

**SCHEME and SYLLABUS
for
BACHELOR OF TECHNOLOGY
in**

FASHION & APPAREL ENGINEERING

2020-2021

(B.Tech. I Yr admitted 2020-21 and B.Tech. LEET admitted 2021-22)



**J.C BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCA
FARIDABAD, HARYANA**

Program Educational Objectives (PEOs)

PEO-01	A fundamental knowledge of the basic and engineering sciences and develop mathematical and analytical skills required for fashion & apparel.
PEO-02	Graduates to be equipped with practical skills and experimental practices related to core and applied areas of fashion & apparel to expand their knowledge horizon beyond books. This will prepare the students to take-up career in industries or to pursue higher studies in fashion and interdisciplinary programs.
PEO-03	Graduates will have improved team building, team working and leadership skills with high regard for ethical values and social responsibilities.
PEO-04	Fashion & Apparel graduates will explore and create innovations in various aspects of engineering.

PROGRAMME OUTCOMES (POs) B.TECH. CIVIL ENGINEERING

Engineering Graduates will be able to:

PO-01	Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and fashion and apparel engineering to the solution of engineering problems.
PO-02	Problem Analysis: Identify, formulate, review literature and analyze fashion and apparel engineering problems to design, conduct experiments, analyze data and interpret data.
PO-03	Design /Development of Solutions: Design solution for fashion and apparel engineering problems and design system components of processes that meet the desired needs with appropriate consideration for public health and safety, and cultural, societal and environmental considerations.
PO-04	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 in fashion and apparel engineering.
PO-05	Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to fashion and apparel engineering activities with an understanding of the limitations.
PO-06	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 fashion and apparel engineering practice.
PO-07	Environment and Sustainability: Understand the impact of the fashion and apparel engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.
PO-08	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the fashion and apparel engineering practice.
PO-09	Individual and Teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings in fashion and apparel engineering.
PO-10	Communication: Communicate effectively on complex engineering activities with the engineering committee and with society at large, such as being able to comprehend and write effective reports and design documentation, and make effective presentations in fashion and apparel engineering.
PO-11	Project Management and Finance: Demonstrate knowledge & understanding of the fashion and apparel engineering principles 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 in fashion and apparel engineering.
PO-12	Life-Long Learning: Recognize the need for, and the preparation and ability to engage in independent research and lifelong learning in the broadest context of technological changes in fashion and apparel engineering.

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO-01	To apply practical skills, and knowledge of engineering fundamentals and fashion and apparel engineering, to industries and institutions.
PSO-02	To explore, create and develop innovations in various aspects of engineering. The student will be ready to take-up career or to pursue higher studies with high regard to ethical values and social responsibilities.

Undergraduate Degree Courses in Engineering & Technology

FASHION & APPAREL ENGINEERING

(As per guidelines of All India Council for Technical Education Model Curriculum)

General, Course structure & Theme & Semester-wise credit distribution Definition of Credit:

1Hr. Lecture (L) per week	1 credit
1Hr. Tutorial (T) per week	1 credit
1Hr. Practical (P) per week	0.5 credits
2 Hours Practical (Lab) per week	1 credit

Credits - 172 for a student to be eligible to get Undergraduate degree in Engineering.

Structure of Under graduate Engineering program:

S.No.	Category	Breakup of Credits (Total172)
1	Humanities and Social Sciences including Management Courses	09
2	Basic Science Courses	25
3	Engineering Science courses including workshop, drawing, basics of electrical/ mechanical/ computer etc.	28
4	Professional core courses	54
5	Professional Elective courses relevant to chosen specialization / branch	21
6	Open subjects –Electives from other technical and / or emerging subjects	03
7	Project work, seminar and internship in industry or Appropriate workplace/ academic and research institutions in India/ abroad	20
8	Mandatory Courses [Environmental Sciences, Induction program, Indian Constitution, Essence of Indian Traditional Knowledge]	(non-credit)
	Total	160+ 12*

*03 credit each year through MOOC in First and Second Year.

*03 credit each year of open elective through MOOC in 3rd and 4th Year.

*Refer implementation of Credit Transfer/Mobility Policy of online courses, 17th meeting of Academic Council (11.6.2019) for details, regarding MOOC credits. Minimum credit to be earned is 12 (**03 each year**) through MOOC for all B.Tech. students in this scheme.

Course Code and Definition:

Course code	Definitions
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PCC-FA	Professional core courses
PEC-FA	Professional Elective courses
OEC-FA	Open Elective courses
LC-FA	Laboratory course
MC	Mandatory courses
PROJ-FA	Project

Project / Industrial training:

1.	Project	24 pd / week	12 Credit	VI &VII
2.	Industrial Training	One semester	08 Credit	VIII
	Total		20 Credit	

PROFESSIONAL ELECTIVE COURSE (PEC): TOTAL 08 IN NUMBER**PROFESSIONAL ELECTIVE COURSE-I (PEC-I) (Semester-IV)**

S.No.	Name of Course	Contact Hours	Credits
1	Engineering Economics	3	3
2.	Introduction to fashion retail	3	3
3.	Supply chain management	3	3

Note: Students will have to select any one out of the list.

PROFESSIONAL ELECTIVE COURSE-II (PEC-II) (Semester-IV)

S.No.	Name of Course	Contact Hours	Credits
1.	Structure & properties of textiles	3	3
2.	Preparative wet process	3	3
3.	Principles of management	3	3

Note: Students will have to select any one out of the list.

PROFESSIONAL ELECTIVE COURSE-III (PEC-III) (Semester-V)

S.No.	Name of Course	Contact Hours	Credits
1	Computer aided designing	3	3
2.	Indian business environment	3	3

Note: Students will have to select any one out of the list.

PROFESSIONAL ELECTIVE COURSE-IV(PEC-IV) (Semester-V)

S.No.	Name of Course	Contact Hours	Credits
1.	Apparel merchandising	3	3
2.	Non-woven technology	3	3

Note: Students will have to select any one out of the list.

PROFESSIONAL ELECTIVE COURSE-V(PEC-V) (Semester-VI)

S.No.	Name of Course	Contact Hours	Credits
1	Advance Apparel construction techniques	3	3
2.	Entrepreneurship Development in Fashion and Apparel	3	3

Note: Students will have to select any one out of the list.

PROFESSIONAL ELECTIVE COURSE-VI (PEC-VI) (Semester-VI)

S.No.	Name of Course	Contact Hours	Credits
1	Project Writing	3	3
2.	Automation in Garment Industry	3	3

Note: Students will have to select any one out of the list.

PROFESSIONAL ELECTIVE COURSE-VII (PEC-VII) (Semester-VII)

S.No.	Name of Course	Contact Hours	Credits
1	Elements of fashion	3	3
2.	Fashion Accessories	3	3

Note: Students will have to select any one out of the list.

PROFESSIONAL ELECTIVE COURSE-VIII (PEC-VIII) (Semester-VII)

S.No.	Name of Course	Contact Hours	Credits
1	Home & industrial textile product	3	3
2.	Technical & specialty textile & apparel	3	3

Note: Students will have to select any one out of the list.

**Note: PEC FAEL -302-2 Apparel Merchandising: indicates that in the 5th Sem.*

***Scheme subject code is PEC FAEL-302 and No.2 is chosen in this semester.*

OPEN ELECTIVE COURSE(OEC):

Note: Students must select one open Elective Courses from the given list:

Course Code	Name of Course	Contact Hours	Credits
Civil OEC3-OE1	Research and IPR	3 L	3 credits
Civil OEC3-OE2	Energy Studies	3 L	3 credits
Civil OEC3-OE3	Life Science	3 L	3 credits
Civil OEC3-OE5	Safety Engineering	3 L	3 credits
OEC-21	Introduction to HRM	3 L	3 credits
OEC-23	Marketing Management	3 L	3 credits
OEC-24	Entrepreneur Development	3 L	3 credits

***Imp.: In addition 02 open elective course through MOOC.**

J C BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCA FARIDABAD
SCHEME OF STUDIES & EXAMINATIONS
B. TECH 1st YEAR (SEMESTER –I) CIVIL ENGINEERING (2022-23)

Course Code	Course Title	L	T	P	Credits	Sessional	External	Category Code
BSC101B	Physics (Mechanics)	3	1	-	4	25	75	BSC
BSC 103D for FAE	Mathematics-I (Civil: Calculus, Multivariable Calculus & Linear Algebra)	3	1	-	4	25	75	BSC
ESC102	Engineering Graphics & Design	-	-	4	2	30	70	ESC
ESC103	Programming for Problem solving	3	-	-	3	25	75	ESC
ESC104	Workshop- I	-	-	4	2	30	70	ESC
BSC104	Physics lab	-	-	3	1.5	15	35	BSC
ESC105	Programming for Problem solving Lab	-	-	4	2	15	35	ESC
	Total Credit				18.5			

Note: Exams duration will be as under

- a. Theory exams will be of 03 hours duration.
- b. Practical exams will be of 02 hours duration
- c. Workshop exam will be of 03 hours duration

Important Notes:

Significance of the Course Notations used in this scheme: -

- C = These courses are common to both the groups Group-A and Group-B.
- A = Other compulsory courses for Group-A.
- B = Other compulsory courses for Group-B.

Students will study either

Group A (BSC103., ESC101, BSC102, ESC104, HSMC101, ESC105, BSC105, HSMC102)

OR

Group B (BSC101., BSC103A/B, ESC102, ESC103, ESC104, BSC104, ESC105)

(* Branch specific scheme and syllabus for Math's-I, Math-II and Physics on next page)

J C BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCA FARIDABAD
SCHEME OF STUDIES & EXAMINATIONS
B. TECH 1st YEAR (SEMESTER –II) CIVIL ENGINEERING (2022-23)

Course Code	Course Title	L	T	P	Credits	Sessional	External	Category Code
BSC 106D for FAE	Mathematics-II (Civil: Differential Equations)	3	1	-	4	25	75	BSC
ESC101	Basic Electrical Engineering	3	1	-	4	25	75	AECC
BSC 102	Chemistry	3	1	-	4	25	75	BEC
ESC106	Workshop- II	-	-	4	2	30	70	BEC
HSMC101	English	2	-	-	2	25	75	BEC
ESC107	Basic Electrical Technology Lab	-	-	2	1	15	35	BSC
BSC 105	Chemistry Lab	-	-	3	1.5	15	35	BEC
HSMC102	English Lab	-	-	2	1	15	35	BEC
	Total Credit	19.5						

Note: Exams duration will be as under

- a. Theory exams will be of 03 hours duration.
- b. Practical exams will be of 02 hours duration
- c. Workshop exam will be of 03 hours duration

Total First Year Credit= 38+ 3*

*Refer implementation of Credit Transfer/Mobility Policy of online courses ,17th meeting of Academic Council (11.6.2019) for details, regarding MOOC credits. Minimum credit to be earned is **03** through MOOC for I Year B.Tech. students admitted in 2019 and onwards.

J C BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCAFARIDABAD
SCHEME OF STUDIES & EXAMINATIONS
B. TECH 2nd YEAR (SEMESTER – III) FASHION & APPAREL ENGINEERING (2020-21)

Course No.	Course Title	Teaching Schedule				Marks for Sessional	Marks for End Term Examination		Total Marks	Credits	Course Code
		L	T	P	Total		Theory	Practical			
ESC201	Basic Electronics	3	-	-	3	25	75	-	100	3	ESC
BSC01	Biology	2	1	-	3	25	75	-	100	3	BSC
ESC- FA 201	Textile raw materials Yarn formation	4	-	-	4	25	75	-	100	4	ESC
PCC- FA 201	Traditional embroidery & textile	4	-	-	4	25	75	-	100	4	PCC
PCC- FA 202	Apparel production	3	-	-	3	25	75	-	100	3	PCC
PCC- FA 203	Fashion sketching, design idea & fashion illustration lab	-	-	2	2	15	-	35	50	1	PCC
PCC- FA 204	Fibres identification & yarn formation Lab	-	-	2	2	15	-	35	50	1	PCC
PCC- FA 205	Elementary garment manufacturing & Pattern making lab	-	-	2	2	15	-	35	50	1	PCC
PRFA-1P	Project-1	0	0	4	4	15	-	35	50	2	PRFA
	Total	15	2	10	27	235	525	140	900	22	

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SCHEME OF STUDIES & EXAMINATIONS
B. TECH 2nd YEAR (SEMESTER – IV) FASHION & APPAREL ENGINEERING (2022-23)

Course No.	Course Title	Teaching Schedule				Marks for Sessional	Marks for End Term Examination		Total Marks	Credits	Course Code
		L	T	P	Total		Theory	Practical			
BSC- FA 201	Applied statistics & operations research	2	1	-	3	25	75	-	100	3	BSC
PCC- FA 206	Apparel production planning and scheduling	2			2	25	75	-	100	2	PCC
PCC- FA 207	Fabric formation	2	1	-	3	25	75	-	100	3	PCC
HSMC 01	Effective Technical Communication	3	0		3	25	75	-	100	3	HSMC
HSMC- FA 202	Evolution of clothing & fashion	3			3	25	75	-	100	3	HSMC
PEC- FAEL 201	PROFESSIONAL Elective Course-I	3	-	-	3	25	75	-	100	3	PEC
PEC- FAEL 202	PROFESSIONAL Elective Course-II	3	-	-	3	25	75	-	100	3	PEC
MC 04	Audit Course-1: Message of Bhagwat Geeta	1	-	-	1	25	75	-	-	-	MC
PCC- FA 208	Fabric formation & analyzing lab	-	-	2	2	15	-	35	50	1	PCC
PCC- FA 209	Apparel Construction lab I	-	-	2	2	15	-	35	50	1	PCC
PRFA-2P	Project-2	0	0	4	4	15		35	50	2	PRFA
	Total	21	2	8	29	220	525	105	850	24	

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SCHEME OF STUDIES & EXAMINATIONS
B. TECH 3rd YEAR (SEMESTER – V) FASHION & APPAREL ENGINEERING (2020-21)

Course No.	Course Title	Teaching Schedule				Marks for Sessional	Marks for End Term Examination		Total Marks	Credits	Course Code
		L	T	P	Total		Theory	Practical			
ESC- FA 301	Knit & Garment Technology	3	1	-	4	25	75	-	100	4	ESC
PCC- FA 301	Colouration of Textile & Apparel products	4	-	-	4	25	75	-	100	4	PCC
PCC- FA 302	Garment production machines & equipment	4	-	-	4	25	75	-	100	4	PCC
PEC- FAEL 301	PROFESSIONAL Elective Course-III	3	-	-	3	25	75	-	100	3	PEC
PEC- FAEL 302	PROFESSIONAL Elective Course-IV	3	-	-	3	25	75	-	100	3	PEC
MC 01	Audit Course-II: Constitution of India	3	-	-	3	25	75	-	-	-	MC
ESC- FA 302	Knit design & development lab	-	-	2	2	15	-	35	50	1	ESC
PCC- FA 303	Colouration of Textile & apparel lab	-	-	2	2	15	-	35	50	1	PCC
PCC- FA 304	Apparel construction lab II	-	-	2	2	15	-	35	50	1	PCC
PRFA-3P	Project-3	0	0	4	4	15	-	35	50	2	PRFA
Total		17	1	9	29	185	375	140	700	23	

***PEC- FAEL302-1 Apparel merchandising: indicates that Program elective COURSE(PEC) schemesubject code is PEC FAEL-302 and S. No. 1 is chosen in this semester.**

J C BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCAFARIDABAD
SCHEME OF STUDIES & EXAMINATIONS
B. TECH 3rd YEAR (SEMESTER – VI) FASHION & APPAREL ENGINEERING (2020-21)

Course No.	Course Title	Teaching Schedule				Marks for Sessional	Marks for End Term Examination		Total Marks	Credits	Course Code
		L	T	P	Total		Theory	Practical			
PCC- FA 305	Colour and design concept	4	-	-	4	25	75	-	100	4	PCC
PCC- FA 306	Textile & apparel product testing	4			4	25	75	-	100	4	PCC
PCC- FA 307	Textiles & Apparel printing	4	-	-	4	25	75	-	100	4	PCC
PEC-FAEL 303	PROFESSIONAL Elective Course-V	3	-	-	3	25	75	-	100	3	PEC
PEC-FAEL 304	PROFESSIONAL Elective Course-VI	3	-	-	3	25	75	-	100	3	PEC
PCC- FA 308	CAD lab	-	-	2	2	15	-	35	50	1	PCC
PCC- FA 309	Textile & Apparel Printing lab	-	-	2	2	15	-	35	50	1	PCC
PCC- FA 310	Colour and Design Lab	-	-	2	2	15	-	35	50	1	PCC
PCC- FA 311	Testing lab	-	-	2	2	15	-	35	50	1	PCC
PRFA-4P	Project-4	0	0	4	4	15		35	50	2	PRFA
Total		15		12	27	175	300	175	650	24	

