Life cycle management (PLM).

UNIT II **10 Hours**

AUTOMATION AND CNC MACHINES

Introduction to Automation - Definition, types, reasons for automating. CNC Machines - Principles, types, features, advantages, applications. CNC Machine structure - Linear motion bearings, Recirculating ball bearings, drive system, and control system. CNC Lathe and Milling programming - Linear and circular interpolation, threading and drilling programs.

UNIT III **7 Hours**

ADDITIVE MANUFACTURING

Introduction - Impact of Additive Manufacturing (AM) and Tooling on Product Development - Distinction between AM and CNC Machining - The Generalized AM Process chain - CAD Model - Input file formats - Generation and Conversion of STL file - File Verification and Repair - Build File Creation - Part Construction - Part Cleaning and finishing - AM Benefits - Classification of AM process

UNIT IV **8 Hours**

LIQUID AND SOLID MATERIAL BASED SYSTEMS

Stereo lithography Apparatus (SLA), Digital Light Processing (DLP), Fused Deposition Modelling (FDM) and Laminated Object Manufacturing (LOM) - Working Principle, Construction, Process, Materials and Applications

UNIT V **11 Hours**

POWDER BASED PROCESSES AND APPLICATIONS OF ADDITIVE MANUFACTURING

Selective Laser Sintering (SLS), Color Jet Printing (CJP), Electron Beam Melting (EBM) and Laser Engineered Net Shaping (LENS) - Working Principle, Construction, Process Variables, Materials and Applications. Reverse Engineering using 3D scanner. Application of Additive Manufacturing in Medical field, Manufacturing, Automotive industries, Aerospace and Electronics and Retail industries.

Total: 45 Hours

Reference(s)

1. Ibrahim Zeid, R.Sivasubramania, CAD/CAM Theory and Practice, Tata McGraw Hill, 2010.
2. M. Aditan, B.S. Pabala, CNC Machines, New age International, 2012.
3. C. K. Chua, K. F. Leong and C. S. Lim, Rapid prototyping: Principles and applications, Cambridge University Press, 2010.
4. D. T.Pham, S. S.Dimov, Rapid manufacturing, Springer-Verlag, London, 2001.
5. I. Gibson, D. W. Rosen, and B. Stucker, Additive Manufacturing Technologies 3D Printing, Rapid Prototyping and Direct Digital Manufacturing, Springer, 2015 http://www.springer.com/978-1-4939-2112-6.
6. www.grabcad.com, www.all3dp.com.

22OME02 INDUSTRIAL PROCESS ENGINEERING 3 0 0 3

Course Objectives

- To impart the knowledge on production planning methodologies and layout design
- To learn about production planning and its control methods
- To provide the knowledge of work study, process charts and ergonomic condition
- To impart the knowledge on inventory control and material handling
- To learn about system analysis and different types of maintenance processes

Programme Outcomes (POs)

PO1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO5: 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.

PO11: 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.

PSO2: Choose the appropriate methodology, materials, tools and machinery to manufacture quality products at economical cost.

Course Outcomes (COs)

1. Select proper plant layout for the required production system.
2. Plan the resources required for the production and to perform the control methods.
3. Apply work study method, prepare charts to outline the process and develop ergonomic condition suitable for the processes.
4. Analyze the inventory required based on production needs and material handling.
5. Assess system analysis and use different types of maintenance process for smooth operations.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	1	-	1	-	-	-	-	-	-	-	-	2	-
2	3	3	1	-	2	-	-	-	-	-	2	-	-	2	-
3	1	3	3	-	2	-	-	-	-	-	-	-	-	2	-
4	2	3	1	-	2	-	-	-	-	-	-	-	-	2	-
5	2	3	1	-	2	-	-	-	-	-	-	-	-	2	-

UNIT I **9 Hours**

INDUSTRIAL ENGINEERING AND PRODUCTION SYSTEM

Industrial engineering - Concept, History and development, Applications, Roles of Industrial engineer- Production management, Industrial engineering versus production management, operations management. Plant layout, Criteria for good layout, Types of layouts - Process layout, Product layout, Combination layout and fixed position layout, Flow (material movement) pattern, Workstation Selection and design.

UNIT II **10 Hours**

PROCESS PLANNING AND PRODUCTION CONTROL

Introduction to Process planning-Definition, Procedure, Process selection, Machine capacity, Process sheet. Process analysis - Group technology, classification and coding system, formation of component family - Production planning, loading, scheduling. Production control -dispatching, routing - Progress control bar, curve, Gantt chart, route and schedule chart.

UNIT III **8 Hours**

WORK STUDY AND ERGONOMICS

Work study - Definition, Need, Advantages, objectives of method study and work measurement, method study procedure, Process chart - symbols, outline process chart, flow process chart, principles of motion economy, ergonomics- applications of ergonomic principles in the shop floor- work benches-seating arrangement, Industrial physiology.

UNIT IV **10 Hours**

INVENTORY MANAGEMENT

Inventory control, classification, management, objectives, functions. Economic order quantity, Economic batch quantity, inventory models, ABC analysis, Material Requirement Planning(MRPI), Manufacturing Resource Planning (MRPII), Operating cycle, lean manufacturing, Supply chain management - Material handling.

UNIT V **8 Hours**

SYSTEM ANALYSIS AND MAINTENANCE

System concept - system analysis, systems engineering, value engineering, value control, types of values. Plant maintenance - objectives, importance. Maintenance engineer - duties, functions and responsibilities. Types - breakdown, scheduled, preventive and predictive - Plant maintenance schedule, Condition monitoring.

Total: 45 Hours

Reference(s)

1. Khanna O.P., Industrial Engineering and management, Dhanpat Rai Publications., 2010.
2. Martand T.Telsang, Industrial Engineering and Production Management, S Chand Publishers, 2006.
3. Panneerselvam R., Production and operations management, Heritage Publishers, 2006.
4. Ravi Shankar, Industrial Engineering and Management, Golgotia Publications Pvt. Ltd., New Delhi, 2009.

22OME03 MAINTENANCE ENGINEERING 3 0 0 3

Course Objectives

- To understand the principles, objectives and importance of maintenance adopted in industry for successful progress.
- To introduce different maintenance categories, its merits and types of lubrication.
- To expose the idea of condition monitoring, methods and instruments used for allied measurements.
- To learn about failure analysis and repair methods for few mechanical elements.
- To promote computerization in maintenance and inventory management.

Programme Outcomes (POs)

PO1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO5: 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.
PO6: 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.
PO7: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PSO2: Choose the appropriate methodology, materials, tools and machinery to manufacture quality products at economical cost.

Course Outcomes (COs)

1. Assess the principles, objectives and importance of maintenance adopted in industry.
2. Select the suitable maintenance category and lubrication type.
3. Apply the appropriate methods and instruments for condition monitoring.
4. Analyze the failures of mechanical systems and select suitable repair methods.
5. Analyze computers in maintenance and inventory management.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	-	-	-	-	-	-	-	-	-	-	-	2	-
2	2	2	-	-	-	-	-	-	-	-	-	-	-	2	-
3	-	-	-	-	2	2	1	-	-	-	-	-	-	2	-
4	1	2	1	-	2	2	2	-	-	-	-	-	-	2	-
5	2	2	2	-	1	1	1	-	-	-	-	-	-	2	-

UNIT I **9 Hours**

PRINCIPLES OF MAINTENANCE PLANNING

Basic principles of maintenance planning - Objectives and principles of planned maintenance activity - Importance and benefits of sound maintenance systems - Maintenance organization - Maintenance economics.

UNIT II **9 Hours**

MAINTENANCE CATEGORIES AND LUBRICATION

Maintenance categories - Comparative merits of each category - Preventive maintenance, Maintenance schedules, Repair cycle - Total Productive Maintenance - Principles and methods of lubrication.

UNIT III **9 Hours**

CONDITION MONITORING

Condition based maintenance - Cost comparison with and without Condition Monitoring - Methods and instruments for condition monitoring - Noise, vibration, wear and temperature measurement.

UNIT IV **9 Hours**

FAILURE ANALYSIS AND REPAIR METHODS

Failure analysis - Failures and their development - Role of Non-Destructive Testing in failure analysis - Repair methods for bearings, cylinder block, fuel pump, shaft.

UNIT V **9 Hours**

COMPUTER AIDED MAINTENANCE MANAGEMENT

Approach towards Computerization in maintenance - computer-aided maintenance management system (CAMMS) - Advantages of CAMMS - spare parts and inventory centre performance reporting.

Total: 45 Hours

Reference(s)

1. Srivastava S.K, Maintenance Engineering, S Chand and Company, 2010.
2. Mishra R.C, Pathak K, Maintenance Engineering and Management, Second edition, Prentice Hall India Learning Pvt. Ltd., 2012.
3. Keith Mobley R, Lindley R. Higgins and Darrin J. Wikoff, Maintenance Engineering Handbook, Seventh edition, McGraw-Hill Professional, 2008.
4. Davies A, Handbook of Condition Monitoring: Techniques and Methodology, Springer, 2012.
5. Otegui Jose Luis, Failure Analysis, Fundamentals and Applications in Mechanical Components, Nineteenth edition, Springer, 2014.

22OME04 SAFETY ENGINEERING 3 0 0 3

Course Objectives

- To study the principles of safety management system.
- To introduce the provisions contained in the industrial laws.
- To provide knowledge on safety requirements for engineering industry.
- To learn safety requirement for chemical industry.
- To study the various safety measures adopted in construction industries.

Programme Outcomes (POs)

PO1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO5: 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.
PO6: 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.
PO8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO12: 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.
PSO1: Design, analyse and evaluate the performance of mechanical systems.
PSO2: Choose the appropriate methodology, materials, tools and machinery to manufacture quality products at economical cost.
PSO3: Address all the fluid flow and heat transfer related problems of mechanical systems.

Course Outcomes (COs)

1. Assess safety management system of an industry.
2. Implement the provisions of acts and rules in industries.
3. Implement and review the safety performance followed in various industries.
4. Evaluate safety appraisal in chemical industries.
5. Generate safety reports on construction industries.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	2	1	-	1	-	-	-	-	-	2	2
2	-	-	-	-	1	-	-	3	-	-	-	-	2	1	-
3	2	-	-	-	-	-	-	-	-	-	-	3	1	-	2
4	2	3	-	-	-	-	-	-	2	-	-	-	2	-	1
5	-	-	-	-	2	-	-	-	-	3	-	-	-	3	-

UNIT I **10 Hours**

SAFETY MANAGEMENT

Concepts - Evolution, International Labour Organization (ILO), National Safety Council, Techniques - Job Safety Analysis (JSA), Safety survey, Safety inspection, Safety Sampling, Accident Reporting and Investigation - Concept of an accident, Accident causation models, cost of accident, investigation, Safety Performance Monitoring - Safety indices.

UNIT II **10 Hours**

SAFETY AND LAW

Factory Act 1948-Safety and Health chapters, Tamil Nadu Factories Rules- Safety and Health chapters, Environment and Pollution Laws, Building and other construction works act 1996, Electricity Rules.

UNIT III **10 Hours**

SAFETY IN ENGINEERING INDUSTRIES

Safety in machine shop,- Principles of machine guarding - Personal protective equipment- Safety in handling industrial gases - Safety in cold forming and hot working of metals- Safety in finishing, inspection and testing, heat treatment, electro plating, leak test, radiography.

UNIT IV **9 Hours**

SAFETY IN CHEMICAL INDUSTRIES

Safety in process design, unit operations, pressure vessel, heat exchanger, safety valves -Plant commissioning and inspection, pressure vessel, Plant maintenance and emergency planning, management of maintenance HAZOP study.

UNIT V **8 Hours**

SAFETY IN CONSTRUCTION INDUSTRY

Construction regulations, contractual clauses, permit to work, - Education and training-Hazards of construction and prevention- excavation, scaffolding, dismantling, road works, construction of high-rise buildings - Working at heights -Working on fragile roofs, work permit systems-Construction machinery, cranes, chain pulley blocks, earth moving equipment, conveyors- Manual handling, Safety in demolition work, - Safety in confined spaces.

Total: 45 Hours

Reference(s)

1. Blake R.B., Industrial Safety, Prentice Hall, Incorporated, New Jersey, 1973.
2. National Safety Council, Accident Prevention Manual for Industrial Operations, Chicago, 1988.
3. Subramanian V., The Factories Act, 1948, with Tamil Nadu Factories Rules , 1950, Madras
4. Environmental Pollution Control Act, 1986.
5. BOCW Act,1996, Madras Book agency, Chennai-1.
6. Explosive Act, 1884, Eastern Book Company, Lucknow -266 001.

22OFD01 TRADITIONAL FOODS 3 0 0 3

Course Objectives

- Understand the importance of traditional foods and food habits.
- Know the traditional processing of snack, sweet and dairy food products.
- Infer the wide diversity and common features of traditional Indian foods and meal patterns.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Course Outcomes (COs)

1. Apply the processing methods of traditional foods in terms of its health benefits.
2. Assess the production methods of traditional sweets, snacks and dairy products.
3. Differentiate Traditional fermented foods products based on its raw material.
4. Implement a large-scale production of tradition foods for its increased consumption.
5. Compare the health aspects of traditional foods with modern foods.

Articulation Matrix

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

UNIT I **9 Hours**

TRADITIONAL METHODS OF FOOD PROCESSING

Introduction - food culture -geographical features and food. Traditional methods of milling grains - rice, wheat and corn - equipment and processes as compared to modern methods. Equipment and processes for edible oil extraction- comparison of traditional and modern methods. Energy costs, efficiency, yield, shelf life and nutrient content comparisons. Traditional methods of food preservation - sun-drying, osmotic drying, brining, pickling and smoking.

UNIT II **9 Hours**

TRADITIONAL SWEETS, SNACKS AND DAIRY PRODUCTS

Production, formulation, preparation and processing of Indian traditional sweet and snack food products:-Rasgolla, Gulab jamun; formulation and preparation of namkeen, potato chips, banana chips. Acid coagulated and fermented dairy products- paneer, dahi, shrikhand, lassi - processing conditions, defects etc. Fat rich products- Butter, ghee and its processing.

UNIT III **9 Hours**

TRADITIONAL FERMENTED FOOD PRODUCTS

Idli, Soya sauce, fish pickle, dry fish, meat and vegetable fermented products. Various alcohol-based products. Ways to increase nutritional quality of food such as enrichment, fortification, fermentation and mutual supplementation. Best cooking and processing methods to retain nutrients

UNIT IV **10 Hours**

COMMERCIAL PRODUCTION OF TRADITIONAL FOODS

Commercial production of traditional breads, snacks, ready-to-eat foods and instant mixes, frozen foods -types marketed, turnover; role of SHGs, SMES industries, national and multinational companies; commercial production and packaging of traditional beverages such as tender coconut water, neera, lassi, buttermilk, dahi. Commercial production of intermediate foods - ginger and garlic pastes, tamarind pastes, masalas (spice mixes), idli and dosa batters

UNIT V **8 Hours**

HEALTH ASPECTS OF TRADIONAL FOODS

Comparison of traditional foods with typical fast foods / junk foods - cost, food safety, nutrient composition, bioactive components; energy and environmental costs of traditional foods; traditional foods used for specific ailments /illnesses.

Total: 45 Hours

Reference(s)

1. Sen and Colleen Taylor, Food Culture in India, Greenwood Press, 2005.
2. Davidar, Ruth N. "Indian Food Science: A Health and Nutrition Guide to Traditional Recipes:" East West Books, 2001.
3. Steinkrus.K.H. Handbook of Indigenous Fermented Foods, CRC press, 1995.
4. Aneja. R.P, Mathur.BN, R.C. Chandan,and Banerjee.A.K. Technology of Indian Milk Products. Dairy India Year Book, 2009.

22OFD02 FOOD LAWS AND REGULATIONS

3 0 0 3

Course Objectives

- Introduce the concept of food hygiene, importance of safe food and laws governing it.
- Learn common causes of food borne illness - viz. physical, chemical and biological and identification through food analysis.
- Understand food inspection procedures employed in maintaining food quality.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO6: 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.
PO7: 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.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

Course Outcomes (COs)

1. Analyse the food safety strategies and nutritional quality of the food.
2. Analyze the food regulatory mechanism and mandatory laws for food products.
3. Determine the national and international regulatory agencies.
4. Apply the voluntary regulatory standards.
5. Assess the implementation of food safety for a food processing industry.

Articulation Matrix

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

UNIT I **10 Hours**

INTRODUCTION

Introduction, concept of food safety and standards, food safety strategies. Food hazards and contaminations - biological (bacteria, viruses and parasites), chemical (toxic constituents / hazardous materials) pesticides residues / environmental pollution / chemicals) and physical hazards. Preventive food safety systems - monitoring of safety, wholesomeness and nutritional quality of food. Prevention and control of physical, chemical and microbiological hazards. Principles of food safety - Establishment: design and facilities - emergency preparedness - Maintenance cleaning and sanitation - personal hygiene - packaging and labelling - transportation - traceability - recall procedure - visitor policy. Adulteration: Intentional and unintentional - Preservatives - antioxidants, sweeteners, flavours, colours, vitamins, stabilizers - indirect additives - organic resides - inorganic residues and contaminants.

UNIT II **10 Hours**

FOOD LAWS

Indian and Food Regulatory Regime (Existing and new), PFA Act and Rules, Food Safety and Quality Requirements, Additives, Contaminants and Pesticide Residue. Food Safety and Standards Act, 2006, FSSAI roles and responsibilities, Essential Commodities Act, 1955, Global Scenario, Codex Alimentarius, WHO/FAO Expert Bodies (JECFA/ JEMRA/JMPR) WHO/FAO Expert Bodies (JECFA/ JEMRA/JMPR). Food safety inspection services (FSIS) and their utilization.

UNIT III **10 Hours**

REGULATIONS

Introduction to OIE & IPPC, Other International Food Standards (e.g. European Commission, USFDA etc). WTO: Introduction to WTO Agreements: SPS and TBT Agreement, Export & Import Laws and Regulations, Export (Quality Control and Inspection) Act, 1963. Role of Agricultural and Processed Food Products Export Development Authority (APEDA), Customs Act and Import Control Regulations, Other Voluntary and mandatory product specific regulations, Other Voluntary National Food Standards: BIS Other product specific standards; AGMARK. Nutritional Labelling, Health claims.

UNIT IV **10 Hours**

STANDARDS

Voluntary Quality Standards and Certification GMP, GHP, HACCP, GAP, Good Animal Husbandry Practices, Good Aquaculture Practices ISO 9000, ISO 22000, ISO 14000, ISO 17025, PAS 22000, FSSC 22000, BRC, BRCIOP, IFS, SQF 1000, SQF 2000. Role of NABL, CFLS.

UNIT V **5 Hours**

IMPLEMENTATION AND RISK ASSESSMENT

Implementation of food safety for a desired food processing industry. Risk assessment studies: Risk management, risk characterization and communication.

Total: 45 Hours

Reference(s)

1. Singal RS (1997). Handbook of indices of food quality and authenticity. Woodhead Publ. Cambridge, UK.
2. Shapton DA (1994). Principles and practices of safe processing of foods. Butterworth Publication, London. Winton AL (1999) Techniques of food analysis, Allied Science Publications New Delhi.
3. Pomeranze Y (2004). Food analysis - Theory and Practice CBS Publications, New Delhi.
4. Jacob MB (1999). The chemical analysis of foods and food products. CBS Publ. New Delhi.

22OFD03 POST HARVEST TECHNOLOGY OF FRUITS AND VEGETABLES **3 0 0 3**

Course Objectives

- To understand the importance and different methods of post-harvest handling and storage of fruits and vegetables.
- To gain knowledge on different preservation methods of fruits and vegetables.
- To familiarize with the value-added products from fruits and vegetables.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: 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.
PO7: 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. Implement the different post-harvest handling practices for the storage of fruits and vegetables.
2. Analyze the suitable preservation method (sugar, salt or dehydration) to produce value added products from fruits and vegetables.
3. Evaluate the requirement of low temperature and irradiation methods to preserve specific fruits and vegetables.
4. Apply the concentration and fermentation methods to preserve fruits and vegetables.
5. Implement the canning method to preserve fruits and vegetables.

Articulation Matrix

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

UNIT I **9 Hours**

POST-HARVEST PRACTICES AND PROCESSING

Maturity indices for harvesting; pathological spoilage's during storage, ripening and control measures, Post-harvest handling, sorting & grading, packaging, storage, transportation, Methods of pre-cooling, post-harvest treatments to hasten and delay ripening; Methods of storage at farm level - cold storage, controlled/modified atmosphere storage, Quality management, export requirements, Nutritive value, nutraceutical properties

UNIT II **9 Hours**

PRESERVATION AND VALUE ADDITION

General principles and methods of fruit and vegetable preservation. Preservation using sugar: Principle and Preparation of jam, jelly, marmalade, squash, RTS, carbonated beverages, crush, nectar, cordial, fruit bar, preserves, candies and carbonated fruit beverages. Processing using salt: Principle - Brining - Preparation of pickles, chutney and sauces, ketchup.

UNIT III **9 Hours**

PRESERVATION BY LOW TEMPERATURE AND IRRADIATION

Preservation by low temperature: definition, principle, methods - Refrigeration, freezing. Methods of freezing- changes during freezing. Preparation of frozen foods. Minimal Processing of Fruits and Vegetables - techniques involved - Preservation by irradiation: definition- principle, application, irradiation unit.

UNIT IV **9 Hours**

PRESERVATION BY DRYING

Machineries involved in processing of fruits and vegetables products. Drying and dehydration: definition, principle, Types of driers: Solar, cabinet, spray drier, drum drier, fluidized bed drier. Preparation of product for dehydration. Dehydration principles and equipment. Preparation of fruits - powder production. Problems related to storage of dehydrated products.

UNIT V **9 Hours**

PRESERVATION BY CANNING

Canning: principles, Types of cans, packing of canned products-preparation of canned products - general considerations in establishing a commercial fruit and vegetable cannery, machineries involved in canning and bottling unit- spoilage of canned foods. Bottling of fruit and vegetable. Precautions in canning operations.

Total: 45 Hours

Reference(s)

1. S.Ranganna, HandBook of Analysis and Quality Control for Fruit and Vegetable Products, McGraw Hill Education (India) Private Limited, Chennai, 2017.
2. N.W. Desrosier, the Technology of Food Preservation, CBS Publisher & Distributions, New Delhi, 1987.
3. R.P. Srivastava and S. Kumar, Fruit and Vegetable Preservation: Principles and Practices, Second Edition, International Book Distribution Co., Lucknow, 1998.
4. G. Lal, G. Siddappa and G.L. Tondon, Preservation of Fruits and Vegetables, Indian Council of Agricultural Research, New Delhi, 1986.
5. Chakraverty, A.S. Mujumdar, G.S.V. Raghavan and H.S. Ramaswamy, Handbook of Post-harvest Technology, Marcel Dekker Press, USA, 2001.
6. D.K. Salunkhe, and S.S. Kadam, Handbook of Fruit Science and Technology: Production, Composition and Processing, Marcel Dekker, New York, 1995.

22OFD04 CEREAL, PULSES AND OILSEED TECHNOLOGY

3 0 0 3

Course Objectives

- Understand the application of scientific principles in the processing technologies specific to the materials.
- Understand the storage methods and handling techniques followed for cereals, pulses and oil seeds.
- Develop the knowledge in the area of Cereals, pulses and oil seed processing and technology.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO4: 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.
PO6: 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.

Course Outcomes (COs)

1. Find the specific processing technologies employed for cereals.
2. Analyse the composition of millets and their nutritional importance.
3. Relate the compositional changes and processing methods of pulses and legumes.
4. Create the competence in processing of oilseeds technology.
5. Relate the storage processing of food grains with quality aspects.

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

UNIT I **9 Hours**

CEREALS

Cereal Grains- Basic agricultural aspects, structure and composition; Storage, Insect control; Processing: Wheat- milling, (Atta and maida), quality aspects of flour, wheat proteins and their function, rheology of flour; wheat based baked products - Bread, Biscuit, Cakes, Extruded products, Pizza, Chapatis, malting and malt products; Rice-Milling, Parboiling, Quick cooking rice, Traditional Indian Products-Puffed Rice, flaked rice, Idli/Dosa/vada mixes and other savouries; Corn- Wet and dry milling, Corn Products - Corn flakes, Corn starch, canned corn products, puffed product; Oats-Milling, Oat Products - Steel cut,rolled oats, quick cooking; Traditional and Fermented cereal products.

UNIT II **9 Hours**

OTHER CEREALS AND MILLETS

Sorghum, Pearl Millet, Finger millet, Foxtail Kodo Millet - Basic agricultural millet, aspects, structure and composition; storage, insect control; processing - pearling, Milling, Malting, Malt based foods, flaked and fermented products; Traditional and Nutritional products based on finger millet.