J C BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCAFARIDABAD
SCHEME OF STUDIES & EXAMINATIONS
B. TECH 4th YEAR (SEMESTER – VII) FASHION & APPAREL ENGINEERING (2020-21)

Course No.	Course Title	Teaching Schedule				Marks for Sessional	Marks for End Term Examination		Total Marks	Credits	Course Code
		L	T	P	Total		Theory	Practical			
PCC-FA 401	Textile & Apparel finishing	3		-	3	25	75	-	100	3	PCC
PCC-FA 402	Textile & Apparel Costing	3		-	3	25	75	-	100	3	PCC
PCC-FA 403	Quality assurance in apparel industry	3		-	3	25	75	-	100	3	PCC
PEC-FAEL 401	PROFESSIONAL Elective Course-VII	3	-	-	3	25	75	-	100	3	PEC
PEC-FAEL 402	Professional Elective Course-VIII	3	-	-	3	25	75	-	100	3	PEC
Civil OEC3	Open Elective Course- III: Any one from list of OE1-OE5	3	-	-	3	25	75	-	100	3	OEC
PCC-FA 404	Apparel draping & grading lab	-	-	2	2	15	-	35	50	1	PCC
PRFA-5P	Project- 5	0	0	4	4	15		35	50	2	PRFA
	Total	18	0	6	24	215	525	70	810	21	

J C BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCAFARIDABAD
SCHEME OF STUDIES & EXAMINATIONS
B. TECH 4th YEAR (SEMESTER – VII) FASHION & APPAREL ENGINEERING (2020-21)

Sl. No.	Course Title	Code	Hours per week			Sessional	End Semester	Total	Credits	Course Code
			L	T	P					
1	Industrial Training with projects	PRFA-6P	0	0	30	150	350	500	10 (Including 02 credit or 20% weightage for project)	PRFA

SEMESTER - I

BSC 101B: PHYSICS (MECHANICS)

L T P Total
3 1 0 4

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Content:

UNIT I: Scalars and Vectors

Transformation of scalars and vectors under Rotation transformation

Forces in Nature; Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Solving Newton's equations of motion in polar coordinates; Problems including constraints and friction; Extension to cylindrical and spherical coordinates

UNIT II: Potential energy function

$F = -\text{Grad } V$, equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, curl of a force field; Central forces; Conservation of Angular Momentum; Energy equation and energy diagrams; Elliptical, parabolic and hyperbolic orbits; Kepler problem; Application: Satellite maneuvers;

UNIT III: Non-inertial frames of reference

Rotating coordinate system: Five-term acceleration formula- Centripetal and Coriolis accelerations; Applications: Weather systems, Foucault pendulum;

UNIT IV: Simple harmonic Motion

Harmonic oscillator; Damped harmonic motion – over-damped, critically damped and lightly-damped oscillators; Forced oscillations and resonance

UNIT V: Rigid body

Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion; Euler's laws of motion, their independence from Newton's laws, and their necessity in describing rigid body motion; Examples

UNIT VI: Three-Dimensional Rigid body motion

Introduction to three-dimensional rigid body motion — only need to highlight the distinction from two-dimensional motion in terms of (a) Angular velocity vector, and its rate of change and (b) Moment of inertia tensor; Three-dimensional motion of a rigid body wherein all points move in a coplanar manner: e.g. Rod executing conical motion with center of mass fixed — only need to show that this motion looks two-dimensional but is three-dimensional, and two-dimensional formulation fails.

Reference books:

1. Engineering Mechanics, 2nd ed. — MK Harbola
2. Introduction to Mechanics — MK Verma
3. An Introduction to Mechanics — D Kleppner & R Kolenkow
4. Principles of Mechanics — JL Synge & BA Griffiths
5. Mechanics — JP Den Hartog
6. Engineering Mechanics - Dynamics, 7thed. - JL Meriam
7. Mechanical Vibrations — JP Den Hartog
8. Theory of Vibrations with Applications — WT Thomson

BSC 103B: MATHEMATICS I

L T P Total
3 1 0 4

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Content:

UNIT I: Calculus: (6 hours)

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

UNIT II: Calculus: (6 hours)

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

UNIT III: Sequences and series: (10 hours)

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

UNIT IV: Multivariable Calculus (Differentiation): (8 hours)

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

UNIT V: Matrices (10hours)

Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

ESC 102 ENGINEERING GRAPHICS AND DESIGN

L T P Total
0 0 0 4

Sessional: 30 marks
Theory: 70 marks
Total: 100 marks
Duration of exam: 4 hours

Course Outcomes

- All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in the design and development of new products or construction. Students prepare for actual work situations through practical training in a new state-of-the-art computer designed CAD laboratory using engineering software. This course is designed to:
- Learn about the visual aspects of engineering design.
- Analyse engineering graphics standards.
- Prepare orthographic and isometric projection.
- Draw section of solids and conic sections.
- Exposure to computer-aided geometric design

Course Content:

- Traditional Engineering Graphics:
- Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.
- Computer Graphics:
- Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)

UNIT I: Introduction to Engineering Drawing covering,

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

UNIT II: Orthographic Projections covering,

Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

UNIT III: Projections of Regular Solids covering,

Those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

UNIT IV: Sections and Sectional Views of Right Angular Solids covering,

Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

UNIT V: Isometric Projections covering,

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

UNIT VI: Overview of Computer Graphics covering,

listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

UNIT VII: Customization & CAD Drawing

consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerance; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles.

Text/Reference Books:

1. (Corresponding set of) CAD Software Theory and User Manuals
2. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
3. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
4. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
5. Aggarwal M L & Sandhya Dixit (2017), Engineering Graphics and Machine Drawing, Dhanpat Rai & Company P Ltd.
6. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

ESC 103 PROGRAMMING FOR PROBLEM SOLVING

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes

- To formulate simple algorithms for arithmetic and logical problems.
- To translate the algorithms to programs (in C language).
- To test and execute the programs and correct syntax and logical errors.
- To implement conditional branching, iteration and recursion.
- To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
- To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

Course Content:

Unit 1 Introduction to Programming (4 lectures)

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) - **(1 lecture)**.

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. **(1 lecture)**

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code- **(2 lectures)**

Unit 2: Arithmetic expressions and precedence (2 lectures)

Conditional Branching and Loops **(6 lectures)**

Writing and evaluation of conditionals and consequent branching **(3 lectures)**

Iteration and loops **(3 lectures)**

Unit 3 Arrays (6 lectures)

Arrays (1-D, 2-D), Character arrays and Strings

Unit 4 Basic Algorithms (6 lectures)

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Unit 5 Function (5 lectures)

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

Unit 6 Recursion (4 -5 lectures)

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Unit 7 Structure (4 lectures)

Structures, Defining structures and Array of Structures

Unit 8 Pointers (2 lectures)

Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Unit 9

File handling (only if time is available, otherwise should be done as part of the lab)

Text Books

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. Bala Guruswamy, Programming in ANSI C, Tata McGraw-Hill
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

ESC 104 WORKSHOP- I

L T P Total
0 0 4 4

Sessional: 30 marks
Theory: 70 marks
Total: 100 marks
Duration of exam: 4 hours

MECHANICAL WORKSHOP

Course Outcomes (COs): After studying this course the students would:

- Have exposure to mechanical workshop layout and safety aspects.
- Understand the functions of various machines and cutting tools used in machine shop.
- Practice real time job preparation using various operations related to machine shop such as filing, drilling, milling & turning.
- Practice job preparation in welding shop.
- Learn to use different measuring tools like vernier caliper, vernier height gauge and micrometer.
- Practice job preparation in sheet metal shop.

List of Exercises:

Fitting, sheet metal and welding workshop:

1. To study layout, safety measures and different engineering materials (mild steel, medium carbon steel, high carbon steel, high speed steel and cast iron etc) used in workshop.
2. To study and use of different types of tools, equipments, devices & machines used in fitting, sheet metal and welding section.
3. To determine the least count of vernier calliper, vernier height gauge, micrometer and take different reading over given metallic pieces using these instruments.
4. To study and demonstrate the parts, specifications & operations performed on lathe machine.
5. To study and demonstrate the parts, specifications & operations performed on milling machine.
6. To study and demonstrate the parts, specifications & operations performed on shaper machine.
7. To prepare a job involving different type of filing practice exercise in specified dimensions.
8. To prepare a job involving multi operational exercise (drilling, counter sinking, tapping, reaming, hack sawing etc.)
9. To prepare a multi operational sheet metal job (self-secured single groove joint/ hasp & stay etc.).
10. To practice striking an arc, straight short bead, straight continuous bead and restart of electrode in flat position by arc welding on given M.S. plate as per size.
11. To practice tack weld of two close plate in flat position by arc welding on given M.S. plate as per size.
12. To practice close butt joint in flat position by arc welding on given M.S. plate as per size.

NOTE: - At least nine exercises should be performed from the above list; remaining three may either be performed from above list or designed by the concerned institution as per the scope of the syllabus and facilities available in institute.

BSC-104: PHYSICS LAB

L T P Total
0 0 3 3

Sessional: 15 marks
Theory: 35 marks
Total: 50 marks
Duration of exam: 3 hours

Select at least 06 experiments from the following:

1. To determine the height of a building using a Sextant.
2. To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c) Modulus of rigidity.
3. To determine the Moment of Inertia of a Flywheel.
4. To determine the Young's Modulus of a Wire by Optical Lever Method.
5. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
6. To determine the elastic Constants of a wire by Searle's method.
7. To determine the value of g using Bar Pendulum.
8. To determine the value of g using Kater's Pendulum
9. Note: Experiments may be added or deleted as per the availability of equipments.

Reference Books:

1. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practical's, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. Engineering Practical Physics, S. Panigrahi & B.Mallick, 1515, Cengage Learning India Pvt. Ltd.
4. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Edn, 1511, Kitab Mahal

ESC 105: PROGRAMMING FOR PROBLEM SOLVING LAB

L T P Total
0 0 4 4

Sessional: 15 marks
Theory: 35 marks
Total: 50 marks
Duration of exam: 4 hours

Laboratory Outcomes

- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program
- To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run time
- To be able to write iterative as well as recursive programs
- To be able to represent data in arrays, strings and structures and manipulate them through a program
- To be able to declare pointers of different types and use them in defining self-referential structures.
- To be able to create, read and write to and from simple text files.

Tutorial 1: Problem solving using computers:

Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:

Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:

Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:

Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:

Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings

Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:

Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):

Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls

Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation

Lab 11: Pointers and structures

Tutorial 12: File handling:

Lab 12: File operations

SEMESTER - II

BSC 106D: MATHEMATICS- II

L T P Total
3 1 0 4

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Content:

UNIT I: Multivariable Calculus (Integration): (10 hours)

Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

UNIT II: First order ordinary differential equations:(6 hours)

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT III: Ordinary differential equations of higher orders:(8 hours)

Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

UNIT IV: Complex Variable – Differentiation:(8 hours):

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

UNIT V: Complex Variable – Integration:(8 hours):

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.

4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc- Graw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010

ESC 101A: BASIC ELECTRICAL TECHNOLOGY

L T P Total
3 1 0 4

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes (COs): At the end of the course, the student shall be able to:

- Analyze and solve D. C. networks by different analysis methods and theorems.
- Formulate and solve complex AC single phase and three circuits.
- Identify the type of electrical machines and their applications.
- Introduce the components of low voltage electrical installations.

Course Contents:

UNIT I

DC Circuits: Basic definitions, Electrical circuit elements (R, L and C), voltage and current sources, Ohm's law and its limitations, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation by mesh analysis and node analysis, Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems. (10)

UNIT II

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. (10)

UNIT III

Poly Phase Systems: Advantages of 3-phase systems, generation of 3-phase voltages, three phase connections (star and delta), voltage and current relations in star and delta connections, three phase powers, analysis of 3-phase balanced circuits, measurement of 3-phase power- 2 wattmeter method. (7)

UNIT IV

Transformers: Magnetic Circuits, construction and working of single-phase transformer, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency, Auto transformer (7)

UNIT V

Electrical Machines: Induction motor: Construction, principle and working of a three-phase induction motor, Single-phase induction motor: Construction, principle and working, Applications DC machine: Construction, principle and working of dc motor and generator. Applications Synchronous machine: Construction, principle and working of synchronous motor and generators. Applications. (9)

UNIT VI

Electrical Installations: Components of LT Switchgear: Fuses, MCB, ELCB, MCCB, Types of Wires, Earthing, Power factor improvement. (7)

Recommended/ Reference Books:

1. D. P. Kothari and, I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill.
3. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press.
4. E. Hughes, “Electrical and Electronics Technology”, Pearson.
5. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India.

Web Links:

1. NPTL Web Course, Basic Electrical Technology, Prof. G. D. Roy, Prof. N. K. De, Prof. T.K. Bhattacharya, IIT Kharagpur
2. (<https://nptel.ac.in/courses/108/105/108105053/>)
3. NPTL Web Course, Electrical Machines-I, Prof. P. Sasidhara Rao, Prof. G. Sridhara Rao, Dr. Krishna Vasudevan, IIT Madras
5. (<https://nptel.ac.in/courses/108/106/108106071/>)
2. NPTL Web Course, Electrical Machines-II, Prof. P. Sasidhara Rao, Prof. G. Sridhara Rao, Dr. Krishna Vasudevan, IIT Madras
6. Krishna Vasudevan, IIT Madras
7. <https://nptel.ac.in/courses/108/106/108106072/>

BSC 102: CHEMISTRY

L T P Total
3 1 0 4

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalize bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalize periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- List major chemical reactions that are used in the synthesis of molecules.

Course Content:

UNIT I Atomic and molecular structure (12 lectures)

Schrodinger equation. Particle in a box solution and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

UNIT II Spectroscopic techniques and applications (8 lectures)

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques. Diffraction and scattering.

UNIT III Intermolecular forces and potential energy surfaces (4 lectures)

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H_3 , H_2F and HCN and trajectories on these surfaces.

UNIT IV Use of free energy in chemical equilibria (6 lectures)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion.

Use of free energy considerations in metallurgy through Ellingham diagrams.

UNIT V Periodic properties (4 Lectures)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

UNIT VI Stereochemistry (4 lectures)

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

UNIT VII Organic reactions and synthesis of a drug molecule (4 lectures)

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Text Books

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition

BSC 106: WORKSHOP II

L T P Total
0 0 4 4

Sessional: 30 marks
Theory: 70 marks
Total: 100 marks
Duration of exam: 4 hours

PART-A COMPUTER ENGINEERING WORKSHOP

Course Outcomes: After the completion of the course the student will be able to:

- Acquire skills in basic engineering practice.
- Have working knowledge of various equipment's used in workshop.
- Have hands on experience about various machines and their components.
- Obtain practical skills of basic operation and working of tools used in the workshop.

Course Content:

1. To study and demonstrate Block diagram of Digital Computer System and brief explanation of each unit.
2. To demonstrate History/ Generation/ classifications and different types of Personnel Computers.
3. To study and demonstrate internal parts of a Computer System (Card level) and other peripheral devices and explanation of POST & BIOS.
4. To study and demonstrate primary memory and secondary memory.
5. To demonstrate CPU Block diagram and other Peripheral chips, Mother Board/ Main Board and its parts, Connectors, Add On Card Slots etc.
6. To study working of various types of monitors: CRT type, LCD type & LED type.
7. To study Keyboard and Mouse: Wired, Wireless, Scroll & Optical with detail working.
8. To study Printers: Dot Matrix Printers, Daisy wheel Printers, Ink-Jet Printers and Laser Jet Printers with detailed working explanation.
9. Assembly / Installation and Maintenance of Personnel Computer Systems: Practical exercise on assembly of Personnel Computer System, Installation of Operating System: Windows & Linux etc, Installation of other Application Softwares and Utility Softwares, Fault finding in Personnel Computers: Software or Hardware wise, Virus: Introduction, its Types & Removal techniques, Data Backup and Restore, Data Recovery Concepts, Typical causes of Data loss.
10. To demonstrate networking concepts: Introduction of Connecting devices: Hub, Switch & Router etc, Networking Cable preparation: Normal & Cross Cables, Data Transferring Techniques from one Computer System to another Computer System, Configuration of Switch/ Routers etc.