UNIT III **9 Hours**

PULSES AND LEGUMES

Basic agricultural aspects, structure, composition, storage, insect control, processing Milling/splitting, dhal milling, products - puffed, flakes, flour, legume-based traditional products, flour based Indian sweets and savouries, soya milk, soy protein Isolate, soya paneer

UNIT IV **9 Hours**

OIL SEEDS AND NUTS

Basic agricultural aspect‟s structure, composition, Storage, Insect control; processing: traditional and modern methods of oil extraction, refining, bleaching, deodorizing, hydrogenation; oil blends; applications of different oils and fats in food processing & products.

UNIT V **9 Hours**

STORAGE AND HANDLING

Bag Storage - Advantages and Disadvantages, Cover Plinth Storage Structures, CAP storage (Cover and Plinth Storage). Protection against Rodents, Fungi, Pests and Mites. Fumigation Processes for bag storage piles. Bulk Storage in silos and large Bins. Conveyors and Elevators for feeding and discharging.

Total: 45 Hours

Reference(s)

1. Chakraverty, A.: Post Harvest Technology of Cereals, Pulses and Oilseeds. Oxford and IBH Publishing Co, Calcutta, 1995.
2. Delcour, Jan A. and R. Carl Hoseney., Principles of Cereal Science and Technology, 3rd Edition, American Association of Cereal Chemists, 2010.
3. Karl Kulp, Handbook of Cereal Science and Technology, 2nd Rev. Edition, CRC Press, 2000.
4. N.L. Kent and A.D.Evans, Technology of Cereals (4th Edition) Elsevier Science (Pergaman),Oxford, UK, 1994.
5. Matz, Samuel A., The Chemistry and Technology of Cereals as Food and Feed, 2nd Edition, CBS, 1996.
6. Morris, Peter C. and J.H. Bryce., Cereal Biotechnology, CRC/Wood head publishing, 2004.

22OPH01 NANOMATERIALS SCIENCE 3 0 0 3

Course Objectives

- Impart knowledge on Nanoscience.
- Explore different techniques of producing nanomaterials.
- Create expertise on the applications of nanomaterials in various fields.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

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

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 -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 physical method: physical vapour deposition, RF sputtering, CVD- chemical method: colloidal and sol-gel methods - template based growth of nanomaterials - ordering of nanosystems, self-assembly and self-organization.

UNIT III **9 Hours**

CHARACTERIZATION TECHNIQUES

General classification of characterization methods - analytical and imaging techniques - microscopy techniques - electron microscopy, scanning electron microscopy, transmission electron microscopy, atomic force microscopy - diffraction techniques - X-ray spectroscopy - 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- quantum well laser- 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- single electron transistor - organic photovoltaic cells- spintronics

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.

22OPH02 SEMICONDUCTOR PHYSICS AND DEVICES 3 0 0 3

Course Objectives

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

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

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

Articulation Matrix

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

UNIT I **9 Hours**

ENERGY BANDS AND CARRIER TRANSPORT PROPERTIES

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

UNIT II **9 Hours**

P-N JUNCTION

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

UNIT III **9 Hours**

BIPOLAR JUNCTION TRANSISTOR

The basic transistor action - operation in the active mode - current gain - static characteristics - carrier distribution in emitter, base and collector region - modes of operation - current - voltage characteristics of common base and emitter configuration - frequency response and switching of bipolar transistor.

UNIT IV **9 Hours**

MOSFET

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

UNIT V **9 Hours**

PHOTONIC DEVICES

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

Total: 45 Hours

Reference(s)

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

22OPH03 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)

PO1:Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Apply 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	1	2	-	-	-	-	-	-	-	-	-	-	-	-

UNIT I **9 Hours**

LASER FUNDAMENTALS

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

9 Hours

UNIT II

LASER BEAM CHARACTERISTICS AND TYPES

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

UNIT III **9 Hours**

LASERS IN SCIENCE

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

UNIT IV **9 Hours**

LASERS IN MEDICINE AND SURGERY

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

UNIT V **9 Hours**

LASERS IN INDUSTRY

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

Total: 45 Hours

Reference(s)

1. K. Thiyagarajan and A. K. Ghatak, "LASERS: Fundamentals and Applications", Springer, USA, 2015.
2. M. N. Avadhanulu, "An Introduction to Lasers Theory and Applications", S. Chand Publisher, 2013.
3. W. Koechner, M. Bass, "Solid State Lasers: a graduate text", Springer Verlag, New York, 2006.
4. K. P. R. Nair, "Atoms, Molecules and Lasers", Narosa Publishing House, 2009.
5. K. R. Nambiar, "Lasers: Principles Types and Applications", New Age International Publications, 2006.
6. A. Sennaroglu, "Solid-State Lasers and Applications", CRC Press, 2006.

22OPH04 BIO-PHOTONICS **3 0 0 3**

Course Objective:

- To understand the light-matter interaction in biological cells or tissues by using the principles of optics and lasers.
- To apply the properties of biological cells or tissues in biomedical applications by various optical imaging, sensing and activation techniques.
- To analyze the concepts of Modern optical measurement techniques and devices in early detection of disease and cure them.

Programme Outcomes (POs)

PO1:Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO9: 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. Assess the laws of optics and lasers to interpret the biological cells and tissues.
2. Find the properties of different optical instruments in biological systems to represent their behavior in structure and design of detection engineering instruments.
3. Show laser tweezers techniques to infer the activities of cells (tissues) and explain the single molecule detection processes in medical diagnosis.
4. Apply the properties of ultra short laser pulses and tissue engineering to rectify the affecting factors in biological cells.
5. Compare the various types of bio-imaging methods to detect the infected cells and molecules in biological science.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO BIOPHOTONICS

Light as Photon Particles – Coherence of light - lasers – classification of lasers – Mechanisms of Non-linear Optics (NLO) processes associated with Biophotonics - Light scattering mechanisms: Rayleigh scattering, Miescattering, Brillouin Scattering, Raman Scattering -Different light sources – Quantitative description of light: Radiometry

UNIT II **9 Hours**

PHOTOBIOLOGY

Interaction of light with cells and tissues – Light – Tissue Interaction Variables – Light –Tissue Interaction Theory: Radiative Transport Theory – Photo process in biopolymers – In Vivo Photoexcitation – photo-induced physical, chemical, thermal and mechanical effects in biological systems – Optical biopsy – Single molecule detection

UNIT III **9 Hours**

BIO-NANO-PHOTONICS

Laser Microtools, Semiconductor quantum dots for bioimaging, Metallic nanoparticles and nanorods for biosensing – Optical biosensors: Fibre-Optic, evanescent wave, surface Plasmon resonance (SPR) based biosensors – biomaterials for photonics – Principle and design of laser tweezers – laser trapping and dissection for biological manipulation.

UNIT IV **9 Hours**

TISSUE ENGINEERING WITH LIGHT

Basics of tissue optics: Light absorption and scattering in tissues, Wavelength effects and spectra– the therapeutic window, Light penetration in tissues – Absorbing agents in tissues and blood –Skinoptics, response to the UV radiation, Optical parameters of tissues – tissue welding – tissue contouring – tissue regeneration – Femto laser surgery – low level light therapy and photo dynamic therapy

UNIT V **9 Hours**

BIO-IMAGING TECHNIQUES AND ITS APPLICATIONS

An overview of optical imaging – Fluorescence Microscopy – Scanning Microscopy – In vivo Confocal Microscopy – Multi photon Microscopy – Optical Coherence Tomography (OCT) – Fluorescence Resonance Energy Transfer (FRET) imaging – fluorescence lifetime imaging Microscopy (FLIM) – Nonlinear optical imaging – Coherent Anti-stokes Raman Scattering –Bioimaging Applications.

Total: 45 Hours

Reference(s)

1. Introduction to Biophotonics, ParasN.Prasad, WileyInter-science, AJohnWiley & Sons, Inc., Publication (Class notes are developed mainly based on this book.)
2. Introduction to Biomedical Imaging, Andrew G.Webb, 2002, IEEE Press.
3. Biomedical Optics: Principles and Imaging, Lihong.V.Wang, Hsin.-I.Wu, 2007, Wiley Interscience 2007. & "An Introduction to Biomedical Optics", R.Splinterand B.A.Hooper, Taylor & Francis
4. Bioimaging Current Concepts in Light and Electron Microscopy, DouglasE.Chandler & Robert W.Roberson, Jones and Bartlett publishers.
5. Optical Imaging and Microscopy: Techniques and Advanced Systems, Peter Török and Fu-JenKao, 2004, Springer.

22OPH05 PHYSICS OF SOFT MATTER 3 0 0 3

Course Objectives

- To recognize the properties of soft matter and hard matter.
- To understand the fundamental interactions of colloids and gels.
- To explain the structure and phase behavior of liquid crystals and supramolecules.
- To summarize the soft matter properties of structures and components of life.

Programme Outcomes (POs)

PO1:Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Find the salient features of soft matter and hard matter
2. Assess the fundamental interactions and stability of colloids and gels
3. Show the structure and properties of liquid crystals
4. Analyze the aggregation and phase behavior of surfactants, polymers, copolymers and block copolymers
5. Analyze the soft matter behavior of nucleic acids, proteins, polysaccharides and membranes

Articulation Matrix

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

UNIT I **9 Hours**

CONDENSED MATTER

Intermolecular forces-Condensation and freezing-mechanical response: Hookean solid-Newtonian liquid-viscoelasticity. Glasses: relaxation time-viscosity- glass forming liquids. Soft matter: length scales-fluctuations and Brownian motion.

9 Hours

UNIT II

COLLOIDAL DISPERSIONS & GELS

Forces between colloidal particles: Vander Waals forces-electrostatic double layer forces-steric hindrance-depletion interactions. Stability and phase behaviour: Crystallization-strong colloids-weak colloids. Physical and chemical gels-classical theory of gelation-elasticity of gels

UNIT III **9 Hours**

LIQUID CRYSTALS

Liquid crystal phases-distortions and topological defects-electrical and magnetic properties-polymer liquid crystals-Fredricks transition and liquid crystal displays

UNIT IV **9 Hours**

SUPRAMOLECULAR SELF ASSEMBLY

Aggregation and phase separation-types of micelles- bilayers and vesicles. Phase behaviour of concentrated surfactant solutions-phase separation in polymers, copolymers and block copolymers

UNIT V **9 Hours**

SOFT MATTER IN NATURE

Components and structures of life-Nucleic acids-proteins-interaction between proteins-polysaccharides-membranes

Total: 45 Hours

References

1. Richard A L Jones, Soft Condensed Matter, Oxford University Press, UK, 2002.
2. Masao Doi, Soft Matter Physics, Oxford University Press, UK, 2013.
3. Ian W. Hamley, Introduction to Soft Matter, John Wiley & Sons, 2007.
4. A. Fernandez-Nieves, A M Puertas, Fluids, Colloids and Soft materials: An Introduction to Soft Matter Physics, John Wiley & Sons, 2016.
5. Maurice Kleman, Oleg D. Lavrentovich, Soft Matter Physics: An Introduction, Springer-Verlag, New York, 2003.

22OCH01 CORROSION SCIENCE AND ENGINEERING

3 0 0 3

Course Objectives

- Analyse the loss incurred due to corrosion in different sectors and terminologies related to corrosion.
- Identify forms and types of corrosion with suitable mechanism.
- Apply various methods of corrosion control, corrosion testing and monitoring.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO7: 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. Analyze if corrosion can occur under specific operating conditions in a given equipment or construction and indicate regions of immunity, corrosion and passivity of a metal.
2. Compare different corrosion types on metals when exposed to air, water and at high temperatures (> 100 C).
3. Assess the corrosion mechanism on steel, iron, zinc and copper metal surfaces.
4. Compute the rate of corrosion on metals using electrochemical methods of testing.
5. Find the correct materials, design and operation conditions to reduce the likelihood of corrosion in new equipment and constructions.

Articulation Matrix

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

UNIT I **9 Hours**

CORROSION

Importance of corrosion - spontaneity of corrosion - units of corrosion rate (mdd and mpy) - direct and indirect damage by corrosion - importance of corrosion prevention in industries - Pilling Bedworth ratio and its significance - passivation - area relationship in both active and passive states of metals - Pourbaix diagrams of Mg, Al and Fe and their advantages and disadvantages.

UNIT II **7 Hours**

TYPES OF CORROSION

Eight forms of corrosion: uniform, galvanic, crevice corrosion, pitting, intergranular corrosion, selective leaching, erosion corrosion and stress corrosion-Catastrophic oxidation corrosion

UNIT III **9 Hours**

MECHANISM OF CORROSION

Hydrogen embrittlement - corrosion fatigue - filiform corrosion - fretting damage and microbes induced corrosion. Corrosion mechanism on steel, iron, zinc and copper metal surfaces

UNIT IV **10 Hours**

CORROSION RATE AND ITS ESTIMATION

Rate of corrosion: Factors affecting corrosion. Electrochemical methods of polarization: Tafel extrapolation polarization and linear polarization. Weight loss method - testing for intergranular susceptibility and stress corrosion. Nondestructive testing methods: Visual testing - liquid penetrant testing - magnetic particle testing - Ultrasonic monitoring, and eddy current testing

UNIT V **10 Hours**

CORROSION CONTROL METHODS

Fundamentals of cathodic protection - types of cathodic protection (sacrificial anodic and impressed current cathodic protection). Stray current corrosion, problems and its prevention. Protective coatings: Metal coatings: Hot dipping (galvanizing, tinning and metal cladding) - natural inhibitors. Selection of suitable design for corrosion control

Total: 45 Hours

Reference(s)

1. Mouafak A. Zaher, "Introduction to Corrosion Engineering", CreateSpace Independent Publishing Platform, 2016.
2. E.McCafferty, "Introduction to Corrosion Science", Springer; 2010 Edition, January 2010.
3. R. Winstone Revie and Herbert H. Uhlig, "Corrosion and Corrosion Control: An Introduction to Corrosion Science and Engineering", 4th Edition, John Wiley & Science, 2008.
4. Mars G. Fontana, "Corrosion Engineering", Tata McGraw Hill, Singapore, 2008
5. David E.J. Talbot (Author), James D.R. Talbot, "Corrosion Science and Technology", Second Edition (Materials Science & Technology), CRC Press; 2nd Edition, 2007.
6. http://corrosion-doctors.org/Corrosion-History/Eight.html.

22OCH02 POLYMER SCIENCE 3 0 0 3

Course Objectives

- Explain the properties of different polymers with its mechanism.
- Select the appropriate polymerization techniques to synthesize the polymers.
- Identify suitable polymers for various industrial applications.

Programme Outcomes (POs)

PO1:Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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. Assess the types of mechanism of polymerization reactions and analyze the natural and synthetic polymers.
2. Find the suitable polymerization techniques to synthesize the high-quality polymers.
3. Show the structure, thermal, and mechanical properties of polymers for different applications.
4. Apply the polymer processing methods to design polymer products.
5. Analyze the polymers used in electronic and biomedical applications.

Articulation Matrix

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

UNIT I **10 Hours**

POLYMERS AND ELASTOMERS

Classification of polymers - Mechanism: Addition polymerization - free radical, cationic, anionic and co-ordination (Ziegler-Natta) polymerization - copolymerization - condensation polymerization (nylon-6,6) -ring opening polymerization (nylon-6). Elastomers: Natural rubber and synthetic rubber: styrene - butadiene rubber (SBR), butyl, neoprene, thiocol rubbers. High performance polymers: polyethers, polyether ether ketone (PEEK), polysulphones and polyimides

UNIT II **8 Hours**

POLYMERIZATION TECHNIQUES

Homogeneous and heterogeneous polymerization - bulk polymerization (PMMA, PVC) - solution polymerization - 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: TGA and DSC - Testing tensile strength - Izod impact - Compressive strength - Rockwell hardness - Vicot softening point - water absorption

UNIT IV **9 Hours**

POLYMER PROCESSING

Moulding: Compression - injection - extrusion and blow mouldings. Film casting - calendering. Thermoforming and vacuum formed polystyrene - foamed polyurethanes. Fibre spinning: melt, dry and wet spinning. Fibre reinforced plastics fabrication: hand-layup - filament winding and pultrusion

UNIT V **10 Hours**

SPECIALITY POLYMERS

Preparation and properties of heat resistant and flame-retardant polymers. Polymers for electronic applications: liquid crystalline, conducting and photosensitive polymers – E waste management. Polymer for biomedical applications: artificial organs, controlled drug delivery, Scaffolds in tissue Engineering –waste management.

Total: 45 Hours

Reference(s)

1. V. R. Gowarikar, N. V. Viswanathan and Jayadev Sreedhar, "Polymer Science", New Age International (P) Ltd., New Delhi, 2021.
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, 2008.
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.
7. Common Biocompatible Polymeric Materials for Tissue Engineering and Regenerative Medicine (2019), Materials Chemistry and Physics https://doi.org/10.1016/j.

22OCH03 ENERGY STORING DEVICES 3 0 0 3

Course Objectives

- Compare the energy density of commercialized primary and secondary batteries.
- Classify the fuel cells and compare their efficiency in different environmental conditions.
- Demonstrate the various energy storage devices and fuel cells.

Programme Outcomes (POs)

PO1:Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO7: 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. Find the parameters required for operation of a cell to evaluate the capacity of energy storage devices.
2. Show the electrodes, electrolyte and cell reactions of different types of primary, secondary batteries and infer the selection criteria for commercial battery systems with respect to commercial applications.
3. Differentiate fuel cells based on its construction, production of current and applications.
4. Compare different methods of storing hydrogen fuel and its environmental applications.
5. Analyze the solar cell based on the materials used in it.

Articulation Matrix

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

UNIT I **6 Hours**

BASICS OF CELLS AND BATTERIES

Components - classification - operation of a cell - theoretical cell voltage - capacity - specific energy - energy density of lithium and lead acid battery - charge efficiency- charge rate - charge retention - closed circuit voltage - open circuit voltage current density - cycle life - discharge rate-over charge-over discharge

UNIT II **10 Hours**

BATTERIES FOR PORTABLE DEVICES AND ELECTRIC VEHICLES

Primary batteries: zinc-carbon - magnesium, and mercuric oxide - recycling/safe disposal of used cells. Secondary batteries: lead acid - nickel-cadmium - lithium-ion batteries - rechargeable zinc alkaline battery. Reserve batteries: Zinc-silver oxide - lithium anode cell - photo galvanic cells. Battery specifications for cars and automobiles. Extraction of metals from battery materials.

UNIT III **10 Hours**

TYPES OF FUEL CELLS

Importance and classification of fuel cells: Description, working principle, components, applications and environmental aspects of the following types of fuel cells: alkaline fuel cells - phosphoric acid - solid oxide - molten carbonate and direct methanol fuel cells

UNIT IV **10 Hours**

HYDROGEN AS A FUEL

Sources and production of hydrogen: Electrolysis and photocatalytic water splitting. Methods of hydrogen storage: High pressurized gas - liquid hydrogen type - metal hydride. Hydrogen as engine fuel - features, application of hydrogen technologies in the future – limitations.

UNIT V **9 Hours**

ENERGY AND ENVIRONMENT

Future prospects of renewable energy and efficiency of renewable fuels - economy of hydrogen energy. Solar Cells: First, second, third and fourth generation solar cell - photo biochemical conversion cell.

Total: 45 Hours

Reference(s)

1. N. Eliaz, E. Gileadi, Physical Electrochemistry, Fundamentals, Techniques and Applications, Wiley, 2019.
2. J. Garche, K. Brandt, Electrochemical Power sources: Fundamentals Systems and Applications, Elsevier, 2018
3. S.P. Jiang, Q. Li, Introduction to Fuel Cells, Springer, 2021.
4. A. Iulianelli, A. Basile, Advances in Hydrogen Production, Storage and Distribution, Elsevier, 2016.
5. M.M. Eboch, The Future of Energy, From Solar Cells to Flying Wind Farms, Capstone, 2020.

22OGE01 PRINCIPLES OF MANAGEMENT 3 0 0 3

Course Objectives

- To develop cognizance about importance of management principles.
- Extract the functions and responsibilities of managers.
- To Study and understand the various HR related activities.
- Learn the application of the theories in an organization.
- Analyze the position of self and company goals towards business.

Programme Outcomes (POs)

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Course Outcomes (COs)

1. Apply the basic concepts of Management.
2. Assess basic knowledge on planning process and its Tools & Techniques.
3. Apply concept of organizing and staffing.
4. Apply concept of directing.
5. Apply management concept of controlling.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	-	-	-	2	-	3	-	-	-	-
2	-	-	-	-	-	-	-	-	2	-	2	-	-	-	-
3	-	-	-	-	-	-	-	-	2	-	2	-	-	-	-
4	-	-	-	-	-	-	-	-	3	-	2	-	-	-	-
5	-	-	-	-	-	-	-	-	2	-	2	-	-	-	-

UNIT I **9 Hours**

INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS

Definition of Management Science or Art Manager Vs Entrepreneur-types of managers - Managerial roles and skills Evolution of Management Scientific, Human Relations, System and Contingency approaches Types of Business organization - Sole proprietorship, partnership, Company - public and private sector enterprises - Organization culture and Environment Current Trends and issues in Management.

UNIT II **9 Hours**

PLANNING

Nature and purpose of planning - Planning process - Types of planning – Objectives - Setting objectives - Policies - Planning premises - Strategic Management - Planning Tools and Techniques - Decision making steps and process.

UNIT III **9 Hours**

ORGANISING

Nature and purpose – Formal and informal organization - Organization chart - Organization Structure Types - Line and staff authority - Departmentalization - Delegation of authority - Centralization and decentralization - Job Design - Human Resource - Management - HR Planning, Recruitment, Selection, Training and Development, Performance Management, Career planning and management

UNIT IV **9 Hours**

DIRECTING

Foundations of individual and group behaviour - Motivation-Motivation theories - Motivational techniques - Job satisfaction - Job enrichment - Leadership-types and theories of leadership - Communication-Process of communication - Barrier in communication Effective communication-Communication and IT.

UNIT V **9 Hours**

CONTROLLING

System and process of controlling - Budgetary and non-Budgetary control techniques - Use of Computers and IT in Management control - Productivity problems and management - Control and Performance-Direct and preventive control - Reporting.

Total: 45 Hours

Reference(s)

1. Robbins S, Management, (13th ed.), Pearson Education, New Delhi, 2017.
2. Stephen A. Robbins and David A. Decenzo and Mary Coulter, Fundamentals of Management, Pearson Education, 7th Edition, 2011.
3. Robert Kreitner and Mamata Mohapatra, Management, Biztantra, 2008.
4. L. M. Prasad, Principles and Practice of Management. 7th Edition, Sultan Chand & Sons, 2007.
5. P. C. Tripathi and P. N. Reddy, Principles of Management, Fourth Edition, Tata McGraw Hill, 2008.

22OGE02 ENTREPRENEURSHIP DEVELOPMENT I 3 0 0 3

Course Objectives

- Learn the basics and scope of the Entrepreneurship.
- Understand the generation of ideas of the Entrepreneurship.
- Evolve the legal aspects of the business.
- Learn to analyze the various business finance.
- Learn the basics of the Operations Management.

Programme Outcomes (POs)

PO6: 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.
PO7: 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.
PO9: 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 role of entrepreneurship in economic development.
2. Apply the types of ideas that to be used for entrepreneurship development.
3. Apply the legal aspects of business and its association.
4. Apply the sources of business and its analysis.
5. Analyse the different modes of operation management.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	1	2	-	2	-	-	-	-	-	-
2	-	-	-	-	-	1	2	-	2	-	-	-	-	-	-
3	-	-	-	-	-	1	2	-	2	-	-	-	-	-	-
4	-	-	-	-	-	1	2	-	2	-	-	-	-	-	-
5	-	-	-	-	-	1	2	-	2	-	-	-	-	-	-

UNIT I **9 Hours**
BASICS OF ENTREPRENEURSHIP
Nature, scope and types of Entrepreneurships, 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, Fractional, 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.

22OGE03 ENTREPRENEURSHIP DEVELOPMENT II 3 0 0 3

Course Objectives

- Evolve the marketing mix for promotion the product / services.
- Handle the human resources and taxation.
- Learn to analyze the taxation.
- Understand the Government industrial policies and supports.
- Preparation of a business plan.

Programme Outcomes (POs)

PO6.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.
PO7.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.
PO9.Individual and Teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Course Outcomes (COs)

1. Analyze the strategies and plans in marketing management.
2. Analyse the cases involved in human resource management.
3. Assess the direct and indirect taxes in business.
4. Analyze the supports given by government for improving the business.
5. Find the various steps involved in preparing the business plan.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	1	2	-	2	-	-	-	-	-	-
2	-	-	-	-	-	1	2	-	2	-	-	-	-	-	-
3	-	-	-	-	-	1	2	-	2	-	-	-	-	-	-
4	-	-	-	-	-	1	2	-	2	-	-	-	-	-	-
5	-	-	-	-	-	1	2	-	2	-	-	-	-	-	-

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.html.