PART-B
ELECTRICAL WORKSHOP

1. Introduction of Electrical Safety precautions, Electrical Symbols, Electrical Materials, abbreviations commonly used in Electrical Engg. and familiarization with tools used in Electrical Works.
2. To make a Straight Joint & Tee joint on 7/22 PVC wire and Britannia Joint on GI wire.
3. To study fluorescent Tube Light, Sodium Lamp and High-Pressure Mercury Vapour Lamp.
4. To study different types of earthing and protection devices e.g., MCBs, ELCBs and fuses.
5. To study different types of domestic and industrial wiring and wire up a circuit used for Stair case and Godown wiring.
6. To make the connection of fan regulator with lamp to study the effect of increasing and decreasing resistance in steps on the lamp.
7. To fabricate half wave and full wave rectifiers with filters on PCB.
8. Maintenance and Repair of Electrical equipment i.e Electric Iron , Electric Toaster ,Water heater, Air coolers and Electric Fans etc.
9. To study soldering process with simple soldering exercises.
10. To make the connection of a three core cable to three pin power plug and connect the other cable end by secured eyes connection using 23/0.0076” or 40/0.0076” cable.

PART- C
ELECTRONICS WORKSHOP

1. To study and demonstrate basic electronic components, Diode, Transistor, Resistance, Inductor and capacitor.
2. To study and demonstrate resistance color coding, measurement using color code and multimeter and error calculation considering tolerance of resistance.
3. To study and demonstrate Multimeter and CRO- front panel controls, description of block diagram of CRT and block diagram of CRO.
4. To study and demonstrate V_p (peak voltage), V_{pp} (peak to peak voltage), Time, frequency and phase using CRO.
5. Introduction to function generator. Functions of front panel controls and measurement of different functions on CRO.
6. To study and demonstrate variable DC regulated power supply, function of controls and DC measurement using multimeter and CRO.
7. Soldering practice on wire mesh or a resistance decade board includes fabrication, soldering, lacing, harnessing forming and observation.
8. Testing of components using multimeter and CRO like diode, transistor, resistance capacitor, Zener diode and LED.
9. To study and demonstrate rectification, half wave, Full wave and bridge rectifier. Fabrication, assembly and waveform observation.
10. To design and fabricate a printed circuit board of a Zener regulated/ series regulated power supply and various measurements, testing of power supply.

Note: At least 8 exercises are to be performed from each part by the students.

HSMC 101: ENGLISH

L T P Total
2 0 2 2

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Content:

UNIT I: Vocabulary Building

The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives., Synonyms, antonyms, and standard abbreviations.

UNIT II Basic Writing Skills

Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely.

UNIT III Identifying Common Errors in Writing

Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés.

UNIT IV Nature and Style of sensible Writing

Describing, Defining, Classifying, Providing examples or evidence

UNIT V Writing introduction and conclusion

UNIT VI Writing Practices

Comprehension, Précis Writing, Essay Writing

ESC 107: BASIC ELECTRICAL TECHNOLOGY LAB

L T P Total
0 0 2 2

Sessional: 15 marks
Theory: 35 marks
Total: 50 marks
Duration of exam: 2 hours

Course Outcomes (COs): At the end of the course, the student shall be able to:

- Get an exposure to common electrical components and their ratings.
- Make electrical connections by wires of appropriate ratings.
- Understand the usage of common electrical measuring instruments.
- Understand the basic characteristics of transformers and electrical machines.
- Get an exposure to the working of power electronic converters.

List of Experiments/ Demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Verification of network theorem in DC circuits, Thevenin's Theorem, Norton's, Theorem, Superposition Theorem etc.
3. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
4. Poly phase systems, three phase connections (star and delta), measurement of three phase power.
5. Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
6. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ring arrangement) and single-phase induction machine.
7. Torque Speed Characteristic of separately excited dc motor.
8. Components of LT switchgear.

BSC 105: CHEMISTRY LAB

L T P Total
0 0 3 3

Sessional: 15 marks
Theory: 35 marks
Total: 50 marks
Duration of exam: 3 hours

Laboratory Outcomes

- The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:
- Estimate rate constants of reactions from concentration of reactants/products as a function of time
- Measure molecular/system properties such as surface tension, viscosity conductance of solutions, redox potentials, chloride content of water, etc
- Synthesize a small drug molecule and analyse a salt sample.

Chemistry Laboratory

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry - determination of redox potentials and emfs
9. Synthesis of a polymer/drug
10. Saponification/acid value of an oil
11. Chemical analysis of a salt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces
14. Chemical oscillations- Iodine clock reaction
15. Determination of the partition coefficient of a substance between two immiscible liquids
16. Adsorption of acetic acid by charcoal
17. Use of the capillary viscosimeters to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg .

HSMC 102: ENGLISH LAB

L T P Total
0 0 2 2

Sessional: 15 marks
Theory: 35 marks
Total: 50 marks
Duration of exam: 2 hours

Course Outcomes

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

English Lab

1. Listening Comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Common Everyday Situations: Conversations and Dialogues
4. Communication at Workplace
5. Interviews
6. Formal Presentations

Suggested Readings:

1. *Practical English Usage*. Michael Swan. OUP. 1995.
2. *Remedial English Grammar*. F.T. Wood. acmillan.2007
3. *On Writing Well*. William Zinsser. Harper Resource Book. 2001
4. *Study Writing*. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
5. *Communication Skills*. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. *Exercises in Spoken English*. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

SEMESTER - III

ESC- 201 BASIC ELECTRONICS ENGINEERING

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Objective: To provide an overview of electronic device components to Mechanical engineering students.

Course Outcomes (CO): On completion of this course, the students will be able to

1. Understand the principles of semiconductor devices and their applications.
2. Design an application using an Operational amplifier.
3. Understand the working of timing circuits and oscillators.
4. Understand logic gates and flip flop as a building block of digital systems.
5. Learn the basics of electronic communication systems.
6. Design the Rigid pavement.

Course Contents:

UNIT-I

Semiconductor Devices and Applications: Introduction to P-N junction Diode and V-I characteristics, Half wave and Full-wave rectifiers, capacitor filter. Zener diode and its characteristics, Zener diode as voltage regulator. Regulated power supply IC based on 78XX and 79XX series, Introduction to BJT, its input-output and transfer characteristics, BJT as a single-stage CE amplifier, frequency response and bandwidth.

UNIT-II

Operational amplifier and its applications: Introduction to operational amplifiers, Op-amp input modes and parameters, Op-amp in open loop configuration, op-amp with negative feedback, study of practical op-amp IC 741, Inverting and non-inverting amplifier applications: summing and difference amplifier, unity gain buffer, comparator, integrator and differentiator.

UNIT-III

Timing Circuits and Oscillators: RC-timing circuits, IC 555 and its applications as stable and mono-stable multi-vibrators, positive feedback, Barkhausen's criteria for oscillation, R-C phase shift and Wein bridge oscillator.

UNIT-IV

Digital Electronics Fundamentals: Difference between analog and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using K-map, Logic ICs, half and full adder/subtractor, multiplexers, de-multiplexers, flip-flops, shift registers, counters, Block diagram of microprocessor/microcontroller and their applications.

UNIT-V

Electronic Communication Systems: The elements of communication system, IEEE frequency spectrum, Transmission media: wired and wireless, need of modulation, AM and FM modulation schemes, Mobile communication systems: cellular concept and block diagram of GSM system.

Reference Books:

1. Floyd ,” Electronic Devices” Pearson Education 9th edition, 2012.
2. R.P. Jain , “Modern Digital Electronics”, Tata Mc Graw Hill, 3rd Edition, 2007.
3. Frenzel, “Communication Electronics: Principles and Applications”, Tata Mc Graw Hill, 3rd Edition, 2001

BSC-01 BIOLOGY

L T P Total
2 1 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of Exam: 3 hours

Course Outcomes:

- Describe the hierarchy of life forms and the different criteria used for classification
- Explain the fundamental principles of genetics, including Mendel's laws, gene mapping, and gene interaction
- Identify the major biomolecules found in living organisms and describe their structure and function
- Explain how enzymes catalyse reactions and discuss the importance of enzyme kinetics
- Describe the molecular basis of information transfer and explain the universality and degeneracy of the genetic code
- Analyse biological processes at the reductionist level by understanding protein structure and function

Course Content:

UNIT I: INTRODUCTION

Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry.

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

UNIT II: CLASSIFICATION

Purpose: To convey that classification per se is not what biology is all about. The underlying criterion,

such as morphological, biochemical or ecological be highlighted.

Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilisation -Autotrophs, heterotrophs, lithotrophes (d) Ammonia excretion – aminotelic, uricotelic, ureotelic (e) Habitatacquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegans, A. Thaliana, M. Musculus.

UNIT III: GENETICS

Purpose: To convey that “Genetics is to biology what Newton’s laws are to Physical Sciences” Mendel’s laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping,

Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

UNIT IV: BIOMOLECULES

Purpose: To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine, Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

UNIT V: ENZYMES

Purpose: To convey that without catalysis life would not have existed on earth.

Enzymology: How to monitor enzyme catalysed reactions. How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.

UNIT VI: INFORMATION TRANSFER

Purpose: The molecular basis of coding and decoding genetic information is universal

Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure-from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

UNIT VII: MACROMOLECULAR ANALYSIS

Purpose: How to analyse biological processes at the reductionist level

Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

UNIT VIII: METABOLISM

Purpose: The fundamental principles of energy transactions are the same in physical and biological world.

Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of K_{eq} and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to $CO_2 + H_2O$ (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy Charge.

UNIT IX: MICROBIOLOGY

Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.

Reference Books

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M. L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons
3. Principles of Bio chemistry (VEdition), By Nelson, D. L.; and Cox, M. M. W. H. Freeman and Company
4. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R. W. H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5. Microbiology, Prescott, L. M. J. P. Harley and C. A. Klein 1995. 2nd edition Wm, C. Brown Publishers.

ESC-FA201 FIBRE TEXTILE RAW MATERIAL & YARN FORMATION

L T P Total
4 0 0 4

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of Exam: 3 hours

Course Outcomes:

- To understand general morphological structure, physical and chemical properties of various natural and synthetic textile fibres
- To understand the cultivation and harvesting processes of various natural and synthetic textile fibres.
- To understand and the manufacturing processes of various synthetic textile fibres. Understand the concept of yarn quality and its importance.

Course Contents:

UNIT I

General definitions and important terminologies related to textiles; Classification of fibres; Essential and desirable properties of textile fibres and their role in final products; Advantages and disadvantages of natural and manmade fibres.

Cotton: structure and properties (physical and chemical); Different Varieties including organic as well as But cotton and their properties; Applications. Bast and leaf fibres such as jute, hemp, sisal and ramie etc: Geographical distribution, extraction, properties and their uses.

UNIT II

Varieties of natural silk, rearing of silk worm, properties and uses of various types of silk; silk reeling, Varieties, sorting and grading of wool, chemical and physical properties of wool, processes involved in the removal of impurities from raw wool; numbering systems of woollen and worsted yarns.

Brief outline of the manufacturing processes of important man-made fibres, viz. rayons (Viscose and Acetate), polynomic, Tencel, nylons, polyester, acrylics, polypropylene, like spandex/lycra etc (only flow charts); their Important physical and chemical properties and applications.

UNIT III

Introduction to objectives of processes like ginning, mixing and blending. Introduction to various preparatory processes involved in the production of yarn viz. opening and cleaning (blow room and card), drawing (draw frame), combing (comber) and rove formation (speed frame) with the objectives of each process

Concept of yarn quality and its importance, Yarn numbering systems and calculations pertaining to conversions.

UNIT IV

Introduction to different processes involved in the production of yarn viz. conventional (ring spinning) and unconventional (rotor, air-jet and friction spinning etc) with the objectives of each. Properties and end uses of different types of yarns such as ring spun, rotor spun, friction spun and air-jet spun etc. Objectives of plying and twisting of spun and filament yarns.

Text Books & Reference Books:

1. Handbook of Textile Fibres J Gordon Cook
2. Textile Fibres HVS Murthy
3. Manmade Fibres RW Moncrieff

PCC-FA-201 TRADITIONAL EMBROIDERY & TEXTILE

L T P Total
4 0 0 4

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of Exam: 3 hours

Course Outcomes:

- To understand the basics of embroidery techniques, tools, equipment's and their need.
- To understand different types of stitches by their unique sample preparation.
- To understand various traditional embroideries with related to fabric used.
- To understand the various sampling and sourcing of traditional textile material related to their colour, motif and production process.

Course Contents:

UNIT I

Basic know-how embroidery techniques: Requirements of embroidery. Tools and Equipment required for embroidery.

UNIT II

Sample preparation with basic embroidery stitches and their derivatives like chain stitch; stem stitch, darning stitch, Herring-bone, open chain, satin, button-hole, bullion knot, Lasy daisy stitch.

UNIT III

Working with Indian Traditional Embroidery with special reference to fabric, embroidery threads, colors, colors, stitches, and motifs Chickankari Lucknow, Phulkari Punjab, Kanthas Bengal, Applique work Orissa and Gujarat Working with Asia Traditional Embroidery with special reference to fabric, embroidery threads, colors, colors, stitches, and motifs suzani Embroidery of Uzbekistan, Traditional Embroidery vitnam, Traditional gold Embroidery of malaysia, Philippine Embroidery

UNIT IV

Sampling and Sourcing of Traditional Indian Textiles with the special reference of materials, colors, motifs and production processes Ikat and Patola, Kalamkari, Chanderi, Kota, Brocades, Bandhani, Block Printed Textiles Preparation of atleast two samples with machine embroidery techniques.

Text Books & Reference Books:

1. Complete Guide to Needle work: Readers Digest
2. The Dictionary of Needle work: Sophia Cauteild and Blanche Saward
3. Ethnic embroidery of India: Usha Shrikant Vandana Embroidery

PCC-FA-202 APPAREL PRODUCTION

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of Exam: 3 hours

Course Outcomes:

- To gain the knowledge of global textile and apparel industry by their history and evolution of various apparel market strategies.
- To understand garment manufacturing processes by means of spreading, marker planning, and cutting with different types of spreading techniques and marker planning processes.
- To understand various types of cutting devices, types of patterns, tracing and marking terminologies.
- To understand different types of pattern layouts techniques.

Course Contents:

UNIT I

Global Textiles and Apparel industry: History and evolution. Indian Textiles and Apparel Industry: History and Evolution. Indian Garment industry vis-à-vis leading countries. Apparel manufacturing countries: their features level of technology, product mix.

UNIT II

Cutting: Objectives and methods of cutting; the planning, drawing, and reproduction of the marker, requirement of marker planning, marker plan efficiency, methods of marker planning and use. Aids and Tool equipment for cutting- Band knife, clamp, click press, electrical cloth notcher, Straight knife cutter, Circular knife, portable rotary knife cutter, Cutting Board, Cutting Table, Drill, Pattern perforator, razor blade, Scissors, Shears, Face to face spreader, Manual spreader, one way spreader, Tubular knit spreader.

UNIT III

Understanding of various fabrics and its effect on spreading and cutting techniques in relation to quality and productivity, the spreading of fabric to form a lay, requirement of spreading and different spreading method. Tracing and marking Terminology-Chalked marking, chalked thread, color coding, pin marking, tailor stacks, thread tracing.

UNIT IV

Types of pattern Commercial pattern, Drafted pattern, Draped pattern, Graded pattern, Production pattern, Trade back pattern Pattern Lay-out Border design fabric, check fabric, Diagonal design fabric/ Diagonal print fabric, Diagonal weave fabric, Irregular design fabric, Knit fabric, Large print fabric, Light reflecting fabric, Napped fabric, Balanced plaid, pile fabric, unbalanced plaid, uneven plaid, plastic fabric, Even stripe, Uneven stripe.

Text Books & Reference Books:

1. Clothing Technology: Carr and Latham
2. Apparel Industry Magazine: World Clothing

PCC-FA-203 FASHION SKETCHING, DESIGN IDEA & FASHION ILLUSTRATION LAB

L T P Total
0 0 2 2

Sessional: 15 marks
Theory: 35 marks
Total: 50 marks
Duration of Exam: 2 hours

Course Outcomes:

- To familiarize students with different sketching mediums, body figures, movements of figures and various fashion silhouette techniques.
- To give practical training to students in understanding the designing of basic fashion details, develop basic fabric textures on different fabrics, illusion of garments on different types of garments and advanced designing on garments based upon different technical garments.
- Designing and sketching of different types of fashion details: necklines, sleeves, collars, pockets, yokes, skirts, waistlines, pleats, tucks and plackets.

Experiments:

1. Usage of different dry and wet colour mediums in sketching e.g. shading, filling etc. Normal figure proportions, Grid theory for formation of fashion figure. Fashion Figure proportions, Fashion figure in different views, as Front View, 3/4th View, Back View, Side View. Flashing of the fashion figure in different views. Movement figures - principles to form a movement figure, sketching of the movement figures in various postures/body positions. Variations of body parts-Arms, Hands, legs, Feet. Facial figure proportions-Features, Hairstyles. Developing Silhouettes draping, fold lines, prints etc. Photo analysis, Fabric rendering, Simple illustration on fashion figures.
2. Developing fabric textures like velvet, tie and dye, batik, denim, fur, leather, net, satin, organdie, etc.
3. Illusion in garments: line, print, color and silhouette Designing of various garments
4. from the following categories: Children wear, Ladies' wear, Men's wear, Evening wear,
5. Night wear, Kitchen wear, summer wear, winter wear and party wear, etc.
6. Advanced designing of the garments based upon innovative/ motivational designing
 - a. e.g. electronics, sports, jewelry, modules, camouflage, etc.

Text Books & Reference Books:

1. Maite Lafuente "Fashion Illustration techniques", Om Publication.
2. Fernandez, "Illustration for Fashion Design 12 Steps to the Fashion Figure", Pearson.
3. Perpard, Prakashan, B Abling, "Antomy And Drawing", Fairchild.
4. Ireland, "Fashion Design Drawing and Presentation", Butstord.
5. Anne allen, "Fashion Drawing: the basic principle", Om Publication.
6. Mckelvey, Fashion Design, Blackwell.

PCC-FA-204 FIBRES IDENTIFICATION & YARN FORMATION LAB

L T P Total
0 0 2 2

Sessional: 15 marks
Theory: 35 marks
Total: 50 marks
Duration of Exam: 2 hours

Course Outcomes:

- To illustrate various fibres on microscopic and chemical and burning test.
- To familiarize the students with various machinery and process involve in conventional fibres toyarn manufacturing.

Experiments:

UNIT I

Principle of microscopy, Microscopic identification of fibres, preparation and mounting of specimen for longitudinal view, Cross-section cutting. Microtomy - cork method, metal plate method, Hardy's Microtome, Mountants and reagents for fibre microscopy: Identification of fibre by burning as well as solubility tests. Standard scheme of analysis of homogenous fibre blends by physical and chemical methods, Qualitative and quantitative determination of components. Preparation of reagents used for chemical analysis.

UNIT II

Discussion and demonstration of the various machines and of manufacturing processes involved in converting fibres to yarn viz. mixing, blending, opening, cleaning, carding, drawing, combing, rove formation, spinning, doubling etc.; Introduction to unconventional spinningmachines/processes; Rotor spinning, Air-jet spinning and Friction spinning etc.; Simple Calculations pertaining to these machines/ processes

Text Books & Reference Books:

1. "Identification of Textile Materials", Textile Institute, Manchester.
2. Gohl EPG. "Textile Science: An explanation of fibre properties", CBS Publishers, Delhi,
3. Heny A.N.J, "Fiber Microscopy", A hand book of laboratory manual.
4. Meredith R & Hearle J.W.S." Physical Methods of Investigating Textiles".
5. § David M. Hall, " Practical Fiber Identification",
6. ", Auburn Al, 1976
7. Cook Gordon J, "Hand Book of textile fibre", Vol. I and II, Woodhead Fibre Science Series.8. UK. 1984.
8. Sara J. Kadolph, "Textiles". Prentice Hall, 10" edition 2007
9. Bernard P. Corbman, "Textile Fibres to Fabric" McGrawhill Publications, 6" Edition 1983

PCC-FA-205 ELEMENTARY GARMENT MANUFACTURING & PATTERN MAKING LAB

L T P Total
0 0 2 2

Sessional: 15 marks
Theory: 35 marks
Total: 50 marks
Duration of Exam: 2 hours

Course Outcomes:

- To understand basic tools, thread types, needle types, trims and components and fusing and pressing machineries.
- To analyze different aids, tools and equipment's for cutting and their applications as well.
- To understand different types of pattern and pattern layout
- To understand equipment's for drafting and to develop basic block construction and prepare different sleeves and collars.

Experiments:

1. Selection for different types of needle according to stitching components.
2. Selection procedure for different types of sewing and embroidery threads. Utility of different Aids and tools for Garment Construction, Basting Operation. Study of sewing machineries, Different tools and Work aids, Application of different trims and components. Study of Fusing and pressing machine procedure
3. Introduction to the tools and material used for drafting. Drafting of child's basic and adult's bodice blocks.
4. Drafting of different commonly used sleeves as set-in, puff, raglan, flared, leg 'o' mutton, etc.
5. Drafting of different collars as peter-pan, sailor, mandarin and shirt collars etc.

Text Books & Reference Books:

1. Carr, H.C., "The clothing Factory ", The Clothing Institute, London, 1972.
2. Jacob Solinger., "Apparel Manufacturing Handbook ", VanNostrand Reinhold Company.1980.
3. Irland, Encyclopedia of Fashion Details, Batsford

SEMESTER - IV

BSC FA- 201 APPLIED STATISTICS & OPERATIONS RESEARCH

L T P Total
3 1 0 4

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- To familiarize students with basic statistics and their applications in apparel sector.
- To understand sampling Theory: Population and sample, types of sampling, sampling distribution of means and proportions.
- To understand theory of probability.
- To understand project scheduling by PERT/CPM.

Course Contents:

UNIT I

Measures of Dispersion: Range, quartile deviation, standard deviation, moments, skewness and Kurtosis (definition, properties and associated numerical only) Regression and Correlation: Karl Pearson coefficient of correlation, rank correlation and line'sofregression, curve fitting (linear, parabolic, and exponential).

UNIT II

Theory of Probability: The concept of probability, additive and multiplicative laws of probability (Statements and associated numerical only) Probability Distributions: Random variate, mathematical expectation, the ormsion expectation, discrete and continuous probability distributions (definition and problems only). Univariate Binomial, Poisson and Normal distribution (properties and applications)

UNIT III

Sampling Theory: Population and sample, types of sampling, sampling distribution of means and proportions (definition only) Tests of Hypothesis and Significance: Definition of statisticalhypothesis, null hypothesis, type I and type II errors and level of significance. Tests of significance for large and small samples (discussion) problem based on X2 test for goodness of fit, t-test, F-test and Analysis of variance (one way and two-way classifications)

UNIT IV

Operations Research: Linear programming problem (formulation and solution by graphical approach only). Transportation problem including time minimizing problems, Basic Assignment problem, sequencing problems (njobs,2 machines and n jobs, machine problems) Project scheduling by PERT/CPM: Definition of network, critical path, floats, finding of critical path and floats.

Text Books & Reference Books:

1. Mathematical Statistics: Rayand Sharma
2. Business Statistics: Gupta and Gupta
3. Operation Research: P.K. Gupta, Manmohan
4. Operations Research for Management: Gupta and Sharma
5. Higher Engineering Mathematics: B.S. Grewal

PCC-FA 206 APPAREL PRODUCTION PLANNING AND SCHEDULING

L T P Total
2 0 0 2

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- To understand concept of production planning and control in an apparel industry using work study.
- To analyze motion study, quick response and various production systems involve in an apparel industry
- To understand and operate different sewing data analysis software (GSD techniques).

Course Contents:

UNIT I

Introduction to production, Operations, Concept of production, Productivity components of production, Production planning & control, its Objective, function & organization of various departments in apparel industry.

UNIT II

Production planning order preparation, material planning, process planning, loading & scheduling in apparel industry. Work measurement: Uses of work measurement, data, and basic procedure of work measurement.

UNIT III

Motion & Time study: Definition & scope of motion & time study, Data for sewing work study, improvement of production efficiency, Production analysis (qualitative & quantitative).

UNIT IV

Co-ordination of activities: Layering & marker planning, Cutting room planning, planning of sewing room, Material management in clothing production Quick response in apparel manufacturing. Different production system.

TEXT BOOKS:

1. Introduction to clothing production management--A.J. Chutter
2. Production management in apparel industry—Rajesh Bheda

PCC-FA 207 FABRIC FORMATION

L T P Total
2 1 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- To understand fabric manufacturing technology and different devices used for winding machine.
- To familiarize students among various types of warping process and sizing machines involve in fabric manufacturing.
- To gain the knowledge of students of different types of looms (Handmade and automatic loom) involve in fabric manufacturing.
- To understand the concept of new advanced types of looms incorporate and also fabric analysis technique.
- To analyse different types of decorative terry pile weave.

Course Contents:

UNIT I

Introduction to warp and weft preparatory processes in relation to production of fabrics with flow charts. Winding: Objectives of winding, Flow of material through a winding machine, brief introduction of various parts Warping: Objectives of warping, types of warping Types of creel. Sizing: Objectives of sizing. Brief introduction to Types of sizing viz aqueous and solvent slasher sizing machine, foam sizing, sinter roller sizing, hot melt sizing and single end sizing, Sizing ingredients: adhesives and different categories of additives.

UNIT II

Pirn winding and Drawing-in: Objectives and flow of material through these operations. Shuttle Looms: Definition of handloom, plain loom, and automatic loom. Introduction to various mechanisms of a loom viz. primary, secondary and auxiliary motion Shuttle less looms: Classification, Their advantages over shuttle looms. Brief description of Sulzer projectile loom, rapier looms, air-jet looms, water jet looms and their salient features. Fabric Analysis: Simple calculations for fabric weight per unit area, linear weight, cover and cover factors.

UNIT III

Basic Concepts: Importance of fabric structure, Classification of fabrics, Notation of Weave, drafting plan, peg plan and dining. Weaves: plain weave and its derivatives, ornamentation, Twillweave and its derivatives, ornamentation, Sateen and Satin and their extensions

UNIT IV

Crepe weave, diamond, mock leno, Cork-screw, honey comb, huck-a-back, Bedford cords, welt and pique fabrics. Decorative Weaves: Extra warp and weft figuring, Backed cloth, Double cloth, treble and multiply belting structures.

Text Books & Reference Books:

1. Principles of Weaving -- Marks & Robinson
2. Textile Design and Color—Watson W Watson
3. Grammer of Textile Design—H Nisbet

HSMC 01 EFFECTIVE TECHNICAL COMMUNICATION

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- To develop communication and technical writing.
- To develop the habit of Self-assessment, Awareness, Perception and values.
- To gain the knowledge of Engineering ethics, Managing time, Role and responsibility of engineer.
- To understand different types of technical documents

Course Contents:

UNIT 1

Information Design and Development- Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media.

UNIT 2

Technical Writing, Grammar and Editing- Technical writing process, forms of discourse, writing drafts and revising, Collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication, Usability, Human factors, Managing technical communication projects, time estimation, Single sourcing, Localization.

UNIT 3

Self-Development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem. Managing Time; Personal memory, Rapid reading, taking notes; Complex problem solving; Creativity

UNIT 4

Communication and Technical Writing- Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report.

UNIT 5

Ethics- Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.

Text/Reference Books:

1. David F. Beer and David Mc Murrey, Guide to writing as an Engineer, John Willey. New York,2004
2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York
3. Shiv Khera, You Can Win, Macmillan Books, New York,2003.
4. Raman Sharma, Technical Communications, Oxford Publication, London,2004.

HSMC-FA 202 EVOLUTION OF CLOTHING & FASHION

L T P Total
3 0 0 3

Sessional: 25 marks

Theory: 75 marks

Total: 100 marks

Duration of exam: 3 hours

Course Outcomes:

- To understand the evolution of clothing and fashion since old civilized to modern civilization through various archetypes, fashion lifecycles, sources of fashion.
- To analyze various fashion leaders theories, national and international designers and also fashion week and fashion calendars.
- To understand the various fashion Center capitals and factors affecting fashion industry.

Course Contents:

UNIT I

Origin of clothing. Objectives of clothing and costumes, Main archetypes of costumes, Principles of history of fashion. Theories of clothing-Protection, adornment, modesty and combined need theory etc. Fashion and its meaning, Principles and history of fashion, Classification of fashion. Fashion product Life cycles. Sources of Fashion, Factors affecting fashion movement like cultural, socio-psychological, etc.

UNIT II

Effect of various factors such as communication, industry, economy, sports etc. on fashion. Fashion leadership theories. Important fashion capitals, National and International fashion designers, National and International fashion markets and fashion weeks.

UNIT III

Indian history of costumes: Concept and comparison of costumes of all stages of prehistoric and medieval period, Study of Costumes, jewelry, footwear, hairstyles etc. in India in different periods as Vedic and post Vedic period, Maurian Period, Gupta period Kushan and Kanishka period.

UNIT IV

Global history of costumes: Concepts and history of classical costumes in Greek civilization and Roman civilization. History of costumes in Egyptian and Byzantine civilization. History of costumes in the western world starting from the origin up to the Reign of Charles and Louis with the emphasis on famous fashion centers and famous fashion designers. Important national and international fashion designers.

TEXT BOOKS:

1. The guide to historic costumes -- Karen Baclaw Ski
2. Inside Fashion Business – Kitty G. Dickerson
3. Inside Fashion Design -- Sharon Lee Tate.

MC 04 MESSAGE OF BHAGWAT GITA

L T P Total
1 0 0 1

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Objectives:

To enable the students to create an awareness on message of Bhagwat Gita. To instill moral, social values and to appreciate the Karma Yoga.

Course Outcomes (CO):

- Realize the relevance of Bhagavad Gita today.
- Relate Yoga to Devotion
- Realize the duties and Responsibilities in the Society.

Course Contents:

UNIT I:

Introduction: Relevance of Bhagavad Gita Today- Background of Mahabharata. Arjuna Vishada Yoga: Arjuna's Anguish and Confusion- Symbolism of Arjuna's Chariot. Sankhya Yoga: Importance of Self- knowledge- Deathlessness: Indestructibility of Consciousness Being Established in Wisdom- Qualities of Sthita- Prajna.

UNIT II:

Karma Yoga: Yoga of Action- Living in the Present- Dedicated Action without Anxiety over Results- Concept of Swadharma.

Dhyana Yoga: Tuning the Mind- Quantity, Quality and Direction of Thoughts- Reaching Inner Silence.

UNIT III:

Bhakti Yoga: Yoga of Devotion- Form and Formless Aspects of the Divine- Inner Qualities of a True Devotee **Gunatraya Vibhaga Yoga:** Dynamics of the Three Gunas: Tamas, Rajas, Sattava- Going Beyond the Three Gunas- Description of the Gunatheetha.

References Books

1. Swami Chinmayananda, "The Holy Geeta", Central Chinmaya Mission Trust.
2. Swami Chinmayananda, "A Manual of Self Unfoldment", Central Chinmaya Mission Trust

PCC-FA 208 FABRIC FORMATION & ANALYZING LAB

L T P Total
0 0 2 2

Sessional: 15 marks

Theory: 35 marks

Total: 50 marks

Duration of exam: 2 hours

Course Outcomes:

- To understand the fabric formation on looms
- The understand mechanism involved and as well as developing creativity in designing unique fabric structures along with fabric analysis.
- To analyse manufacturing processes involved in converting yarns to fabric winding.

Experiments:

1. Basic principles of woven fabric analysis: estimation of data for cloth reproduction, Identification of yarns and materials used in their construction.
2. Weave analysis, Sett, Cover factor, Count and weight calculations for simple and compound woven structures, Specifications of standard woven fabric.
3. Discussion and Demonstration of various machines and of manufacturing processes involved in converting yarns to fabric winding, warping, sizing, Drawing-in, weaving by Hand looms, Plain Looms.
4. Automatic Shuttle Looms, Shuttle less Looms and Knitting, Passage of material through them and brief study of their essential components and mechanisms.
5. Simple production and efficiency calculations pertaining to these processes.

Text Books & References:

1. Navneet Kaur, Comdex Fashion Design; Fashion Concepts: Vol -1, Dreamtech press, 2010
2. Gokarshan N.. Fabric structure and design, New Age Publishers
3. Groszicki Z J, Watson Textile Design and Colour", Newnes Butterworth.
4. Nisb: H. "Grammar of Textile Design", , D 13 Tarapore Wala sons and Co.

PCC-FA 209 APPAREL CONSTRUCTION LAB

L T P Total
0 0 2 2

Sessional: 15 marks
Theory: 35 marks
Total: 50 marks
Duration of exam: 2 hours

Course Outcomes:

- Understanding the basic block information, dart manipulation and drafting techniques. To analyze style variations of dart manipulation
- To understand designing and construction of garments of children, men and women using different construction and decorative features.