22OGE04 NATION BUILDING, LEADERSHIP AND SOCIAL RESPONSIBILITY

3 0 0 3

Course Objectives

- To understand the importance of National Integration, Patriotism and Communal Harmony.
- To outline the basic awareness about the significance of soft skills in professional and inter-personal communications and facilitate an all-round development of personality.
- To analyze the different types of responsibility role of play for the improvement of society.

Programme Outcomes (POs)

PO1.Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO3.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.
PO7.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.
PO12.Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Assess religo-cultural diversity of the country and its impact on the lives of the people and their beliefs.
2. Find a sense of responsibility, smartness in appearance and improve self-confidence.
3. Create the sense of self-less social service for better social & community life.
4. Apply the importance of Physical and Mental health and structure of communication organization and various mode of communication.
5. Create awareness about the various types of weapon systems in the Armed Forces.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	-	1	-	-	-	1	-	-	-	-	3	-	-	-
2	2	-	2	-	-	-	2	-	-	-	-	2	-	-	-
3	2	-	1	-	-	-	1	-	-	-	-	2	-	-	-
4	2	-	3	-	-	-	3	-	-	-	-	3	-	-	-
5	2	-	1	-	-	-	1	-	-	-	-	2	-	-	-

UNIT I **9 Hours**

NATIONAL INTEGRATION

Importance & Necessity, Factors Affecting National Integration, Unity in Diversity. Threats to National Security. Water Conservation and Rain Harvesting, Waste Management and Energy Conservation. Leadership Capsule-Traits-Indicators-Motivation-Moral Values-Honor Code-Case Studies: Shivaji, Jhansiki Rani, Case Studies–APJ Abdul kalam, Deepa Malik, Maharana Pratap, N Narayan Murthy Ratan Tata Rabindra Nath Tagore, role of NCC cadets in 1965 war.

UNIT II **9 Hours**

PERSONALITY DEVELOPMENT AND LEADERSHIP

Intra & Interpersonal skills - Self-Awareness- &Analysis, Empathy, Critical & creative thinking, Decision making and problem solving, Communication skills, Group Discussion – copping with stress and emotions, changing mindset, Public Speaking, Time Management, Social skills, Career counselling, SSB procedure and Interview skills.

UNIT III **9 Hours**

SOCIAL SERVICE, COMMUNITY DEVELOPMENT AND ENVIRONMENTAL AWARENESS

Basics of social service and its need, Types of social service activities, Objectives of rural development programs and its importance, NGO‟s and their contribution in social welfare, contribution of youth and NCC in Social welfare. Protection of children & women safety, Road/ Rail Travel Safety, New initiatives, Cyber and mobile security awareness. Disaster management Capsule-Organization-Types of Disasters-Essential Services-Assistance-Civil Defence Organization

UNIT IV **9 Hours**

HEALTH, HYGIENE AND COMMUNICATION

Sanitation, First Aid in Common Medical Emergencies. Health, Treatment and Care of Wounds. Yoga-Introduction, Definition, Purpose, Benefits. Asanas-Padamsana, Siddhasana, Gyan Mudra, Surya Namaskar, Shavasana, Vajrasana, Dhanurasana, Chakrasana, Sarvaangasana, Halasana etc.

Obstacle Training Contact: Obstacle training - Intro, Safety measures, Benefits, Straight balance, Clear Jump, Gate Vault, Zig Zag Balance, High Wall etc.

Communication: Basic Radio Telephony (RT) Procedure-Introduction, Advantages, Disadvantages, Need for standard- Procedures-Types of Radio Telephony Communication-Radio telephony procedure, Documentation.

UNIT V **9 Hours**

ARMED FORCES AND NCC GENERAL

Introduction to Digital Signal Processors- Basic Classification-Features TMS320C6713 Architecture-Functional Unit-Pipelining- Addressing Modes -Instruction set Simple Assembly Language Program.

Total: 45 Hours

Reference(s)

1. Director General NCC Website: https://indiancc.nic.in/ncc-general-elective-subject-course-design/.
2. Grooming Tomorrow‟s Leaders, published by DG, NCC. https://indiancc.nic.in/.
3. Youth in Action, published by DG, NCC. https://indiancc.nic.in/.
4. The Cadet, Annual Journal of the NCC. https://indiancc.nic.in/.
5. Précis Issued by respective Service Headquarters on specialized subject available to PI Staff as reference material. https://indiancc.nic.in/.

22OAI01 FUNDAMENTALS OF DATA SCIENCE

3 0 0 3

Course Objectives

- To learn the basics of data science and statistical inference.
- To understand the concept of data pre-processing.
- To visualize the processed data using visualization techniques.

Programme Outcomes (POs)

PO1.Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2.Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3.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.

PO4.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.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PSO1. Ability to design and develop Artificial Intelligence algorithms, tools and techniques for solving real world problems.

PSO2. Ability to identify and use appropriate analytical tools and techniques on massive datasets to extract information.

Course Outcomes (COs)

1. Assess the basics of data science and exploratory data analysis.
2. Analyze the useful information using mathematical skills.
3. Demonstrate the usage of statistical inference and regression models.
4. Find various data operations for cleaning and grouping of data.
5. Implement the visualization of data using visualization tools.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	2	2	-	-	-	-	-	-	-	3	3	-
2	3	3	3	3	3	-	-	-	-	-	-	-	3	3	-
3	3	3	3	3	3	-	-	-	-	-	-	-	3	3	-
4	3	3	3	3	3	-	-	-	-	-	-	-	3	3	-
5	3	3	3	3	3	-	-	-	-	-	-	-	3	3	-

UNIT I **9 Hours**

INTRODUCTION

Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleaning, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications.

UNIT II **9 Hours**

DESCRIPTIVE STATISTICS I

Frequency distributions – Outliers – relative frequency distributions – cumulative frequency distributions – frequency distributions for nominal data – interpreting distributions – graphs – averages – mode – median – mean – averages for qualitative and ranked data – describing variability– range – variance – standard deviation – degrees of freedom – interquartile range.

UNIT III **9 Hours**

DESCRIPTIVE STATISTICS II

Normal distributions – z scores – normal curve problems – finding proportions – finding scores – more about z scores – correlation – correlation coefficient for quantitative data – computational formula for correlation coefficient – regression – regression line – least squares regression line – standard error of estimate – interpretation of r^2.

UNIT IV **9 Hours**

PYTHON FOR DATA HANDLING

Basics of Numpy arrays – aggregations – computations on arrays – comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – hierarchical indexing – combining datasets – aggregation and grouping.

UNIT V **9 Hours**

DATA VISUALIZATION

Types of data visualization: Exploratory, Explanatory, visualization with matplotlib – line plots – scatter plots – visualizing errors – density and contour plots – histograms, binnings, and density – three-dimensional plotting– geographic data – data analysis using statmodels and seaborn – graph plotting using Plotly **-** Visualization Tools: Tableau.

Total: 45 Hours

Reference(s)

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016.
2. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017.
3. Jake VanderPlas, “Python Data Science Handbook”, O‟Reilly, 2016.
4. Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green Tea Press, 2014.
5. https://www.coursera.org/specializations/data-science-fundamentals.
6. https://www.coursera.org/learn/foundations-of-data-science
7. https://onlinecourses.swayam2.ac.in/imb23_mg64/preview
8. https://www.udemy.com/course/the-data-science-course-complete-data-science-bootcamp/

22OAM01 COMPUTER VISION IN HEALTHCARE APPLICATION 3 0 0 3

Course Objectives

- Understand the algorithms and techniques used in image formation.
- Implement the motion computation and 3D vision to generate 3-dimensional imagesof an object.
- Develop computer vision tools to assist surgeons during procedures, providing real- time feedback and guidance.

Program Outcomes (POs)

PO1.Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

PO2.Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3.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.

PO4.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.

PO5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PSO1. Ability to design and develop Artificial Intelligence algorithms, tools and techniques for solving real world problems.

Course Outcomes (COs)

1. Interpret the image processing techniques for computer vision.
2. Implement the image pre-processing techniques.
3. Demonstrate 3D vision and motion related techniques.
4. Compute Vision for physical rehabilitation and training.
5. Analysis of Medical Image for Predictive Analytics and Therapy.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	1	1	-	-	-	-	-	-	-	-	-	2	-	-
2	2	3	2	-	3	-	-	-	-	-	-	-	3	-	-
3	2	2	2	-	2	-	-	-	-	-	-	-	3	-	-
4	2	3	3	-	3	-	-	-	-	-	-	-	3	-	-
5	2	3	3	2	3	-	-	-	-	-	-	-	3	-	-

UNIT I **10 Hours**

COMPUTER VISION FOUNDATIONS

History of Computer Vision – Basics of Image Processing, Machine Learning – Information Retrieval – Neuroscience – Robotics – Speech – Cognitive Sciences –Algorithms, Systems and Theory .Image Processing - Colour - Linear Algebra Primer - Pixels and Filters – Edge Detection - Features and Fitting - Feature Descriptors - Image Resizing - Segmentation - Semantic Segmentation - Clustering - Object recognition - Dimensionality Reduction - Face Identification - Visual Bag of Words - Object Detection from Deformable Parts - Semantic Hierarchies and Fine Grained Recognition - Motion - Tracking - Deep Learning

UNIT II **10 Hours**

IMAGE FORMATION AND IMAGE PRE-PROCESSING

Geometric primitives and transformations – Photometric image formation – The digital camera – Point operators – Linear Filtering – More neighbourhood operators – Fourier transforms – Pyramids and wavelets – Geometric transformations – Global optimization. Feature detection and matching – Segmentation – Edge detection - 2D and 3D feature based alignment – Pose estimation – Geometric intrinsic calibration – Triangulation – Two-Frame Structure from motion – Factorization – Bundle adjustment – Constrained Structure and Motion – Dense motion estimation.

UNIT III **7 Hours**

3D VISION

Methods for 3D Vision - 3D reconstruction – Image based rendering, Image Recognition – Object Detection – Space, Instance and Category Recognition – Recognition Databases and test sets.

UNIT IV **9 Hours**

COMPUTER VISION FOR ASSISTING HEALTHCARE APPLICATIONS

UNIT V **9 Hours**

HEALTH CARE APPLICATIONS AND CONTEMPORARY ISSUES

Analysis of Medical Image - Computer Vision for Predictive Analytics and Therapy - Fundamental Algorithms for Medical Images - Machine Learning Algorithms for Medical Images – Deep learning approaches for healthcare applications - Contemporary issues.

Total: 45 Hours

Reference(s)

1. Ranjay Krishna, "Computer Vision: Foundations and Applications", Stand ford University, December 2017.
2. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer 2011.
3. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.
4. Forsyth D A and Ponce J, "Computer Vision: A Modern Approach", Prentice Hall, 2003.
5. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Third Edition, Academic Press, 2012.
6. Forsyth D A and Ponce J, "Computer Vision: A Modern Approach", Prentice Hall, 2003.

22OAM02 NEURAL NETWORKS 3 0 0 3

Course Objectives

- To understand the major concepts in deep neural networks.
- To apply Convolutional Neural Network architectures for any real-life applications.
- To analyse the key computations underlying deep learning to build and train deepneural networks for various tasks.

Program Outcomes (POs)

PO1.Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

PO2.Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3.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.

PO5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PSO1. Ability to design and develop Artificial Intelligence algorithms, tools and techniques for solving real world problems.

Course Outcomes (COs)

1. Apply Convolution Neural Network for any suitable applications.
2. Analyze the various classifiers of Single-layer perceptron.
3. Apply Convolutional Neural Networks and its variants for any suitable applications.
4. Analyze the Single-layer Feedback Networks with its mathematical foundation.
5. Analyze the various categories of associative memory with its case studies.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	1	-	1	-	-	-	-	-	-	-	2	-	-
2	2	2	3	-	3	-	-	-	-	-	-	-	2	-	-
3	1	3	3	-	3	-	-	-	-	-	-	-	2	-	-
4	2	2	2	-	3	-	-	-	-	-	-	-	2	-	-
5	2	2	1	-	3	-	-	-	-	-	-	-	2	-	-

UNIT I **9 Hours**

INTRODUCTION

Fundamental concepts and Model: Models of artificial Neural Networks, Neural processing, Learning and Adaptation, Neural network Learning rules- Hebbian rule, Perceptron rule, Delta rule.