Experiments:

1. Developing the basic blocks, marking information on blocks. Adaptations of the basic blocks, principle of dart manipulation by (i) slash and spread method (ii) pivotal transfer method.
2. Style variations of dart manipulation pleats, tucks, gathers, dart clusters, radiating darts, terminating darts.
3. Fitting problems and their identification. Commercial paper pattern symbols used in commercial patterns, envelopes for commercial paper patterns, guide sheet and other relevant information.
4. Flat pattern technique drafting, developing paper pattern, designing and construction of garments of children, men and women using different construction and decorative features.

Text Books & References:

1. Armstrong, Pattern Making for Fashion Design, Dorling Kindersley publication.
2. Aldrich, Metric Pattern Cutting for Children wear & baby wear, Blackwell publication.
3. Aldrich, Pattern Cutting for Women tailored Jacket, Blackwell publication.
4. Holman, Pattern Cutting Made Easy, Batsford publication.

SEMESTER - V

ESC-FA 301 KNIT & GARMENT TECHNOLOGY

L T P Total
3 1 0 4

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- To analyze knitted fabrics, their properties, manufacturing techniques as well as ornamentation. To understand the concepts of fully fashioned garments
- Understand the classification of warp and weft knitting machines To understand the quality control of various knitting processes.

Course Content:

UNIT I

Definition of knitting, Type of Knitted fabrics and their characteristics, End-uses of knitted fabrics. Fundamental Stitches: Knit, Tuck and float stitches and their uses. Stitch diagrams. Knitting cycles of Latch, Beard and Compound Needles. Basic weft knitted structures (Plain, Rib, Interlock and Purl) and their properties, description of machine for production of these. Design and timings of their cams. UNIT

UNIT II

Patterning devices in weft knitting like multi-cam track, swing cam, pattern wheel jacquard and electronic jacquard, their mechanisms of operation. Development of knit structures on Circular and Flat Knitting Machine. Quality control of various knitting processes Ornamentation of knitted fabrics. Derivatives of basic structures like Le-coste, Accordion, Half and Full Cardigan, Milano Rib, French Rib, Swiss Rib, Single Pique, Taxi Pique, Pin Tuck. Classification of warp and weft knitting machines. Classifications of warp knitting machines. Description of Raschal and tricot machines. Characteristics of Raschal and Tricot structures Calculations for Tightness factor, fabric cover, stitch density, areal density and knitting machine production

UNIT III

Introduction to Knitted Garments- types and flowchart including the steps of production. Fully Cut garments- spreading hand and machine spreading, types of lays Marking manual – and computerized marking Cutting devices as die-cutter. Hand shears, laser cutting, etc. Cut stitch shaped Fitting blocks as easy fitting and close-fitting blocks. Consideration of visual stretch, stretch in action, etc. Shaping of various garments, e.g., in body sleeve angles, etc., Cutting in case of cut stitch shaped garments Integral garments Basic techniques as course shaping Wales shaping, tubular knitting, running-on, change of stitch type, casting -off, etc. Machine knitted integral garments as berets, half hose, upper and lower bodice garments as Jacket, Wagnall garment, Tubular garment, etc

UNIT IV

Fully fashioned garments- Concepts of use of basic forms i.e., circle, bell, and balloon, triangle, overlays in the generation of a garment shape. Broader classification of integral garments. Fashioning for shaping, fashion frequency. Most used fashion details- Necklines, sleeves, etc. Application of each in Linking and Mock Linking. Linking machine and Cup seamer. Quality control of knitted garments.

Text Books & Reference Books:

1. Knitting Technology: Wignal
2. Knitting Technology: Azgaonkar

PCC-FA 301 COLOURATION OF TEXTILE & APPAREL PRODUCTS

L T P Total
3 1 0 4

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- After completion of the course, students will be able to:
- Understand the fundamentals of textile coloration and pre-treatments. Analyze the textile dyes and techniques for different fibres.
- Apply dyes on fabric and garments.
- Develop the sample of denim using indigo dye.

Course Content:

UNIT I

Elementary knowledge and Process line for preparatory wet processing, Natural and added impurities in greige cotton fabrics. Overview of singeing, desizing, scouring operations with their objective, principal and mechanism, general recipe, drawbacks and advantages. Introductory idea of machines used in preparatory wet processing.

UNIT II

General introduction to bleaching and mercerization with their objectives, mechanism, machine used, drawbacks and advantages. Introduction to heat setting: objectives and mechanism. Pretreatment processing of wool and silk textile., General concept of dyeing i.e. dye-fibre interaction, dye uptake, shade percentage. Introductory idea of dyeing of fibre, yarn and fabric on different dyeing machines.

UNIT III

Introductory idea of dyeing of cellulosic fibres with direct, acid, basic, reactive, vat, metal complex, sulfur, azoic and pigments (overview).

UNIT IV

Dyeing concept of synthetic textile materials such as Polyester, Nylon (disperse), etc . Dyeing of denim using indigo dye. Chemical auxiliaries used in dyeing. Colour measurement and fastness (light, washing, perspiration, sublimation, chlorine, etc.) properties, Garment dyeing and processing: concept and machine used.

Text Book & Reference Books:

3. GohlEP Gand Vilensky Publishers.

PCC-FA302 GARMENT PRODUCTION MACHINES & EQUIPMENT

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- To understand garment manufacturing process , sewing machineries , sewing needle etc.To understand sewing machine and computerized embroidery machines.
- To analyse the handling of garments between different processes in the apparel industry.
- To understand the applications of Programmable logic circuits (PLC) in the Garment manufacturing processes.

Course Content:

UNIT I

Overview of the Garment Manufacturing processes, Introduction to the latest advancements in the Garment manufacturing processes. Fabric cutting Process: Pre-requisites for the fabric cutting. Tools and equipment needed for the cutting process. Advancements in the fabric cutting technology.

UNIT II

Garment assembly processes: Basics of sewing, Functional parts of sewing machines (SNLS): Feed mechanisms, Run-in-ratio, Effect of sewing process on the sewing thread strength. Principle, mechanism and utility of following machines: Interlock machine, Overlock machine, Double needle Lock stitch and chain stitch sewing machines, Bar- tacking machine, Feed off the arm, Button attaching and buttonhole making machine and computerized embroidery machines.

UNIT III

Study of sewing needle temperature: Factors affecting and remedial measures, Methods for the needle temperature measurement. Study of the measurement of the sewing forces and pressure during sewing. Study of the measurement techniques of the sewing thread tension on the sewing machine: SNLS and overlock machines. Applications of Programmable logic circuits (PLC) in the Garment manufacturing processes. Robotics: Basic analogy, its applications, scope and limitations in the Garment Industry.

UNIT IV

Pressing and Fusing process and equipment. Handling of garments between different processes in the apparel industry.

Text Books & Reference Books:

1. Knitted Clothing Technology-Brackenburry
2. The Technology of Clothing Manufacture-Harold Carr,
3. Barbara Latham Introduction to Clothing Manufacture-GerryCooklin
4. Apparel Production-Jacob Solinger Robotics
5. Automation in the Textile Industry-M.G.Mahadevan
6. Fashion Production Terms-Debbie Ann Giocello & Berle.

ESC-FA302 KNIT DESIGN & DEVELOPMENT LAB

L T P Total
0 0 2 2

Sessional: 15 marks

Theory: 35 marks

Total: 50 marks

Duration of exam: 2 hours

Course Outcomes:

- To impart knowledge among students with basics of different woven.
- To analyze knitted fabric structures.
- Design samples on handloom, power loom and knitting machines.

Experiments:

1. Study of warp patterning through sectional warping.
2. Study of weft patterning through drop box motion.
3. Study of weft patterning through electronic dobby and jacquard.
4. To prepare fabric samples on desk looms/hand looms with basic weaves like plain, twill, satin, sateen, matt and some decorative weaves like honey comb, mock-leno, crepe, screw etc.
5. To study single jersey, rib, interlock circular weft knitting m/cs.
6. Practice of fabric sample preparations on these m/cs.
7. To study flatbed weft knitting m/cs.
8. Practice of fabric sample preparations on these m/cs.
9. To prepare different knitted fabric design by combination of knit tuck and float using pattern wheel jacquard in circular m/c.
10. Study of different types of fabrics and their specifications according to their end use.

Text Books & References:

1. Azgaonkar, "Knitting Technology", Universal Publishing Corporation, 1998.
2. Spencer, Knitting Technology, Pergamon Press.
3. Wignall H, Hosiery Technology, Plainfield, N.J.: Textile Book Service, 1968.
4. Irfan Ahmed sheikh, Pocket Knitting Expert, Irfan publisher
5. Terry, Knitted Clothing Technology, Blackwell

PCC-FA303 COLOURATION OF TEXTILE & APPAREL LAB

L T P Total
0 0 2 2

Sessional: 15 marks

Theory: 35 marks

Total: 50 marks

Duration of exam: 2 hours

Course Outcomes:

- To understand various preparatory wet processing.
- To analyse dyeing applications on various type of fabrics. To understand dyeing of Wool and Silk by acid and dyes.

Experiments:

1. Desizing of cotton by various methods and determination of desizing efficiency. Scouring and determination of scouring efficiency, Bleaching of cotton using hydrogen peroxide. Assessment of bleached goods. Mercerization of cotton, Scouring and bleaching of wool. Degumming and bleaching of silk.
2. Dyeing of Cotton, by direct, reactive, sulfur, vat, azoic dyes. Dyeing of Wool and Silk by acid, metal complex dyes, Nylon with acid dyes, Carrier, HTHP, Thermos lining dyeing of PET, Dyeing of Acrylic with basic dyes, Dyeing of Cotton/Polyester and Polyester/Viscose blend. After treatment of direct dyes, Rectification and Stripping of dyes. Measurement of fastness properties, Perspiration, light, washing, rubbing, etc., Computer color matching

Text books & references:

1. Gohl EP G and Vilensky LD, "Textile Science", , CBS Publishers.
2. Chakraborty J N, "Fundamental and practices in colouration of textiles", Woodhead Publishing India Pvt Ltd, 2008
3. Trotman E R, "Textile Scouring and Bleaching", Griffin, 1968.
4. Shenai VA, "Technology of Bleaching & Mercerizing", Sevak Pub., Mumbai.
5. Gulrajani M L, "Chemical Processing of Silk".
6. Shenai V A, "Technology of Dyeing", Sevak Pub., Mumbai.
7. Trotman E R, "Dyeing and Chemical Technology of Textile Fibres", B.I. Publications Pvt.Ltd.
8. Hall David M, Chemical Technology of textiles: a laboratory manual of Textile Engineering, Auburn University, 1981

PCC-FA304 APPAREL CONSTRUCTION-II

L T P Total
0 0 2 2

Sessional: 15 marks
Theory: 35 marks
Total: 50 marks
Duration of exam: 2 hours

Course Outcomes:

- To understand the basic dart manipulation.
- To analyse different types of patterns, involve in Designing of garments

Experiments:

Principle of dart manipulation by (i) Slash and spread method (ii) Pivotal transfer method Style variations of dart manipulation pleats, tucks, gathers, dart clusters, radiating darts, terminating Dart Commercial paper patterns-symbols used in commercial patterns, envelopes for commercial paper patterns, guide sheet and other relevant in formation.

Text Books & References:

1. Chuter. Introduction to Clothing Production Management, Blackwell.
2. S. Armstrong, Pattern Making for Fashion Design, Dorling Kindersley publication.

SEMESTER - VI

PCC-FA 305 COLOUR AND DESIGN CONCEPT

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- To understand various terminology and theories of colors.
- Design ideas concepts and their role and application in apparel construction.
- To understand the composition of designs and geometric ornamentation
- To understand colour combination and intensity charts.

Course Content:

UNIT I

COLOUR Concept and specifications of colour, Light and colour phenomenon, Additive and Subtractive combinations, Colour theories as light theory, pigment/ Brewster colour theory. Colour wheel primary, secondary, sub-secondary and tertiary colours, Rainbow colours. Colour combination techniques in fabric and garments. Psychological effects of colour, Warm and Cool colours. Colour harmony. Definition of Colour as per C.I.E., Tristimulus value, Hue and Chroma; Color gamut

UNIT II

Colour combination techniques in fabric and garments. Colour contrast in fabric and garments. Application of colour combination and harmony in designing of clothing/fabric. Modification of colours as formation of tint, shades and coloured grays etc. Colour intensity charts. Outline for the movement of colours in fashion with the factors affecting the choice of colour. Elements of design of a motif : line, dot, curve, colour and texture. Different Types and their applications.

UNIT III

Composition of designs Geometric ornamentation, conventional treatment of natural and artificial forms, adoption and reproduction of earlier designs. Construction of symmetrical figures, Reversing inclined figures. Arrangement of figures - unit-repeating design, the drop device, drops reverse designs, sateen system of distribution (with reference to half drop, diamond base, ogee base, rectangular base lines). Construction of designs from incomplete repeat.

UNIT IV

Study of Pattern: historical precedents. Symmetry principle concepts, perspectives and its application, classification of motifs, border patterns, all over patterns, Counterchange motifs, border patterns and all over patterns.

Text Books & Reference Books

1. Design and colour: Watson
2. Colour mixing Bible: Watson Guptill Publication

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PCC-FA 306 TEXTILE & APPAREL PRODUCT TESTING

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- To understand methods of testing relevant to fibres, yarn and fabrics with brief description of relevant equipment.
- To understand garment Testing
- To understand testing and its importance.
- To understand adhesion between interlining and fabric, shrinkage, zippers, buttons, snap fasteners and other general garment properties

Course Content:

UNIT I

Introduction to testing and its importance, Standard atmospheric conditions for testing and its effect on test results. Testing of yarn strength, elongation, twist, evenness and hairiness. Fabric dimensions measurement length, width, thickness, weight/area, thread/length and crimp.

UNIT II

Tensile strength and elongation: Definition of different units, tensile strength and elongation, work of rupture, tearing strength, bursting strength. Serviceability: Snagging test, Pilling test, Abrasion resistance.

UNIT III

Comfort: Water vapour repellency, Wicking properties, Air permeability, Thermal insulation and wettability. Fabric handle: Bending length, Crease recovery, Drape, Low stress mechanical properties. FAST, Kawabata Evaluation System.

UNIT IV

Garment Testing: Dimensions, Seam strength, Seam slippage, Adhesion between interlining and fabric, shrinkage, zippers, buttons, snap fasteners and other general garment properties. Needle Cutting/Yarn severance.

Text Books & Reference Books:

1. Principles of Textile testing: J.E Booth
2. Textile Testing V.K. Kothari
3. Apparel quality Control V.K. Mehta
4. Physical Testing of Textile: Saville

PCC-FA 307 TEXTILES & APPAREL PRINTING

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- To understand fundamentals of printing, various methods and styles of printing. To understand applications of printing procedure
- To understand detail chemistry of dyes and printing auxiliaries. To analyse some special printing process.

Course Content:

UNIT I

Different methods and styles of printing of natural and synthetic fabrics, machinery involved: Block, Roller, Rotary & Screen, Transfer Printing.

UNIT II

Design making and screen exposing - Table, Flat-bed, Rotary screen. Ink-jet printing, Xerographic printing, Lithographic printing, etc.

UNIT III

Printing with reactive dye and pigments. Special effects like Batik, Tie and dye.

UNIT IV

Some special printing: Wax prints, Java prints, Fancy prints, Bleeder style, Crimpstyle.

Text Books & Reference Books:

1. Technology of printing: V A Shenai
2. Textile Printing Second annual Symposium: R B Chavan

PCC-FA 310 COLOUR AND DESIGN LAB

L T P Total
0 0 2 2

Sessional: 15 marks
Theory: 35 marks
Total: 50 marks
Duration of exam: 2 hours

Course Outcomes:

- To analyse construction of motif or design and further application. To understand water colours to fill.
- To understand arrangement of the primary, secondary and intermediate colours in the Brewster's Theory

Experiments:

Specification of color with hue, value and chroma, color combinations according to pigment theory of colour. Arrangement of the primary, secondary and intermediate colours in Colour illusions, warm and cool colour effects, Modification of pigment, the Brewster's theory colour with formation of tint, shades and coloured grays etc, Colour and gray intensity charts. Types of lines, dots and curves and their effects, To produce floral, geometrical, abstract and border designs. Enlargement and reduction of designs. Simple Weave and colour effects. Compound colour and weave effects stripe colour and weave effect, Check colour and weave effect, Special colour and weave effect, figured colour and weave effect. Placement of figures and motifs half drop, double 1/2 drop, diamond base, ogee base, rectangular, horizontal, vertical etc.