UNIT II **9 Hours**

SINGLE LAYER PERCEPTRON MODEL

Single-layer perceptron classifiers: Classification model, Features and decision regions, Discriminant functions, Linear machine and Minimum distance classification, Non- parametric training concept, Training and Classification using the Discrete perceptron: algorithm and example, Single layer continuous Perceptron networks for linearly separable classifications.

UNIT III **9 Hours**

MULTI LAYER FEED FORWARD NETWORKS

Multilayer feed forward Networks: Linearly separable Pattern classification, Delta learning rule for Multiperceptron model, Generalized Delta learning rule, Feed forward recall and error back propagation training.

UNIT IV **9 Hours**

SINGLE LAYER FEEDBACK NETWORKS

Single-layer Feedback Networks: Basic concepts of dynamic systems, Mathematical foundations of Discrete-time Hopfield Networks, Mathematical foundations of Gradient type Hopfield networks, Associative memories: Basic concepts, Linear Associator.

UNIT V **9 Hours**

ASSOCIATIVE MEMORY

Bidirectional associative memory - associative memory for spatio-temporal patterns - Case study: Implementation of NN in any simulator. Self-Learning: Bidirectional Associative memory.

Total: 45 Hours

Reference(s)

1. E. A.E and S. J.E, "Introduction to Evolutionary Computing | The on-line accompaniment to the book Introduction to Evolutionary Computing", Evolutionary computation.org, 2015.
2. F. Lobo, "Evolutionary Computation 2018/2019", Fernandolobo.info, 2018.
3. "EC lab Tools", Cs.gmu.edu, 2008.
4. "Kanpur Genetic Algorithms Laboratory", Iitk.ac.in, 2008.
5. "Course webpage Evolutionary Algorithms", Liacs.leidenuniv.nl, 2017.

22OBM01 OCCUPATIONAL SAFETY AND HEALTH IN PUBLIC HEALTH EMERGENCIES

3 0 0 3

Course Objectives

- To know about Occupational safety and health (OSH).
- To discuss about risks faced by emergency responders during disease outbreaks and other emergencies.
- To create awareness on necessary strategies for managing OSH in emergency situations.

Programme Outcomes (POs)

PO2.Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3.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.

PO4.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.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO12. 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.

PSO2. Critically analyze the current healthcare systems and develop innovative solutions effectively through problem specific design and development using modern hardware and software tools.

Course Outcomes (COs)

1. Assess the occupational safety measures by the scientific knowledge to overcome the risks faced by emergency responders.
2. Apply appropriate strategies and tools in Occupational safety and healthcare.
3. Analyze common risks for safety and health in emergencies.
4. Apply appropriate occupational safety practices in chemical accidents.
5. Assess Occupational safety measures in radiation incidents.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	3	2	1	-	-	-	1	-	-	-	2	-	2	-
2	-	2	2	2	-	-	-	1	-	-	-	2	-	2	-
3	-	3	2	2	-	-	-	1	-	-	-	2	-	2	-
4	-	2	2	2	-	-	-	1	-	-	-	2	-	2	-
5	-	3	2	2	-	-	-	1	-	-	-	2	-	2	-

UNIT I **9 Hours**

MANAGEMENT ASPECTS

Management system approach to occupational safety and health hazards and risks – rights, duties and responsibilities of employers and workers during outbreaks and emergencies – Emergency responders health monitoring and surveillance.

UNIT I **9 Hours**

TRATEGIES AND TOOLS

International Health Regulations, 2005 – Incident command system for managing outbreaks and emergencies – Occupational safety and health controls – Strategies for infection prevention and control.

UNIT III **9 Hours**

COMMON RISKS FOR SAFETY AND HEALTH IN EMERGENCIES

Vector-borne diseases, water and food-borne diseases, Vaccine-preventable diseases – Heat stress - Slips, trips and falls - Road traffic injuries – Ergonomic hazards - Violence – Psychological stress during outbreaks and injuries.

UNIT IV **9 Hours**

OCCUPATIONAL SAFETY AND HEALTH IN CHEMICAL INCIDENTS

Emergencies caused by chemical incidents – occupational safety and health hazards and risks of chemicals – Personal Protective Equipment – Decontamination of emergency response personnel – medical surveillance of emergency responders

UNIT V **9 Hours**

OCCUPATIONAL SAFETY AND HEALTH IN RADIATION INCIDENTS

Sources and scenarios of radiation incidents – guidance for protection of emergency responders - Occupational health surveillance of persons occupationally exposed to radiation in emergencies

Total: 45 Hours

Reference(s)

1. Emergency responder health monitoring and surveillance. National Response Team technical assistance document. Atlanta (GA): National Institute for Occupational Safety and Health; 2012.
2. Emergency response framework (ERF). Geneva: World Health Organization; 2013.
3. Guidelines on occupational safety and health management systems, second edition. Geneva: International Labour Organization; 2009.
4. OSH management system: a tool for continual improvement. Geneva: International Labour Organization; 2011.
5. OECD Environmental Outlook to 2050: the consequences of inaction. Paris: Organization for Economic Co-operation and Development; 2012.

22OBM02 AMBULANCE AND EMERGENCY MEDICAL SERVICE MANAGEMENT

3 0 0 3

Course Objectives

- To understand the ambulance & transport management and allied services.
- To compare the ambulance design and equipment, transportation and corporate Profit.
- To carry-out various acts governing transport management.

Programme Outcomes (POs)

PO1.Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2.Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PSO1.Apply knowledge on foundation in Life Science, engineering, mathematics and current biomedical engineering practices with an ability to demonstrate advanced knowledge of a selected area within Biomedical Engineering.

PSO2. Critically analyze the current healthcare systems and develop innovative solutions effectively through problem specific design and development using modern hardware and software tools.

Course Outcomes (COs)

1. Find ambulance services, types and allied services.
2. Analyze minimum ambulance rescue equipment and developing a transportation Strategy.
3. Assess the Emergency response team, Transportation interfaces, Transportation Service Characteristics& regulatory reforms involved.
4. Show ambulance services, types and allied services.
5. FInd minimum ambulance rescue equipment and developing a transportation Strategy.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	-	-	-	-	-	-	-	-	-	-	-	2	-
2	2	-	-	-	-	-	-	-	-	-	-	-	-	3	-
3		2	-	-	-	-	-	-	-	-	-	-	-	2	-
4	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
5	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-

UNIT I **9 Hours**

INTRODUCTION

Introduction-transportation ambulance types-Advanced Life Support Ambulance-Basic Life Support Ambulance-Patient Transport Ambulance-Emergency Services-Ambulances-Allied services-telephone management

UNIT II **9 Hours**

AMBULANCE DESIGN AND EQUIPMENT

Design and Equipment of Ambulances -Minimum Ambulance Rescue Equipment-Emergency drugs medicines Recruitment validation Training to handle in house Ambulance emergency procedures Checklist measures Roles of paramedics, midwives, community nurses, hospice workers in emergency handling via ambulance

UNIT III **9 Hours**

TRANSPORTATION REGULATION FOR EMERGENCY MEDICAL SERVICE

Crisis Management-Anxiety & Stress Management-the Emergency response team-police assistance- Information handling & processing-Establishing customer service levels - Developing and Reporting customer service standards - Impediments to an Effective customer Service strategy - Improving customer Service Performance Transportation

UNIT IV **9 Hours**

AMBULANCE PREVENTIVE MAINTENANCE

Legal obligations Switch Console Front, Main Electrical, Patient Compartment Climate Oxygen System On Board Suction system 110/12 VOLT system, Modular Body, Medical Equipment - Cot & Stretcher, safety belts-driver(s), passenger, Patients-child restraint device-incubator

UNIT V **9 Hours**

THE MOTOR VEHICLE ACT

The Motor Vehicle Act, 1988- Rules of the road Regulations 1989- Overall Dimensions of Motor Vehicles (Prescription of conditions for exemption) Rules 1991-Use of Red light on the top front of the vehicle.

Total: 45 Hours

Reference(s)

1. Fawcett, "Supply Chain Management", Pearson Education India, 01-Sep-2008 - 600 pages.
2. B. Feroz, A. Mehmood, H. Maryam, S. Zeadally, C. Maple and M. A. Shah, "Vehicle-Life Interaction in Fog-Enabled Smart Connected and Autonomous Vehicles," in IEEE Access, vol. 9, pp. 7402-7420, 2021, Doi: 10.1109/ACCESS.2020.3049110.
3. R. Jin, T. Xia, X. Liu, T. Murata and K. -S. Kim, "Predicting Emergency Medical Service Demand with Bipartite Graph Convolutional Networks," in IEEE Access, vol. 9, pp. 9903-9915, 2021, Doi: 10.1109/ACCESS.2021.3050607.
4. Les Pringle, "Call the Ambulance", Transworld Publishers, 2010.
5. Edward J. Bardi, John Joseph Coyle, Robert A. Novack "Management of Transportation", Thomson/South-Western, 2006.

22OBM03 HOSPITAL AUTOMATION **3 0 0 3**

Course Objectives

- To introduce the concepts of hospital systems and need for central monitoring.
- To exemplify the power generation, utility and protection systems.
- To apply the distributed and central monitoring functions in hospital environment.

Programme Outcomes (POs)

PO1.Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2.Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PSO1.Apply knowledge on foundation in Life Science, engineering, mathematics and current biomedical engineering practices with an ability to demonstrate advanced knowledge of a selected area within Biomedical Engineering.
PSO2. Critically analyze the current healthcare systems and develop innovative solutions effectively through problem specific design and development using modern hardware and software tools.

Course Outcomes (COs)

1. Find the factors in central power generating and monitoring systems.
2. Analyze the sensors and actuators for the automation systems.
3. Analyze the equipment types and its applications.
4. Apply software tools and digital computer for monitoring of parameters and medical data handling.
5. Design central monitoring station for hospitals for control and surveillance applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
2	-	2	-	-	-	-	-	-	-	-	-	-	-	2	-
3	-	2	-	-	-	-	-	-	-	-	-	-	3	-	-
4	-	2	-	-	-	-	-	-	-	-	-	-	-	2	-
5	3	-	-	-	-	-	-	-	-	-	-	-	-	2	-

UNIT I **9 Hours**
AUTOMATION IN HEALTHCARE
Introduction to automation Role of automation in healthcare Remote Patient Monitoring Maximizing resources on patient care Reducing variability, Automating clinician and patient interactions through products.

UNIT II **9 Hours**
POWER GENERATION AND MEDICAL GAS PRODUCTION
Power generator, Battery: Maintenance and troubleshooting, energy conservation and monitoring system - Automation in dryer, compressor, air conditioning, lighting, heating systems.

UNIT III **9 Hours**

AUTOMATION IN PIPING

Monitoring of flow and pressure of medical gas System components Vacuum control units Automatic changeover system - Types of Outlets - Leakage test- Prevention and safety automation.

UNIT IV **9 Hours**

INSTRUMENTATION SYSTEMS

Optical sensors, Pressure Sensors - Ultrasonic Sensors - Tactile Sensors - Thermal sensors -Biosensor - Linear Actuators, Central monitoring station - Alarm system - Regulation and standards.

UNIT V **9 Hours**

APPLICATIONS

Business intelligence & executive dashboards - Radio-Frequency Identification (RFID)- based patient and asset tracking solutions - Tablet-based applications for bed side access to doctors/nurses - Healthcare CRM for patient relationship management - Patient kiosk, tele-health - HIS integration.

Total: 45 Hours

Reference(s)

1. Khandpur RS, Handbook of Biomedical Instrumentation, Prentice Hall of India, New Delhi, 3rd edition, 2014.
2. Joseph J. Carr and John M. Brown, Introduction to Biomedical Equipment Technology, Pearson Education India, Delhi, 4th edition 2008.
3. Curtis Johnson D Process Control Instrumentation Technology, Prentice Hall of India, 8th edition 2006.
4. John V. Grimaldi and Rollin H. Simonds., Safety Management, All India Travelers Book seller, New Delhi, 1989.
5. N.V. Krishnan, Safety in Industry, Jaico Publisher House, 1996.

22OIT01 DATA STRUCTURES 3 0 0 3

Course Objectives

- To understand the basic concepts such as Abstract Data Types, Linear and Non-Linear Data structures
- To analyze the performance of algorithms using time and space complexity.
- To understand the behavior of Linear and Non-Linear data structures
- To choose the appropriate data structures for a specified application
- To write programs in C++ to solve problems using various data structures.