Text Books & References:

1. Groszicki Z J, "Watsons Textile Design and Colour", Newnes Butterworth, 1988.
2. Gohl EP G and Vilensky I.D, "Textile Science", CBS Publishers, Delhi, 1983.
3. Hideaki Chijliwa, Color Harmony - A guide to creative color combinations, 1994 edition.
4. Davis. Marian L.. Visual Design in Dress, Prentice-Hall Inc., 1996.
5. Elizabeth Rouse, Understanding Fashion, BSP Professional Books, 198°.

SEMESTER - VII

PCC-FA 401 TEXTILE & APPAREL FINISHING

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- To develop water repellent and water proof finish, flame-proof and flame-retardant finish.
- To understand mechanism of shrinking and pre-shrunk fabric.
- To understand finishing of denim: stone wash, enzyme wash, etc. enzyme wash and some other specialty finishes

Course Content:

UNIT I

Introduction to textile finishing. Aim and scope. Classification of finishes. Concept of permanent and temporary finishes. Various finishes in industrial practices such as raising and shearing, drying. Calendaring - its types, construction and function of various calendaring m/cs.

UNIT II

Mechanism of shrinking and pre-shrunk fabric. Sulfurizing method and mechanism. Brief concept of finishing of wool: Crabbing, dequantizing, milling, shrink finishing, etc. General chemical finishes like softening, stiffening, delustering of rayon, polyester. Organdy finish. Silky finish of polyester. Weighting of silk

UNIT III

Introduction and preliminary concepts of specialty finishes such as durable press textile and garments, anti-crease finish. Water repellent and water proof finish, Flame-proof and flame-retardant finish.

UNIT IV

Introduction and preliminary concepts of specialty finishes such as Soil and oil repellent finish, anti-static finish, antimicrobial finish. Introduction of enzymes and their applications in finishing of textiles and garments. Finishing of denim: stone wash, enzyme wash, etc. enzyme wash and some other specialty finishes. Brief introduction to garment finishing machines.

Text Books & References:

1. JT Marsh, An Introduction to Textile Finishing, Chapman and Hall, 2nd Ed, London, 1966.
2. Shenai V A, Textile Finishing, Sevak Pub., Mumbai.

PCC-FA 402 TEXTILE & APPAREL COSTING

L T P Total
3 0 0 3

Sessional: 25 marks

Theory: 75 marks

Total: 100 marks

Duration of exam: 3 hours

Course Outcomes:

- To develop water repellent, water proof finish, flame-proof and flame-retardant finish.
- To understand methods of costing.
- To understand cost analysis of different garments with example.
- To understand finishing of denim: stone wash, enzyme wash, etc. enzyme wash and some otherspecialty finishes.
- To analyse the dollar plan in action, control system, and fashion consideration in practices.

Course Content:

UNIT I

General Cost Concept: Classification of cost (Fixed, Variable, Semi-variable and Total Cost), Cost elements (direct, indirect), planning and storage of materials, pricing and control of materials, computation and control of labour cost, Remuneration and incentives to labour. Overhead costs: Classification and accumulation, allocating service department costs, distribution and absorption, marketing and administration, depreciation and miscellaneous.

UNIT II

Methods of costing: Single or output costing, job order cost system, introduction to other methods of costing. Cost control techniques: standard costing, variance analysis (Materials and labour, overheads, sales and marketing). Cost control and cost reduction.

UNIT III

Costing in textile industry: Cost structure, raw material cost, labour cost and other expenses. Yarn realization, determination of cost per kg of yarn, per meter of fabric. Cost of dyeing/printing per meter fabric. Value loss, selling price decision of fabric. Costing in apparel industry: Raw material cost, labour cost and other expenses. Cost analysis of different garments with example.

UNIT IV

Dollar Planning and control: Introduction, Responsibilities for a dollar plan, Requirements of a dollar plan, Approach to a dollar plan, Elements of the dollar plan (planned sales, Planned Stock turnover, Stock/Sales ratio. The relationship between stock turnover and stock/sales ratio). Retail inventory method- Advantages, Applications, The dollar plan in action. Control system, Controls and Fashion consideration.

Text Books & References:

1. B.M.L. Nigam, House, Delhi,2007.
2. Dodge, R., Foundation of Business Accounting, Chapman and Hall,1993.
3. Drury, C., Costing, An Introduction Chapman and Hall,1998.
4. Holmes, G. and Sugden, A., Interpreting Company Reports and Accounts, Wood head-Faulkner,1999.
5. Horngren, C.T., Introduction to Management Accounting, Prentice Hall, 1996.

PCC-FA 403 QUALITY ASSURANCE IN APPAREL INDUSTRY

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- To understand Tools of quality control.
- To understand Principles of quality control, total quality control, statistical quality control.
- To understand ISO-9000 series of standards. Quality assurance, TQM, Six.
- To analyse the various care labeling system.

Course Content:

UNIT I

Definition & importance of Quality, Tools of quality control.

UNIT II

Quality Control Principles of Quality Control, total quality control, statistical quality control, quality circle, quality and profitability, Quality control in fusing.

UNIT III

Inspection Definition, inspection, loop, raw material inspection, in-process inspection, final inspection, comparability checks.

UNIT IV

ISO-9000 series of standards. Quality assurance, TQM, Six Sigma. Care labeling of apparel and textiles American care labeling system, British care labeling system, Japanese care labeling system.

Text Books & References:

1. An Introduction to Quality Control for the apparel Pradip V Mehta.
2. Managing Quality in the Apparel Industry Satish Bhardwaj & V Mehta
3. The Technology of Clothing Manufacture Harold Care & Barbara Latham

PCC-FA 404 APPAREL DRAPING & GRADING LAB

L T P Total
0 0 2 2

Sessional: 15 marks

Theory: 35 marks

Total: 50 marks

Duration of exam: 2 hours

Course Outcomes:

- Analyze different pattern making and grading techniques.
- Evaluate different dart manipulation method and able to apply them.
- Create different type of sleeves, collars and draping.
- Create yokes and neckline and draping.

Experiments:

1. Illustration for the techniques of draping to get the fault free draped pattern.
2. Practice of draping of basic bodice to the dress-form.
3. Variations in bodices as per the designing details.
4. Draping of basic skirt and hence skirt variations.
5. Fundamentals & techniques for Grading with the use of size-charts etc.
6. Grading of basic bodices by z-track and 3-track method.
7. Computerized grading on Lectra software.
8. Practice on software available for draping and grading.

Text Books & References:

1. Armstrong, Pattern Making for Fashion Design, Dorling Kindersley publication.
2. Aldrich, Metric Pattern Cutting Men's wear 4 Ed., Blackwell publication.
3. Aldrich, Metric Pattern Cutting for Children wear & baby wear, Blackwell publication.
4. Aldrich, Pattern Cutting for Women tailored Jacket, Blackwell publication.
5. Holman, Pattern Cutting Made Easy, Batsford publication.
6. Cooklin, Patter Grading Men's cloth, Blackwell publication.
7. Cooklin, Pattern Grading Women's cloth, Blackwell publication.

PROFESSIONAL ELECTIVE COURSE (PEC)

PROFESSIONAL ELECTIVE COURSE-I (PEC-I) (Semester-IV)

S. No.	Name of Course	Contact Hours	Credits
1	Engineering Economics	3	3
2.	Introduction to fashion retail	3	3
3.	Supply chain management	3	3

Note: Students will have to select any one out of the list.

PEC-FAEL 201-1 ENGINEERING ECONOMICS

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- To understand brief idea about ergonomics by their practical utility and importance. To understand the concept of market demand and their practical application.
- To gain the knowledge of various types of cost accounting techniques.
- To understand the role of supply and demand, globalization of Indian economy by their merits and demerits with affect the international market scenario.

Course Content:

UNIT I

Definition of Economics - various definitions, Nature of Economic problem, Production possibility curve Economic laws and their nature. Relation between Science, Engineering, Technology and Economics. Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility - its practical application and importance.

UNIT II

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand. Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

UNIT III

Various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost, real cost opportunity cost. Shape of average cost, marginal cost, total cost etc. in short run and long run. Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

UNIT IV

Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on prices. Nature and characteristics of Indian economy (brief and elementary introduction), Privatization - meaning, merits and demerits. Globalization of Indian economy - merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement.

Text Books & Reference Books:

1. Principles of Economics -- P.N. Chopra (Kalyani Publishers).
2. Modern Economic Theory: K.K. Dewett (S. Chand)
3. Micro Economic Theory -- M.L. Jhingan (S. Chand)
4. Micro Economic Theory -- H.L. Ahuja (S. Chand)
5. Modern Micro Economics --S.K. Mishra (Pragati Publications)
6. Economic Theory - A.B.N. Kulkarni& A.B. Kalkundrikar (R. Chand & Co.)

PEC-FAEL 201-2 INTRODUCTION TO FASHION RETAIL

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- To gain the importance of fashion retail sector by means of various fashion stores. To understand the concept idea behind retailer and wholesaler.
- To gain the knowledge of concept of retail marketing, retail mix and various promotion mix comes under retailing.
- To understand the dimension of retailing sector.

Course Content:

UNIT I

Retail, fashion retailing - types of retail formats, retail formats operating fashion in India-franchised retail, chain store retailing, specialty stores, factory outlets, discount retailing, non-store retailing like online retailing, level of service offered, franchising system characteristics, retail marketing decisions.

UNIT II

Wholesalers-difference between retailers and wholesalers, types of wholesalers, major functions and services provided by wholesalers, product line of wholesalers, modes of physical distribution, marketing logistics, inventory management

UNIT III

Retail marketing nature, concept and importance, objectives of retail marketing, retail marketing mix, mix planning and composition, key elements of retail mix, retail marketing planning and its types, retail buying sequence and communication. Various modes of fashion retail promotions. Influence of promotion on the business, limitations.

UNIT IV

Changing dimensions of fashion retailing - growth of private labels: retailers into manufacturing, concentration of retail power, globalization of retailing, relationship marketing, partnerships, logistics and distribution.

Text Books & References:

- Kitty G. Dickerson, Inside the Fashion Business, 7th Edition, Pearson Education, India Philip Kotler and Kevin Keller, Marketing Management, 13th Ed, Prentice Hall

PEC-FAEL 201-3 SUPPLY CHAIN MANAGEMENT

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- To gain the basic idea about supply chain by means of flow and various drivers involve in supply chain management.
- To understand various supply chain management decision techniques. To understand the concept of inventory management.
- To understand the importance of reverse supply chain and forward supply chain and their application.

Course Content:

UNIT I

Introduction of Supply Chain, Supply Chain Concepts: flow of materials, flow of Information, Supply Chain Drivers.

UNIT II

Objective of supply chain, decision phases in a supply chain, process view of supply chain- cycle view and push/pull view, importance of supply chain flows.

UNIT III

Safety Inventory, cyclic inventory, role of sourcing in a supply chain supplier scoring and assessment, supplier selection, design collaboration, procurement process, sourcing planning and analysis, procurement process, making sourcing decisions in practice.

UNIT IV

Reverse supply chain (RSC), difference with forward supply chain, cost considerations involved, industries participation, factors leading to application of concept of RSC in specific industries and its restricted application, benefits, cost effectiveness of RSC compared to forward supply chain. Overview on critical path management, the role of IT in supply chain.

Text Books & References:

1. Martin Christopher, "Logistics & Supply Chain Management: Strategies for reducing cost and improving service"2n
2. Douglas Macbeth and Ferguson N, "Partnership Sourcing: An integrated Supply Chain Approach" Financial Times Management, 1994

PROFESSIONAL ELECTIVE COURSE-II (PEC-II) (Semester-IV)

S.No.	Name of Course	Contact Hours	Credits
1.	Structure & properties of textiles	3	3
2.	Preparative wet process	3	3
3.	Principles of management	3	3

Note: Students will have to select any one out of the list.

PEC-FAEL 202-1 STRUCTURE & PROPERTIES OF TEXTILES

L T P Total
3 0 0 3

Sessional: 25 marks

Theory: 75 marks

Total: 100 marks

Duration of exam: 3 hours

Course Outcomes:

- Related the importance, objectives and fundamentals of textile testing.
- Perform proper sampling techniques and procedures for testing.
- Evaluate the influence of fabric/ garment properties.
- Use of analytical skills to assess different quality aspects.
- Develop insight into innovative quality products.

Course Content:

UNIT I

Structure and Properties of Ring, Rotor, DREF spun yarns, multifilament and textured yarns. Importance of Yarn structure in relation to different mechanical properties of Apparel Fabrics.

Cloth setting theories: Ashenhurst's, Armitage's, Law's, Brierley's and Peirce's theory: its basic seven equations and idea of jamming

UNIT II

Tensile property of fabrics: tensile curve for fabrics and geometrical changes during tensile deformation, factors affecting tensile strength of fabrics, bending property of fabrics: Different bending stiffness parameters by cantilever testing, Bending hysteresis testing and different parameters measured by it, Bending hysteresis curve, Factors affecting bending stiffness of fabrics

UNIT III

Shear stiffness of fabrics: problems during shear testing and their remedies. Shear hysteresis curve, Spring- friction block model of shear behaviour. Creasing of fabrics: Mechanism of creasing, different motions within fabric structure while creasing. Factor affecting crease resistance and crease recovery of fabrics.

UNIT IV

Comfort of fabrics, different constituents of comfort. Flow of heat, moisture and air through textile material, Factors affecting thermal insulation, moisture propagation and air permeability of fabrics. Drapability of fabrics, Drape testing, drape parameters and factors affecting drape behavior. Introduction to the term Tailor ability and Formability for apparel fabrics. Handle of fabrics. Objective evaluation of fabric handle. Constituent properties of handle.

Text Books & Reference Books:

Textile Yarns-Technology, Structure and Applications: Goswami et al
Structural Mechanics of Fibres, Yarns and Fabrics: Hearle et al

PEC-FAEL 202-2 PREPARATIVE WET PROCESS

L T P Total
3 0 0 3

Sessional: 25 marks

Theory: 75 marks

Total: 100 marks

Duration of exam: 3 hours

Course Outcomes:

- To understand the elementary pre-treatment processes of various natural and synthetic textile materials.
- To know how various recipes and machineries involved for removing impurities in greige fabric.
- To understand knowledge of various modern textile pretreatment processes involved in textile wet processing sector.
- To gain the knowledge of various auxiliaries suitable of wet processing.

Course Content:

UNIT I

Greige Fabric checking, Preparation of process chart. Elementary knowledge of processing department, identification of impurities in greige, cotton, wool, silk and synthetics. Identification of size materials on fabric. Recipes, conditions and machinery use for removing impurities from greige fabric, yarn and fibres.

UNIT II

Introduction to different processes (Desizing, Scouring, bleaching, mercerizing, milling, etc.) involved for the above and the machinery used.

UNIT III

Heat and steam setting of synthetic fibres / fabrics / yarns (polyester, nylon, acrylic, polypropylene, spandex fibre etc.). Physical principles involved in detergency, condition for efficient detergency. Commercial detergents. Dry cleaning, Stain removals

UNIT IV

Modern developments in pre-treatments. Continuous processing machinery. Auxiliaries used in Desizing, scouring, bleaching and mercerizing.

Text Books & Reference Books:

1. Textile Chemistry RH Peters
2. Mercerizing JT Marsh
3. Textile Scouring and Bleaching E R Trotman
4. Technology of Bleaching & Mercerising V A Shenai
5. Chemical Processing of Silk ML Gulrajni

PEC-FAEL 202-3 PRINCIPLES OF MANAGEMENT

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

1. After completion of the course, students will be able to: Implement the process of Management planning.
2. Implement Organizing in an enterprise.
3. Implement the process of Directing controlling.
4. Analyze the Global Environment with ideas of Globalization and Liberalization.

UNIT I

Introduction to management: Science as well as Art, Management and Administration brief out lines of Management Thoughts, Process of Management- Planning: Nature and Purpose-Steps involved in Planning- Objectives- Setting Objectives- Process of Managing by Objectives- Strategies, Policies and Planning Premises- Forecasting Decision making

UNIT II

Nature and Purpose, types of organization structure, Organizing: departmentation by difference, Line and Staff authority, Benefits and Limitations, Decentralization and Delegation of Authority, Staffing nature and process, brief concept and role of HRD.

UNIT III

Directing: Scope - Human Factors - Creativity and Innovation - Leadership-Types of Leadership, styles and qualities of leadership, Motivation: meaning, types, significance and motivational theories

UNIT IV

Controlling: Management control- concept and process, overview of control techniques (traditional and modern), managing ethics and social responsibility. The Global Environment - Globalisation and Liberalisation, Introduction to RTI act.