Programme Outcomes (POs)

PO1.Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2.Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3.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.
PO5.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.
PO7.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.
PSO1: Design and develop cost effective, secure, reliable IT, network and web-based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Analyze the performances of the sorting and searching algorithms.
2. Apply linked list linear data structures operations using dynamic memory allocation.
3. Apply stack and Queue data structure operations to solve computational problems.
4. Design tree data structures and hashing techniques for effective searching of data.
5. Create algorithms for solving real world problems using Graph data structure.

Articulation Matrix

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

UNIT I **8 Hours**
INTRODUCTION

Introduction to data structures-types of data structures- Pseudo code - Abstract data types - ADT Implementations performance analysis- time complexity and space complexity- basics of OOPS concepts.

UNIT II **9 Hours**

SORTING AND SEARCHING TECHNIQUES

Searching methods: Linear and binary search methods, Sorting techniques: Insertion Sort - Selection Sort - Bubble Sort - Merge sort - Quick sort.

UNIT III **11 Hours**

LINEAR DATA STRUCTURES

Stack operation - Stack ADT - Applications of stack - Queues operations - Queue ADT - Queue applications – Linked List - Circular - Doubly linked list.

UNIT IV **11 Hours**

TREE

Basic Tree concepts - Binary Trees - Tree Traversals - Binary Search Trees – B Tree - Heap concepts - Heap ADT.

UNIT V **6 Hours**

GRAPHS

Introduction – types of graphs- Shortest Path Algorithms: Unweighted Shortest Paths - Dijkstra's Algorithm. Minimum Spanning Tree: Prim's Algorithm - Kruskal's Algorithm- graph search methods DFS, BFS

Total: 45 Hours

Reference(s)

1. A Abirami, Priya R L, Advanced Data Structures and Algorithms, BPB publisher, 2023 March.
2. Data Structures using C++, Special Edition-MRCET, Tata McGraw-Hill Publishers 2017.
3. Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and Mount, Wiley student edition, John Wiley and Sons, 2011.
4. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition, 2013.
5. D.S. Malik, Data Structures Using C++, Second Edition, 2010.

22OIT02 C++ PROGRAMMING 2 0 2 3

Course Objectives

- To understand the concept of Object-Oriented Programming.
- To apply the Object-Oriented concepts to solve problems using C++.

Programme Outcomes (POs)

PO1.Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2.Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3.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.

PO5.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.

PSO1.Design and develop cost effective, secure, reliable IT, network and web-based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Implement C++ programs using classes and objects.
2. Find C++ programs using the concept of Inheritance.
3. Design applications using virtual functions.
4. Apply the concept of Operator overloading.
5. Find GUI applications using C++ library classes.

Articulation Matrix

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

UNIT I **5 Hours**

BASICS OF C++ PROGRAMMING

C++ Program Structure, Character Set and Tokens, Data Type, Type Conversion, Preprocessor Directives, Namespace, Input/output Streams and Manipulators, Dynamic Memory Allocation with new and delete, Control Statements. Functions: Function Overloading, Inline Functions, Default Argument, Pass by Reference, Return by Reference, Scope and Storage Class. Pointers: Pointer variables declaration & initialization, Operators in pointers, Pointers and Arrays, Pointer and Function.

UNIT II **6 Hours**

CLASSES & OBJECTS

A Simple Class and Object, accessing members of class, Initialization of class objects: (Constructor, Destructor), Default Constructor, Parameterized Constructor, Copy Constructor, The Default Copy Constructor, Objects as Function Arguments, Returning Objects from Functions, Structures and Classes, Memory allocation for Objects, Static members, Member functions defined outside the class.

UNIT III **7 Hours**

OPERATOR OVERLOADING & INHERITANCE

Fundamental of operator overloading, Restriction on operator overloading, Operator functions as a class member, Overloading unary and binary operator, Introduction to inheritance, Derived Class and Base Class, Access Specifiers (private, protected, and public), Types of inheritance.

UNIT IV **6 Hours**

VIRTUAL FUNCTION & POLYMORPHISM

Concept of Virtual functions, Late Binding, Abstract class and pure virtual functions, Virtual Destructors, Virtual base class, Friend function and Static function, Assignment and copy initialization, Copy constructor, This pointer, Concrete classes, Polymorphism and its roles.

UNIT V **6 Hours**

FUNCTION TEMPLATES AND EXCEPTION HANDLING

Function templates, Function templates with multiple arguments, Class templates, templates and inheritance, Exceptional Handling (Try, throw and catch), Use of exceptional handling.

Experiment 1 **3 Hours**

Introduction to Object Oriented Programming- Classes and Objects.

Experiment 2 **5 Hours**

Programs using Constructor, Destructor

Experiment 3 **4 Hours**

Programs on operator overloading.

Experiment 4 **5 Hours**

Programs on Inheritance

Experiment 5 **3 Hours**

Programs on Virtual Function

Experiment 6 **3 Hours**

Programs on Friend Function

Experiment 7 **3 Hours**

Programs on exception handling

Experiment 8 **4 Hours**

Programs on Function and Class Templates

Total 60 Hours

Reference(s)

1. E Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill Publishing, New Delhi, 2011.
2. Robert Lafore, Object Oriented Programming in C++, Galgotia Publication, 2010.
3. B Trivedi, Programming with ANSI C++, Oxford University Press, 2010.
4. H M Deitel and P J Deitel, C++ How to Program, Seventh Edition, Prentice Hall, 2010.
5. K R Venugopal, Rajkumar and T Ravishankar, Mastering C++, Tata McGraw Hill Publishing, New Delhi, 2010.

22OIT03 PROGRAMMING IN JAVA 2 0 2 3

Course Objectives

- To understand the concept of Object-Oriented Programming
- To develop console applications using Java.
- To develop GUI applications using Java library classes.

Programme Outcomes (POs)

PO1.Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2.Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3.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.

PO5.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.

PSO1.Design and develop cost effective, secure, reliable IT, network and web-based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Implement Java programs using classes and objects.
2. Create Java programs using the concept of Inheritance.
3. Design applications using functions, files and exceptions.
4. Create console applications using Java OOPS.
5. Create GUI applications using Java library classes.

Articulation Matrix

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

UNIT I **6 Hours**

INTRODUCTION TO OOP AND JAVA FUNDAMENTALS

Object Oriented Programming - Abstraction - objects and classes- Encapsulation- Inheritance- Polymorphism- OOP in Java - Characteristics of Java - The Java Environment -Java Source File -Structure - Compilation. Fundamental Programming Structures in Java - Defining classes in Java - constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays, Packages- JavaDoc comments.

UNIT II **6 Hours**

INHERITANCE AND INTERFACES

Inheritance -Super classes- sub classes –Protected members - constructors in sub classes- the Object class - abstract classes and methods- final methods and classes - Interfaces - defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists - Strings.

UNIT III **6 Hours**

EXCEPTION HANDLING AND I/O

Exceptions - exception hierarchy - throwing and catching exceptions - built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics - Streams -Byte streams and Character streams - Reading and Writing Console - Reading and Writing Files

UNIT IV **6 Hours**

MULTITHREADING AND GENERIC PROGRAMMING

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming - Generic classes - generic methods -Bounded Types - Restrictions and Limitations.

UNIT V **6 Hours**

EVENT DRIVEN PROGRAMMING

Graphics programming - Frame - Components -working with 2D shapes - Using color, fonts, and images - Basics of event handling -event handlers -adapter classes -actions - mouse events -AWT event hierarchy- Introduction to Swing- layout management - Swing Components -Text Fields, Text Areas -Buttons- Check Boxes -Radio Buttons -Lists- choices- Scrollbars -Windows -Menus - Dialog Boxes.

Experiment 1 **4 Hours**

Introduction to Object Oriented Programming- Classes and Objects.

Experiment 2 **5 Hours**

Programs using inheritance and polymorphism

Experiment 3 **5 Hours**

Programs on operator overloading.

Experiment 4 **5 Hours**

Programs on exception handling

Experiment 5 **5 Hours**

Programs on multi-threading in java

Experiment 6 **6 Hours**

Programs on java swing

Total 60 Hours

Reference(s)

1. Herbert Schildt, Java: The Complete Reference, Eleventh Edition, McGraw-Hill Education, 2018.
2. D.T. Editorial Services, Java 8 Programming Black Book, second edition, Dreamtech Press, 2015.
3. Vaskaran Sarcar, Interactive Object-Oriented Programming in Java, Second edition, Apress, 2019.

22OAG01 RAIN WATER HARVESTING TECHNIQUES 3 0 0 3

Course Objectives

- To enhance the awareness about water resources management and conservation
- To acquire knowledge about water harvesting techniques and their implementation.
- To practice the design aspects of sustainable rainwater harvesting solutions for communities.

Programme Outcomes (POs)

PO1.Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2.Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3.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.

PO7.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.

PSO2. Improvise technologies to minimize the crop loss from field damage during harvesting, sorting, processing, and packaging.

Course Outcomes (COs)

1. Assess the sources, availability and challenges in water resources management.
2. Assess various water harvesting systems in practice.
3. Execute design considerations for comparing surface runoff harvesting methods.
4. Compare the characteristics and impacts of flood water harvesting techniques.
5. Evaluate various rainwater harvesting methods for groundwater recharging.

Articulation Matrix

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

UNIT I **8 Hours**

WATER RESOURCES AND CONSERVATION CHALLENGES

Global water distribution – primary and secondary sources of water – technical, social and cultural aspects; Global challenges in water and climate – water scarcity – water pollution – Indian scenario; Water resources management – public participation – integrated approach; Water governance – water sharing plans – policy, schemes and concerns.

UNIT II **10 Hours**

WATER RESOURCES

Principles of water harvesting for rural and urban – collection at micro and macro levels, flow control, storage and uses; Rainwater harvesting systems – traditional and contemporary – groundwater recharge; Water resources inventory – site analysis – database collection – water allocation principles based on demand and supply; Traditional water harvesting systems – practices in India – references in old texts – reasons for their deterioration – way forward; Watershed-based approach – project planning at micro and macro levels – community participation – rain centres.

UNIT III **9 Hours**

SURFACE RUNOFF HARVESTING

Short-term and micro-level harvesting techniques for runoff – terracing and bunding – rock and ground catchments; Long-term and macro-level harvesting techniques for runoff – farm ponds – percolation ponds and nala bunds; Design considerations – site selection – selection of runoff coefficients – computation of rainwater runoff volume – hydrograph analysis – cost estimation; Design of storage structures – storage capacity – selection of component – methods of construction.

UNIT IV **9 Hours**

FLOOD WATER HARVESTING

Floods – causes of urban floods and droughts – characteristics of water spread – impacts; Flood water harvesting – permeable rock dams – water spreading bunds – flood control reservoir; Design considerations – computation of flood water quantity; Trenching and Diversion Structures – types – site selection – design criteria – most economic section – design consideration of ditch system.

UNIT V **9 Hours**

GROUNDWATER HARVESTING

Rooftop rainwater harvesting – recharge pit – recharge trench – tube well – recharge well; artificial recharge – gully plug – dug well – percolation tank – nala bunds – recharge shaft; Groundwater harvesting – aquifer characteristics – subsurface techniques – infiltration wells – recharge wells – groundwater dams; Design of drainage system – types – design criteria – filter design – causes of failures

Total: 45 Hours

Reference(s)

1. Theib YO, Dieter P, Ahmed YH, Rainwater Harvesting for Agriculture in the Dry Areas, CRC Press, Taylor and Francis Group, London, 2012.
2. Lancaster, Brad. Rainwater Harvesting for Drylands and Beyond, Volume 1, 3rd edition, Rain source Press. 2019.
3. Das M, Open Channel Flow, Prentice Hall of India Pvt. Ltd., New Delhi, 2008.
4. Michael AM, Ojha TP, Principles of Agricultural Engineering, Volume II, 4th Edition, Jain Brothers, New Delhi, 2003.
5. Suresh R, Soil and Water Conservation Engineering, Standard Publisher Distributors, New Delhi, 2014.
6. Singh G, Venkataramanan C, Sastry G, Joshi BP, Manual of Soil and Water Conservation Practices, CSWCR&TI, Dehradun, 1990.
7. https://onlinecourses.swayam2.ac.in/cec21_ge14/preview
8. https://archive.nptel.ac.in/content/storage2/courses/105101010/downloads/Lecture10.pdf

22OEE01 VALUE ENGINEERING 3 0 0 3

Course Objectives

- To understand the concept of value engineering in order to reduce cost of product or process or service.
- To implement creative and innovative techniques using FAST diagram.
- To study benefits of Value Engineering for various industries.

Programme Outcomes (POs)

PO10.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.
PO11.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.
PO12. 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.
PSO1. Design, analyze, and evaluate the performance of real-world problems in the field of Electrical and Electronics using contemporary tools
PSO2. Apply knowledge skills and attitude to conduct experiments and interpret data to solve complex engineering problems in the power systems network, power electronics, electric drives and develop control strategies by considering economic and environmental constraints.

Course Outcomes (COs)

1. Apply the concepts of value and value engineering to prepare a job plan.
2. Analyze the cost and worth of a product/service using the principles of economics.
3. Evaluate the value of a product/service to take managerial decisions.
4. Apply the soft skills in understanding team building, team work and report writing.
5. Asses the functions and values of product/services in industries using case studies.

Articulation Matrix

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

UNIT I **8 Hours**

INTRODUCTION TO VALUE ENGINEERING

Historical perspective of Value Engineering, Aims and objectives of Value Engineering, Concept of Value, Value Engineering concerned with Economic Value, Value Engineering Job plan.

UNIT II **9 Hours**

FUNCTIONAL ANALYSIS

Function-Cost-Worth analysis: Function Analysis System Technique (FAST); Review of principles of engineering economics.

UNIT III **10 Hours**

EVALUATION OF VALUE ENGINEERING

Evaluation of function, Problem setting system, problem solving system, setting and solving management - decision - type and services problem, evaluation of value.

UNIT IV **9 Hours**

HUMAN ASPECTS IN VALUE ENGINEERING

Team building; Life cycle costing; Managing Value Engineering Study; Value Engineering Report writing; Presentation Skill - Individual and Team Presentations; Implementation and follow-up.

UNIT V **9 Hours**

BENEFITS OF VALUE ENGINEERING

Classification of hazardous zones-intrinsically safe and explosion proof electrical apparatus-increase safe Value Engineering Case studies in the Industries like Manufacturing; Construction; Health Care; Process.

Total: 45 Hours

Reference(s)

1. Anil Kumar Mukhopadhyaya, Value Engineering Mastermind - From Concepts to Certification, Response. Business Books from SAGE, Los Angeles / London / New Delhi / Singapore / Washington DC, 2014.
2. Anil Kumar Mukhopadhyaya, Value Engineering -Concepts, Techniques and Applications, Response Books, A Division of SAGE Publications, New Delhi / Thousand Oaks / London, 2003.
3. R. D. Miles, Techniques of Value analysis & Engineering, McGraw Hill, 2000.
4. E. Midge Arthur, Value Engineering -A Systematic Approach, McGraw Hill Book Co., New York, 2000.
5. Zimmerman, Value Engineering - A Practical Approach, CBS Publishers & Distributors, New Delhi, 2000.
6. https://www.investopedia.com/terms/v/value-engineering.asp#:~:text=Value%20engineering %20promotes%20the%20substitution,is%20also%20called%20value%20analysis.
7. https://cleartax.in/glossary/value-engineering/

22OEE02 ELECTRICAL SAFETY 3 0 0 3

Course Objectives

- To provide knowledge on basics of electrical fire and statutory requirements for electrical safety.
- To understand the causes of accidents due to electrical hazards.
- To know the various protection systems in Industries from electrical hazards.
- To know the importance of earthing.
- To distinguish the various hazardous zones and applicable fire proof electrical devices.

Programme Outcomes (POs)

PO1.Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2.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.
PO6. 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.
PO7. 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.
PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9**.** Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PSO1. Modeling, design and Analysis of Electrical and Electronic Systems using design principles and software tools.
PSO2. Apply the core knowledge and technical skills to develop reliable and sustainable solutions to real world problems.

Course Outcomes (COs)

1. Analyze the basic concepts in electrical circuit and hazards involved in it.
2. Analyze the electrical hazards in the workplace and its impacts.
3. Assess the operation of various protection systems from electrical hazards.
4. Analyze the various safety procedures involved in the industries.
5. Find the different hazardous zones in Industries and their safety measures.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION

Objectives of safety and security measures - Hazards associated with electric current and voltage - principles of electrical safety - working principles of major electrical equipment - Typical supply situation - Indian electricity act and rules - statutory requirements from electrical inspectorate-International standards on electrical safety.

UNIT II **9 Hours**

ELECTRICAL HAZARDS

Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity- Energy leakage-clearances and insulation-classes of insulation-voltage classifications-excess energy- current surges-over current and short circuit current-heating effects of current- Lightning, hazards, lightning arrestor, -national electrical safety code ANSI.

.

UNIT III **9 Hours**

ELECTRICAL SAFETY EQUIPMENT

Fuse, circuit breakers and overload relays - safe distance from lines - capacity and protection of conductor joints and connections, overload and short circuit protection - earth fault protection. FRLS insulation - insulation and continuity test - system grounding - equipment grounding - earth leakage circuit breaker (ELCB) - ground fault circuit interrupter - electrical guards - Personal protective equipment.

UNIT IV **9 Hours**

ELECTRICAL SAFETY OPERATION AND MAINTENANCE

Role of environment in selection - protection and interlock - discharge rod and earthing devices - safety in the use of portable tools - preventive maintenance - installation – earthing, specifications, earth resistance, earth pit maintenance - Fire Extinguishers - CO2 and Dry Powder schemes.

UNIT V **9 Hours**

HAZARDOUS AREAS

Classification of hazardous zones-intrinsically safe and explosion proof electrical apparatus-increase safe equipment-their selection for different zones-temperature classification-grouping of gases-use of barriers and isolators-equipment certifying agencies – electrical safety standards. (IS, API and OSHA standards).

Total: 45 Hours

Reference(s)

1. Fordham Cooper, W., "Electrical Safety Engineering, Butterworth and Company", London, Third Edition, 2013.
2. "Indian Electricity Act and Rules", Government of India.
3. "Power Engineers", Handbook of TNEB, Chennai, 2010.
4. "Accident prevention manual for industrial operations", N.S.C., Chicago, 1982.
5. John Cadick, P.E., Mary Capelli-Schellpfeffer, Dennis K. Neitzel, Al Winfield, "Electrical Safety Handbook", Fourth Edition, Tata McGraw Hill, 2014.
6. https://egyankosh.ac.in/handle/123456789/59158
7. https://tnebes.org/archive/2019/May19/safetymanual%20.pdf
8. https://electricalsafety.lbl.gov/resources/standards/

22OIT04 FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS

2 0 2 3

Course Objectives

- To Understand functional components of the Database Management System
- To Understand need for concurrency and transaction property
- To compare and contrast various indexing strategies in different database systems.

Programme Outcomes (POs)

PO1.Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2.Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. 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.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9**.** Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PSO1. Design and develop cost effective, secure, reliable IT, network and web-based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Analyze the essential concepts and key issues involved in the design of a relational database.
2. Apply the concepts of normalization and ER model to guarantee an efficient database.
3. Analyze the concurrent execution of transaction process and various recoveries from failures
4. Apply indexing and query optimization techniques for a database design.
5. Analyze the various advanced database systems for efficient data storage & NOSQL concepts.

Articulation Matrix

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

UNIT I **6 Hours**

RELATIONAL DATABASES

Purpose of Database System - Views of data - Data Models - Database System Architecture - Introduction to relational databases - Relational Model - Keys - Relational Algebra - SQL fundamentals - Advanced SQL features.

UNIT II **6 Hours**
DATABASE DESIGN
Entity-Relationship model - E-R Diagrams - Enhanced-ER Model - ER-to-Relational Mapping - Functional Dependencies - First, Second, Third Normal Forms, - Boyce/Codd Normal Form- Multivalued Dependencies and Fourth Normal Form

UNIT III **6 Hours**
TRANSACTION
Transaction Concepts - ACID Properties - Schedules - Serializability - Concurrency Control -Need for Concurrency - Locking Protocols - Two-Phase Locking - Deadlock - Transaction Recovery - Save Points - Isolation Levels.

UNIT IV **6 Hours**
FILE AND QUERY PROCESSING
RAID - File Organization - Organization of Records in Files - Indexing and Hashing -Ordered Indices - Static Hashing - Dynamic Hashing - Query Processing Overview - Algorithms for SELECT and JOIN operation.

UNIT V **6 Hours**
ADVANCED DATABASES
Distributed Databases: Architecture, Data Storage, Transaction Processing - Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL - Graph Database.

5 Hours
Experiment 1
Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables with suitable examples.

Experiment 2 **5 Hours**
Implementation of different types of operators in SQL.

- Arithmetic Operators
- Logical Operators
- Comparison Operator
- Special Operator
- Set Operation

Experiment 3 **3 Hours**
Database Querying - Simple queries, Nested queries, Sub queries & Joins.

Experiment 4 **3 Hours**
Implement

- Group By & having clause
- Order by clause
- Indexing

Experiment 5 **4 Hours**
Create a student database table currently stored as a single table. Normalize these structures to meet the 3NF requirements and draw ER model Diagram

Experiment 6 **5 Hours**
Implementation of Database Backup & Recovery commands, Rollback, Commit & Save point.

Experiment 7 **5 Hours**
Develop database for a Book Publishing Company

Total 60 Hours

Reference(s)

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, Database System Concepts, Sixth Edition, Tata McGraw Hill, 2011.
2. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Sixth Edition, Pearson Education, 2011.
3. C.J.Date, A.Kannan, S.Swamynathan, An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006.
4. “Raghu Ramakrishnan, Database Management Systems, Fourth Edition, McGraw-Hill College Publications, 2015.
5. G.K.Gupta,Database Management Systems, Tata McGraw Hill, 2011.
6. https://www.geeksforgeeks.org/introduction-of-dbms-database-management-system-set-1/
7. https://www.javatpoint.com/dbms-tutorial
8. https://onlinecourses.nptel.ac.in/noc22_cs91

22OCB01 INTERNATIONAL BUSINESS MANAGEMENT 3 0 0 3

Course Objectives

- To enable the students to understand the fundamentals of international business.
- To provide competence to the students on making international business decisions.
- To enable the students to understand the financial and promotional assistance available for exporters

Programme Outcomes (POs)

PO1.Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO7.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.
PO9.Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Course Outcomes (COs)

1. Demonstrate the role and importance of digital marketing in today‟s rapidly changing business environment.
2. Find the techniques to help organizations to utilize social media for digital marketing.
3. Analyse the key elements and campaign effectiveness of E-Mail marketing and mobile marketing.
4. Evaluate the effectiveness of a digital marketing campaign using Google Analytics.
5. Apply advanced practical skills to plan, predict and manage digital marketing campaign

Articulation Matrix

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

UNIT I **9 Hours**
INTRODUCTION
Definition, Drivers of International Business, Domestic Vs. International Business, Trade and Investment Theories: Interventionist Theories, Free Trade Theories, Theories Explaining Trade Patterns: PLC Theory, The Porter Diamond, Factor Mobility Theory.

UNIT II **9 Hours**
GLOBALIZATION
Globalization: Implications, Challenges - Protectionism: Tariff Barriers, Non-Tariff Barriers-Forms of Integration, Role of WTO and IMF in International Business, Economic, Political, Cultural and Technological Environments.

UNIT III **9 Hours**

INTERNATIONAL BUSINESS STRATEGIES

Market Entry Strategies, Multinational Strategy, Production Strategy, Marketing Strategy, Human Resource Strategy.

UNIT IV **9 Hours**

FOREIGN EXCHANGE

Foreign Exchange Market – Functions, Theories of Exchange Rate Determination, Exchange Rate Forecasting, Convertibility of Currency, Risks associated with Foreign Exchange.

UNIT V **9 Hours**

EXPORTS AND ETHICS IN INTERNATIONAL BUSINESS

Exports – Risks, Management of Exports, Regulatory frameworks, Export financing, Countertrade, Ethics – Issues, Dilemma and Theory.

Total: 45 Hours

References:

1. John D Daniels, Lee H.Radebaugh, and Sullivan, "International Business", New Delhi: Pearson Education, 2018.
2. Charles W L Hill and Arun Kumar Jain, "International Business", New Delhi: Tata McGraw Hill, 2017.
3. Francis Cherunilam, "International Business", New Delhi: Prentice Hall of India, 2020.
4. Simon Collinson, Rajneesh Narula, Alan M. Rugman, "International Business", New Delhi: Pearson Education, 2020.
5. K.Aswathappa, "International Business", New Delhi: Tata McGraw Hill, 2020.