Text Books & References:

1. Robbins, S.P. and Decenzo, D. A., Fundamentals of Management, Pearson Education Asia, New Delhi.
2. Harold Koontz and Heinz Weihrich, Essentials of Management, Tata McGraw-Hill, New Delhi, 1998
3. Joseph L. Massie, Essentials of Management, Prentice Hall of India, Pearson Fourth Edition, New Delhi, 2003.
4. Tripathy P.C. and Reddy P.N., Principles of Management, Tata McGraw-Hill, New Delhi, 1999.
5. Decenzo David and Robbins Stephen A.,

PROFESSIONAL ELECTIVE COURSE-III (PEC-III) (Semester-V)

S.No.	Name of Course	Contact Hours	Credits
1	Computer aided designing	3	3
2.	Indian business environment	3	3

Note: Students will have to select any one out of the list.

PEC-FAEL 301-1 COMPUTER AIDED DESIGNING

L T P Total
3 0 0 3

Sessional: 25 marks

Theory: 75 marks

Total: 100 marks

Duration of exam: 3 hours

Course Outcomes:

- To impart an understanding about the fundamentals, principles and applications of CAD.
- To give hands on training to students on Corel Draw software's and their use in Fashion Designing Field
- To learn in crin development, logo designing, making fashion illustration and designing with the help of software's.
- To be familiar with various graphics approaches using design software.
- To have adequate exposure of photoshop software for designing and modification in designs.

Course Content:

UNIT I

Fundamentals of CAD: Definition, History, Hardware and Software requirements of CAD, Design Process, Application, Use, Creating the manufacturing Data base and benefits of CAD.

UNIT II

Hardware in CAD: Introduction, Design workstation, Graphics terminal, input and output devices, central processing unit and secondary storage.

UNIT III

Introduction to Computer Graphics What is Computer Graphics, Computer graphics applications, Computer Graphics Hardware and Software. Two-dimensional graphics primitives, Point and lines, Line drawing algorithms: DDA, Bresenham's: Circle drawing algorithms; midpoint circle drawing algorithm, Bresenham's circle drawing algorithm.

UNIT IV

Introduction to Software Packages: Introduction to Auto-CAD: Features, Basic Drawing Techniques: Drawing Line, Circle, Rectangle, Arc, Polyline, Ellipse, Elliptical Arc, Polygons, Donuts, Corner rounding, Chamfering, Displacing, Duplicating, Removing Objects. Introduction to Corel Draw Features and basic drawing techniques. Introduction to Photoshop Features and basic drawing techniques.

Text Books & Reference Books:

1. Computer Aided Design & Manufacturing: Mikcle P Groover, Emory W. Zimmers Jr
2. Computer Graphics Principles & Practices: James D Foley, Andeies
3. Second Edition Van Da Shvan K Feiner. John F Hughes
4. Computer Graphics; Donald Mearn & M Pauline, Baker Mastering
5. AUTOCAD2004& AUTOCADLT2004: George Omur

PEC-FAEL 301-2 INDIAN BUSINESS ENVIRONMENT

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Content

UNIT I

Nature, Components and Determinants of Indian Business environment. General concept: GNP, GDP, BOT, BOP, Fiscal Policy, Monetary Policy, Fiscal Deficit, etc.

UNIT II

New economic policy, EXIM Policy, Economic Reforms Liberalization, Privatization, Globalization., Public enterprise reforms and Disinvestments programmes.

UNIT III

Financial Institutions and their role. Concept of Stock exchanges and Role of SEBI. World Bank and IMF and their impact on Indian Business Environment.

UNIT IV

WTO Genesis, Agreement, Rounds, Impact on Indian Business Environment, Indian Business Scenario. National textile policy and Role of BIFR.

Text Books & Reference Books:

1. Indian Economy T R Jain
2. Economic Environment of Indian Business Mishra & Puri
3. Business Environment Francis Cherunilam
4. International Marketing Cateora
5. International Marketing Onk visit & Shaw

PROFESSIONAL ELECTIVE COURSE-IV(PEC-IV) (Semester-V)

S.No.	Name of Course	Contact Hours	Credits
1.	Apparel merchandising	3	3
2.	Non-woven technology	3	3

Note: Students will have to select any one out of the list.

PEC-FAEL 302-1 APPAREL MERCHANDISING

L T P Total
3 0 0 3

Sessional: 25 marks

Theory: 75 marks

Total: 100 marks

Duration of exam: 3 hours

Course Outcomes:

- After completion of the course, students will be able to learn:
- Marketing and management functions in fashion sector the knowledge about product development and product life cycle.

Course Content:

UNIT I

Merchandising: Concept and definition. Uniqueness of apparel merchandising. Different components and activities of merchandising line, planning, line development and line presentation Fashion forecasting and its importance. Factors influencing fashion, Role of a merchandiser in an apparel industry, Essential qualifications of a merchandiser.

UNIT II

Concept of retailing and wholesaling. Classification of retailer and wholesaler. Function performed by distribution channel members. Decision making in retailing. Pricing consideration and pricing strategy. Factors affecting pricing strategy. Setting up and changing of price. Terms and definitions used in pricing. Pricing strategy commonly adopted by an apparel merchandiser. Mode of disposition of unsold merchandise.

UNIT III

Product line planning. Importance of planning, Different steps involved in product line planning. Different approaches of merchandise planning: Top -Down and Bottom up, Approach and contemporary line planning. Relative merits and demerits of different approach. Concept and definition of assortment planning. Objective of assortment planning. Importance of balanced assortment. Product line development. Various ways of product line development. Line presentation and its importance in retailing. Visual merchandising.

UNIT IV

Budgeting concept and definition. Importance of budgeting. Various steps involved in budgeting. Dollar And unit control system. Integrating dollar and unit concept. Planning of inventory and reorder point. Cost associated with inventory. Economic order quantity.

Text Books & References:

1. Apparel Merchandising Martin Kunj
2. Fashion Merchandising and Marketing: Cynthia R. Easterling and MarianH. Jernigan
3. Fashion: From Concept to Consumer: Gini Stephens Fring
4. Fashion Buying Helen Goworek
5. Fashion Marketing: Tony Hines

PEC-FAEL 302-2 NON-WOVEN TECHNOLOGY

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- Analyze the basic concepts of non-woven formation
- Develop the skills of selecting suitable raw material, process premieres as per the end applications
- Evaluates non-woven interrails and apply the apocopate technological stuff in nonwoven industry.
- Apply the knowledge in product development in non- woven industry

Course Content:

UNIT I

Introduction to Nonwovens, Historical Development, Definitions of nonwovens, classification of Non-Woven fabrics, Development of nonwoven industry & future perspective, Raw materials: Natural and synthetic fibres, bonding agents, Types of bonding agent

UNIT II

Web formation techniques: fibre preparation, brief introduction to dry laying, wet laying, parallel laying, cross laying and random laying methods, spun laying, melt blowing, SM, SMS fabrics. Mechanical bonding: Needle punching technology, needle punching machine, felting needles, needle classification and their specifications, factors affecting the properties of needle punched fabrics.

UNIT III

Brief introduction to spun lacing technology, factors affecting the spun laced fabric, stitch bonding techniques. Chemical bonding: Adhesive bonding, methods of bonding agent application, drying by convection, conduction, radiation, infrared and high frequency driers. Thermal bonding: Thermal bonding techniques, Area bonding, point bonding & their properties

UNIT IV

Finishing of nonwoven fabrics: shrinkage, calendaring, pressing, splitting, grinding, washing, dyeing, printing, softening, coating and laminating. Applications: Medical and hygiene, apparel, household & home textiles, geotextiles, filtration, automotive textiles, agriculture, leather industry, Brief introduction to methods of testing nonwoven fabrics.

Text Books & Reference Books

1. Non-woven fabrics: N. N. Banerjee

PROFESSIONAL ELECTIVE COURSE-V(PEC-V) (Semester-VI)

S.No.	Name of Course	Contact Hours	Credits
1	Advance Apparel construction techniques	3	3
2.	Entrepreneurship Development in Fashion and Apparel	3	3

Note: Students will have to select any one out of the list.

PEC-FAEL 303-1 ADVANCE APPAREL CONSTRUCTION TECHNIQUES

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- Have the knowledge of sewing machines, sewing needles and sewing threads.
- be able to identify seams and stitches and their appearance, applications and properties. Able to make garments in various category.
- Able to present his design.

Course Content:

UNIT I

Production Scheduling, Patterning and cutting procedures, Garment assembly.

UNIT II

Pattern making and construction techniques of shirts, pants/trousers and Jackets/Coats, Swimwear, sportswear/Actionwear, Capes or hoods.

UNIT III

Development of Men's Ready-to-wear, Design and production procedures of men's tailored clothing.

UNIT IV

Presentation techniques Flat sketches, Mood board, Storyboard, Portfolio.

Text Books & Reference Books:

2. Inside the Fashion Business: K G Dickerson
3. Fashion from Concept to Consumer: GS Frings
4. Pattern-making for Fashion Design: H J Armstrong

**PEC-FAEL 303-2 ENTREPRENEURSHIP DEVELOPMENT APPAREL AND FASHION
INDUSTRY**

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- After completion of the course, students will be able to:
- Evaluate and analyze the various Personal and industrial challenges industry and develop entrepreneur skills to overcome constraints...
- Develop the skills of systematic planning and managing a business enterprise develop and strengthen entrepreneurial quality and motivation
- Analyze the challenges of a fashion entrepreneur in different areas.

Course Content:

UNIT I

Introduction entrepreneurship, development of entrepreneurship, role of entrepreneurs in development of apparel and fashion industry, entrepreneurship with reference to fashion and apparel industry in India.

UNIT II

Entrepreneurial support by state, central financial institutions, organizations, Government policies with references to textile and apparel industry. Business planning Starting a new venture related to apparel industry, essentials of a successful center.

UNIT III

Location & plant layout-factors influencing plant location, building, structure, lighting, ventilation, material handling, availability of labour, material management and transportation.

UNIT IV

Industrial sickness and remedies, tax planning, VAT, Patent Rules, Factory Act, Minimum wages, knowledge of exemptions & deductions. Environmental considerations and social responsibilities

Text Books & Reference Books:

1. New Initiatives in Entrepreneurship Education & Training Jain GR & Gupta Fashion Entrepreneurship Retail Business planning. D, Michele Ganaganagar

PROFESSIONAL ELECTIVE COURSE-VI (PEC-VI) (Semester-VI)

S.No.	Name of Course	Contact Hours	Credits
1	Project Writing	3	3
2.	Automation in Garment Industry	3	3

Note: Students will have to select any one out of the list.

PEC-FAEL 304-1 PROJECT WRITING

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcome:

- Learn to write research with effective results.
- Knows about project methods.
- Knows about rules and regulation used in writing project.

Course Content:

UNIT I

Planning and preparation, word order, breaking up long sentences, structuring paragraphs and sentences, being concise and removing redundancy.

UNIT II

Clarifying who did what highlighting your finding, Hanging and Criticizing, paraphrasing and plagiarism, Section of a paper, Abstract, Introduction.

UNIT III

Review of the Literature, Methods, Results, Discuss, Conclusions, The final check.

UNIT IV

Key skills are needed when writing a Title, Abstract, Introduction, literature, Methods, Result, Discussion, Conclusion.

Suggested Studies:

2. Goldbort R(2006)writing for science, Yale University press (available on Google books).
3. Day R (2006) how to write and publish a scientific paper ,Cambridge University press.
4. Highman N(1998) handbook of writing for the mathematical science, SIAM highman's book .
5. Adrian wallwork ,English for writing research paper Springer new work New York detached.

PEC-FAEL 304-2 AUTOMATION IN GARMENT INDUSTRY

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- Identify the fundamentals of automation in apparel industry.
- Analyse the samples developed with and without attachments in terms of quality, time consumption, costs and overall performance.
- Explain industrial terminology and operate equipment in appropriate way.
- Analyse the stitching techniques, stitches, machine and production processes.
- Implement the concept and types of automation.
- Assess the degree and level of automation.
- Use various components of automation like sensors, actuators, PL.C.

Course Content:

UNIT I

Automation in the apparel Industry. Automation in the retail industry. Computer integrated manufacturing in the textile industries.

UNIT II

Automated material handling. Robotics. Requirement for automation in today's textile manufacturing environment.

UNIT III

Quick response & Technology, Evolution of computer integrated manufacturing systems. Emerging technologies.

UNIT IV

Nature of trade & future of the apparel industry.

Textbooks:

1. Automation in the textile industry--G.A. Berkstresser, D.R. Buchanan, P. Grady
2. From fibres to apparel --D.R. Buchanan, G. A. Berkstresser, P. Grady

PROFESSIONAL ELECTIVE COURSE-VII (PEC-VII) (Semester-VII)

S.No.	Name of Course	Contact Hours	Credits
1	Elements of fashion	3	3
2.	Fashion Accessories	3	3

Note: Students will have to select any one out of the list.

PEC-FAEL 401-1 ELEMENTS OF FASHION

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- After completion of the course, students will be able to:
- understand the basic concepts of design and Mood Boards.
- 2 concepts of elements of design and principles of design on apparels: figure design analysis. understand the concepts of different Men dress style and Women dress style.

Course Content:

UNIT I

Origin of fashion, Origin of clothing, Fashion language, Philosophy of design, Nature of fashion. Elements of fashion, Terminology of fashion: style, design, taste, classic, fad.

UNIT II

Component of fashion: Silhouette, Texture, Details. Study of leading fashion designers; French, Italian, American, Indian. Costumes of ancient civilization; Egypt, Roman, French. Fashion trends.

UNIT III

Principle of fashion. Environmental factor Demographic & Psychographics, Economic factors, Sociological factor, psychological factor. Fashion influence & theories of fashion adoption. Movement of fashion, the cycle of fashion; stages of cycle. Factors influencing fashion movement (accelerating & retarding factors). Fashion prediction.

UNIT IV

Leaders of fashion, Birth of fashion, designer's role, manufacturing roles, trailer's role, insight & intuition of sources of design. Trade shows, fashion promotion and advertisement. Retailing: an overview on different types of retail store. Merchandising: role of a merchandiser, little idea about visual merchandising

Text Books & References:

1. Anderson and Anderson, "Costume design", Harcourt Brace 2nd Ed, 1999.
2. Laver J, "Costume and Fashion", Thames & Hudson, 1995.
3. Lee Sharon, "Inside Fashion Design", Tate, 1977.
4. Brockman, H.L., "The theory of Fashion", John Wiley & Sons, 1965.

PEC-FAEL 401-2 FASHION ACCESSORIES

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- After completion of the course, students will be able to:
- Develop the skills of accessory illustration and visual merchandising.
- Create new accessory designs

Course Content:

UNIT I

Fashion Accessories definition and classification. Usage of different raw materials as leather, fur, beads, metal etc. Various notion and trims used in fashion accessories.

UNIT II

Leather Accessories: Brief idea about processing of leather, fashion leather terminology, care of leather. Leather Garments: Pattern making, needle and sewing thread specifications and finishing of garments. Leather Footwear: Parts of shoe, brief shoe designing as last, development last, pattern making, die-manufacturing, cutting, fitting, assemblage of remaining components, bottoming, finishing, caring of footwear. Handbags and belts: Construction and style of each.

UNIT III

Jewellery Designing: Different metals and stones, faceted cuts used for jewellery designing. Brief production tech as fusing, soldering, cutting etc, stone settings, Different jewellery styles as rings, bracelets, necklaces, tiara etc. Different stone setting as buttercup, inlay etc.

UNIT IV

Other accessories: Glove: Material used, component part of glove, glove construction, care of glove. Hosiery: Materials, Construction, Sizes and Care. Hats: Construction, care of hats. Scarves: Construction, Care and styles.

Text Books & References:

1. Know your Fashion Accessories Meadows
2. Fashion Apparel & Accessories Diamond, Jay & Ellen

PROFESSIONAL ELECTIVE COURSE-VIII (PEC-VIII) (Semester-VII)

S.No.	Name of Course	Contact Hours	Credits
1	Home & industrial textile product	3	3
2.	Technical & specialty textile & apparel	3	3

Note: Students will have to select any one out of the list.

PEC-FAEL 402-1 HOME & INDUSTRIAL TEXTILE PRODUCT

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course outcome:

- To understand various types of home textile.
- To understand raw material of home fashion fabrics.
- To explore various presentation techniques of home fashion.

Course Content:

UNIT I

Introduction to Home Fashion, Present scenario of Home Fashion/Textile market in the domestic and international market.

UNIT II

Selection of raw material and the essential characteristics of Home Textile materials. Different home fashion fabrics Table Linens, Bedspreads, Curtains, other draperies.

UNIT III

Advanced fabric structures for Home Textile material_Brocade, Damask, Gauze, Leno, Upholstery fabrics. Floor Coverings Carpets (domestic and machine made and rugs).

UNIT IV

Design criteria of Home Fashion/Textile material Presentation techniques Flat sketches, Mood board, Storyboard, Portfolio.

Text Books & Reference Books:

1. Textile Design Z J Grosicki
2. Textile Fabrics and their Selection, 7th Ed Isabel B. Wongate
3. Fashion & Furnishing International Inside the Fashion Business K G Dickerson
4. Fashion from Concept to Consumer G S Frings
5. Pattern-making for Fashion Design H J Armstrong
6. Sewing Readers Digest.

PEC-FAEL 402-2 TECHNICAL & SPECIALTY TEXTILE & APPAREL

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course outcome:

- Understanding the principles and processes of technical textile production.
- Gaining knowledge of specialized textile materials, such as smart textiles, geo-textiles, and medical textiles.
- Developing skills in designing and manufacturing specialty textiles and apparel.
- Learning about the properties and applications of advanced textile technologies, nanotechnology.
- Acquiring knowledge of quality control and testing methods used in the textile and apparel industry.

Course Content:

UNIT I

High Tech Garments Definition and different types. Brief idea about properties and uses of Specialty fibers like Nomex, Kevlar, Glass fiber, components as conductive yarns, shape memory materials, phase change material used in high tech garments.

UNIT II

Protective clothing: General requirement of protective clothing. Chemical protective clothing (CPC) Areas of use, CPC items for air-born, liquid hazard. Different chemicals used, parts of CPC, Performance evaluation, Permeation, Solubility and diffusion theory, Barrier effectiveness, structural integrity. Thermal Protective Clothing - Combustion mechanism, fire governing parameters, Requirements, designing of TPC, Construction, various parameters affecting flame retardancy, Performance evaluation. Pesticide Protective Clothing - Requirements of protective clothing, different areas, different parts of PPC, Performance evaluation of PPC. Antimicrobial clothing Requirement, microbiology of skin clothing interface, approach to produce antimicrobial fabrics, performance evaluation. Ballistic Protective clothing Requirements, principle of mechanism, different fibers and fabrics, soft and hard armor, Factors influencing performance.

UNIT III

Medical Responsive Garments- Definition, requirements, fibres, classification, working of artificial tandem and alignments, kidney, heart, surgical product, cardiovascular graft, sterilization, wound care. Smart Electronic Clothing Requirement, different sensor, processing of conductive yarn, implementation level of SOT, superhuman wardrobe, application in defense. Sportswear Requirement, different fibers used, approaches for manufacture.

UNIT IV

Breathable apparel Introduction, principle, classification and use. Moisture management fabric, polar technology, power dry etc. High visibility apparels Introduction, requirements, material, different classifications, design features. Smart Colorants Definition different types and application. Different parts of space suit. Different parts of space suits. Different textiles used as packaging material-types and properties.

Text Books & References:

1. The Super modern Wardrobe Bolten, Andrew

2. Smart Fibres, Fabrics & Clothing Tao, Xiaoming
3. Protective Clothing System & Material Raheel, Masturaed

OPEN ELECTIVE COURSE(OEC):

Note: Students must select one open Elective Courses from the given list:

Course Code	Name of Course	Contact Hours	Credits
Civil OEC3-OE1	Research and IPR	3 L	3 credits
Civil OEC3-OE2	Energy Studies	3 L	3 credits
Civil OEC3-OE3	Life Science	3 L	3 credits
Civil OEC3-OE5	Safety Engineering	3 L	3 credits
OEC-21	Introduction to HRM	3 L	3 credits
OEC-23	Marketing Management	3 L	3 credits
OEC-24	Entrepreneur Development	3 L	3 credits

***Imp.: In addition, 02 open elective course through MOOC.**

CIVIL OEC3-OE1 RESEARCH AND IPR

L T P Total
3 0 0 3

Sessional: 25 marks

Theory: 75 marks

Total: 100 marks

Duration of exam: 3 hours

Course Outcomes:

- Understand research problem formulation.
- Analyze research related in formation.
- Follow research ethics.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted students in general & engineering in particular.

Course Content:

UNIT I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

UNIT II

Effective literature studies approaches, analysis Plagiarism, and Research ethics.

UNIT III

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT IV

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

References:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science &

engineering students"

2. Wayne Goddard and Stuart Melville, "Research Methodology: an Introduction"
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step-by-Step Guide for beginners"

CIVIL OEC3-OE2 ENERGY STUDIES

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- Understand effect of using these sources on the environment and climate
- Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment.
- List and describe the primary renewable energy resources and technologies.
- To quantify energy demands and make comparisons among energy uses, resources, and technologies.
- Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.

Course Content:

UNIT I

Introduction to Energy Science: Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment

UNIT II

Energy Sources: Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration, high efficiency batteries.

UNIT III

Energy & Environment: Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and research policy.

UNIT IV

Engineering Projects connected with the Energy Sources: Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams; Nuclear reactor containment buildings and associated buildings, Spent Nuclear fuel storage and disposal systems.

UNIT V

Engineering for Energy conservation: Concept of Green Building and Green Architecture; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption

Text/Reference Books:

1. Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press
2. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press
3. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaia
4. Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII,
5. Ristinen, Robert A. Kraushaar, Jack J. A Kraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley
6. UNDP (2000), Energy and the Challenge of Sustainability, World Energy assessment
7. E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley Publishing Company.

CIVIL OEC3-OE3 LIFE SCIENCE

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- To describe the process of transpiration and explain how plants absorb minerals from the soil.
- To identify the components of an ecosystem, describe the flow of matter and energy in an ecosystem, and explain the characteristics, frequency, life forms, and biological spectrum of a community.
- To Understand population characteristics, ecotypes, gene pool concepts, genetic diversity in populations, polymorphism, and heterogeneity.
- Be able to explain basic concepts such as totipotency and cell manipulation.

Course Content:

UNIT I

Plant Physiology covering, Transpiration; Mineral nutrition.

Ecology covering, Ecosystems- Components, types, flow of matter and energy in an ecosystem; Community ecology- Characteristics, frequency, life forms, and biological spectrum; Ecosystem structure- Biotic and a-biotic factors, food chain, food web, ecological pyramids; (3 Lectures)

UNIT II

Population Dynamics covering, Population ecology- Population characteristics, ecotypes; Population genetics- Concept of gene pool and genetic diversity in populations, polymorphism and heterogeneity; Environmental Management covering, Principles: Perspectives, concerns and management strategies; Policies and legal aspects- Environment Protection Acts and modification, International Treaties; Environmental Impact Assessment- Case studies (International Airport, thermal power plant); (3 Lectures)

UNIT III

Biotechnology covering, Basic concepts: Totipotency and Cell manipulation; Plant & Animal tissue culture- Methods and uses in agriculture, medicine and health.

UNIT IV

Biostatistics covering, Introduction to Biostatistics: -Terms used, types of data; Measures of Central Tendencies- Mean, Median, Mode, Normal and Skewed distributions; Analysis of Data- Hypothesis testing and ANNOVA (single factor)

Text/Reference Books:

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H. John Wiley and Sons
3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
4. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R. W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher.

CIVIL OEC3-OE5 SAFETY ENGINEERING

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

1. Understand the fundamental principles and concepts of safety engineering, including hazard identification, risk assessment, and safety control measures.
2. Identify and evaluate potential hazards in various engineering contexts, considering factors such as equipment design, operational procedures, and environmental conditions.
3. Explain the process of conducting a comprehensive safety analysis, including the use of tools and techniques such as fault tree analysis, failure mode and effects analysis, and hazard and operability study.
4. Design and implement effective safety control measures in an engineering context, demonstrating competence in selecting appropriate personal protective equipment, designing safety systems, and developing safe operational procedures.
5. Apply the knowledge gained to solve real-world problems related to safety engineering.
6. Develop an awareness of the ethical considerations in safety engineering, promoting a sense of responsibility towards protecting the safety and health of workers, the public, and the environment.

Course Content:

UNIT I

Introduction-Safety-Goals of safety engineering. Need for safety. Safety and productivity Definitions: Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence, Reportable accidents. History of safety movement. Theories of accident causation, Safety organization- objectives, types, functions, Role of management, supervisors, workmen, unions, government and voluntary agencies in safety. Safety policy. Safety Officer-responsibilities, authority. Safety committee need, types, advantages

UNIT II

Accident prevention Methods- Engineering, Education and Enforcement, Safety Education & Training - Importance, Various training methods, Effectiveness of training, Behavior oriented training. Communication-purpose, barrier to communication. Housekeeping: Responsibility of management and employees. Advantages of good housekeeping. 5 s of housekeeping. Work permit system- objectives, hot work and cold work permits. Typical industrial models and methodology. Entry into confined spaces.

UNIT III

Monitoring Safety Performance: Frequency rate, severity rate, incidence rate, activity rate. Cost of accidents- Computation of Costs- Utility of Cost data. Plant safety inspection, types, inspection procedure. Safety sampling techniques. Job safety analysis (JSA), Safety surveys, Safety audits. Safety Inventory Technique.

UNIT IV

Accident investigation -Why? When? Where? Who? & How? . Basics- Man Environment & Systems. Process of Investigation -Tools-Data Collection-Handling witnesses- Case study. Accident analysis - Analytical Techniques-System, Safety-Change Analysis-MORT Multi Events Sequencing-TOR.

Text/References Books:

1. N.V. Krishnan, Safety Management in Industry, Jaico Publishing House,1997
2. Ronald P. Blake, Industrial Safety: Prentice Hall, New Delhi,1973 3)
3. David L. Goetsch, Occupational Safety and health, Prentice Hall
4. Ted S. Ferry, Modern Accident Investigation and Analysis, John Wiley & Sons
5. Willie Hammer, Occupational Safety Management and Engineering, Prentice Hall
6. Alan Waring, Safety Management System, Chapman & Hall
7. JohnV. Grimaldi and RollinH. Simonds, Safety Management, All India Traveller Book Seller.
8. Accident Prevention Manual for Industrial Operations: National Safety Council, Chicago.

OEC-21 INTRODUCTION TO HRM

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- Understand the basics of human resource management and its relevance in present scenario.
- Develop critical understanding of contemporary developments in human resource management.
- Comprehend the essentials of employing, maintaining, and promoting a motivated workforce in an organization.
- Demonstrate the necessary skill sets for integrate the knowledge of HR concepts to make correct business decisions

Course Content:

UNIT I

Human Resource Management: concept and scope; Roles, responsibilities and competencies of HR manager; Challenges to HR professionals; Human Resource Planning & Forecasting: significance and process.

UNIT II

HR Sourcing: Recruitment, Selection and Induction. Job Analysis: job Description and job Specification; Job Design: concept and methods; Job Evaluation-concept & methods; Performance appraisal and counselling.

UNIT III

Training: training process and methods; Career planning and Development; Succession planning; Employee Compensation: basic concepts & determinants;

UNIT IV

Industrial Relations and Grievance Handling; Employee welfare; Dispute Resolution; International Human Resource Management; Contemporary Issues in HRM. HR Audit & Accounting, ethics & corporate social responsibility.

Text/References Books:

1. K. Aswathapa Human resource Management: Text and cases, 6th edition, Tata McGraw Hill, New Delhi, 2012
2. Uday Kumar Haldar & Juthika Sarkar (2012) Human resource Management New Delhi, Oxford University Press.
3. De Cenzo, Da & Robbins S.P. (2010) Fundamentals of Human Resource Management, 9th edition, New York, John Wiley & Sons.
4. Gary Dessler (2008) Human Resource Management, 11th edition New Delhi: Pearson Prentice Hall.
5. Tanuja Agarwala, Strategic Human resource Management, Oxford University Press 2007.

OEC-23 MARKETING MANAGEMENT

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- Understand the basic concepts of marketing and the changing dynamics of marketing environment.
- Gain Insights in consumers decision-making process and their buying behaviour.
- Understand needs of the consumer's and design & develop strategies for new products.
- Understand strategies related to 4 Ps of marketing.

Course Content:

UNIT-I

Nature and scope of marketing; Philosophies of marketing management; marketing environment; marketing research and marketing information system; Ethical issues in marketing

UNIT-II

Understanding consumer behaviour; factors influencing consumer buying behaviour and organizational buying behaviour; market segmentation, targeting and positioning; marketing strategies in the different stage of the product life cycle; new product development process

UNIT-III

Introduction to Product mix and product line decisions; branding and packaging decisions; Pricing strategies and practices; factors affecting selection of marketing channels; Introduction to wholesaling and retailing; Introduction to Promotion Mix: Advertising, sales promotion, public relations, personal selling

UNIT-IV

Sales Forecasting Methods; Introduction: Green Marketing; Event Marketing; Direct marketing; Network Marketing; Holistic Marketing; Permission Marketing; Social Marketing.

Text/References Books:

1. Kotler and Armstrong, Principles of Marketing; PHI, New Delhi
2. Kotler, Philip, Kevin Keller, A. Koshy and M. Jha, Marketing Management in South Asian Perspective, Pearson Education, New Delhi
3. Kerin, Hartley, Berkowitz and Rudelius, Marketing, TMH, New Delhi
4. Etzel, Michael J, Marketing: Concepts and Cases, TMH, New Delhi
5. Kumar, Arun and Meenakshi, N., Marketing Management, Vikas Publication

OEC-24 ENTREPRENEUR DEVELOPMENT

L T P Total
3 0 0 3

Sessional: 25 marks
Theory: 75 marks
Total: 100 marks
Duration of exam: 3 hours

Course Outcomes:

- It will help students to prepare business plan
- Students will be able to check the feasibility of starting new projects
- They will be able to know the support available from Govt. to start a new venture
- Students will be aware about the concepts of entrepreneurship development and significance in ofentrepreneurship in economic development.

Course Contents:

UNIT I

Concept of Entrepreneur, Characteristics, qualities and pre-requisites of entrepreneur, entrepreneurship and intrapreneur, Entrepreneur vs. Manager; Economic, social and psychological need for entrepreneurship;

UNIT II

Environmental Factors affecting success of a new business, Formulation of business plan, Contents and significance of business plan.

UNIT III

Feasibility Understand -Preparation of Feasibility Reports: Economic, Technical, Financial and Managerial Feasibility of Project, Methods and procedures to start and expand one's own business

UNIT IV

Role of Government and Promotional agencies in entrepreneurship development, Entrepreneurship Development Programmes.

Texts/Reference Books:

1. Desai, A N. "Entrepreneur & Environment". 1990. Ashish, New Delhi. Drucker, Peter. "Innovation and Entrepreneurship". 1985. Heinemann, London.
2. Jain Rajiv. "Planning a Small-Scale Industry: A Guide to Entrepreneurs". 1984. S.S. Books, Delhi. Kumar, S A. "Entrepreneurship in Small Industry". 1990, Discovery, New Delhi.
3. McClelland, D C and Winter, W G. "Motivating Economic Achievement". 1969. Free Press, New York.
4. Pareek, Udai and Venkateswara Rao, T. "Developing Entrepreneurship -A Handbook on Learning Systems". 1978, Learning Systems, Delhi.

Mandatory Audit Course

MC-01 CONSTITUTION OF INDIA

L T P Total
1 0 0 1

Sessional: 25 marks

Theory: 75 marks

Total: 100 marks

Duration of exam: 3

hours

CONSTITUTION OF INDIA– BASIC FEATURES AND FUNDAMENTAL PRINCIPLES

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the —basic structure of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of —Constitutionalism – a modern and progressive concept historically developed by the thinkers of —liberalism – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of —constitutionalism in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of —diversity. It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be —static and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it —as one of the strongest court in the world.

COURSE CONTENT

1. Meaning of the constitution law and constitutionalism.
2. Historical perspective of the Constitution of India.
3. Salient features and characteristics of the Constitution of India.
4. Scheme of the fundamental rights.
5. The scheme of the Fundamental Duties and its legal status.
6. The Directive Principles of State Policy – Its importance and implementation.
7. Federal structure and distribution of legislative and financial powers between the Union and the States.
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India

9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions : National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

REFERENCES:

1. *The Constitutional Law Of India 9th Edition, by Pandey. J. N.*
2. *The Constitution of India by P.M.Bakshi*
3. *Constitution Law of India by Narender Kumar*
4. *Bare Act by P. M. Bakshi*