Curriculum

for

Bachelor of Garment Engineering Technology Degree

(2023)

Higher Education Commission
Islamabad
Curriculum Division

Acronyms, Abbreviations & Definitions

Acronym/Abbreviation	Definition
HEC	Higher Education Commission
NTC	National Technology Council
NCRC	National Curriculum Review Committee
IEA	International Engineering Alliance
IDTE	Inter Disciplinary Technology Elective
HEI	Higher Education Institution
SIT	Supervised Industrial Training
Th	Theory
Lab	Laboratory
Cr. Hrs.	Credit Hours
PLO	Program Learning Outcome
CLO	Course Learning Outcome
ICT	Information and Communications Technology

Contents

1. Introduction

Curriculum is the total learning experience of a student that occurs in the educational process. The term refers specifically to a planned sequence of instruction, and to the student's experiences in terms of the educator's or institutions instructional goals. Curriculum is a systematic and intended packaging of competencies (i.e., knowledge, skills, and attitudes, underpinned by values) that learners should acquire through organized learning experiences.

Curriculum forges in learners' life-long learning competencies, as well as social attitudes and skills, such as tolerance and respect, constructive handling of diversity, peaceful conflict management, promotion and respect of Human Rights, gender equality, justice, and inclusiveness. At the same time, curriculum must be singularly aligned to national development goals, and produce human resources that becomes an effective factor of production in the economy.

Curriculum is thus the foundation on which rests the edifice of academic programs designed for focused outcomes that equip graduates with desired skill sets. Engineering technology curriculum aims to produce proficient engineering technology graduates who meet demands of both national and international job markets. The curriculum conforms substantially to the Sydney Accord – the international accreditation body regulating local accrediting institutions of partnering countries -- and is in consonance with the essence of Graduates Attributes and Professional Competence defined by International Engineering Alliance (IEA). [See Appendixes A through C]

Curriculum is developed and reviewed by HEC's National Curriculum and Review Committee (NCRC).

2. Curriculum Development Methodology

2.1 Benchmarking

Curriculum for Garment Engineering Technology is benchmarked to HEC's Undergraduate Policy and is in accordance with NTC Curriculum Framework. It conforms substantially to standards laid out by the Sydney Accord and the International Engineering Alliance pertaining to engineering technology programs [See Appendix A through C].

The course of studies clearly defines, and differentiates, the program from engineering programs by contact hours spent in classrooms, laboratories, and the industry.

Ideally an engineering program is designed with classroom to practical training ratio of 70:30 contact hours with emphasis on design aspects. Whereas for engineering technology programs, the ratio of contact hours is reversed to 30:70, providing more opportunity for hands on and psychomotor training.

2.2 Curriculum Development Cycle

Curriculum development is a rigorous process and entails the following steps:

- Nominations of leading national experts are requested from academia and relevant industry forums to constitute a National Curriculum Review Committee (NCRC).
- From the nominations received, NCRC is finalized and notified by NTC/HEC.
- To run affairs smoothly, right at the start NCRC Members elect from among themselves a Coordinator, a co-Coordinator, and a Secretary to steer, control and record proceedings.
- A Preliminary Meeting of NCRC, spanning three days, is held to establish framework and benchmarking issues, and assign different facets of curriculum development to smaller teams within the NCRC.
- A draft curriculum is prepared by NCRC at the end of the Preliminary Meeting and sent to relevant foreign experts for review and feedback.
- After receiving foreign expert's review and feedback, a Final NCRC Meeting, lasting up to three days, is held to finalize recommendations, and prepare the final curriculum document.
- The entire cycle of curriculum development is completed in two months.

2.3 Historical Timeline of Meetings

Historical Timeline of Meetings for curriculum development are:

- Preliminary Meeting of NCRC [See Appendix D]
- Final Meeting of NCRC [See Appendix E]

3. Curriculum Details

Bachelor of Garment Engineering Technology Program			
Parameter	**HEC Framework**	**Framework - A (SIT in Semester 7 & 8)**	**Framework - B (SIT in Semester 8 Only)**
Program Type	Semester System	Semester System	Semester System
Program Duration	8 Semesters Min: 4 Years Max: 7 Years	8 Semesters Min: 4 Years Max: 7 Years	8 Semesters Min: 4 Years Max: 7 Years
Semester Duration	16 weeks of Teaching 2 weeks for Exams	16 weeks of Teaching 2 weeks for Exams	16 weeks of Teaching 2 weeks for Exams
Total Number of Courses	39-47	39	45 (Opt.**)
Engineering Technology Domain Courses	25-34	26	+ 6 (Opt.)
Non-Engineering Technology Domain Courses	13	13	13 (Opt.)
Total Credit Hours	124-136	136	136
Engineering Technology Domain Credit Hours	-	104	104 (opt)
Percentage of Engineering Technology Domain Courses	-	76.48 %	76.48 %
Percentage of Non-Engineering Technology Domain Courses	31.45%	23.52 %	23.52 %
Non-Engineering Technology Domain Credit Hours	39	32	32
No. of Credit Hours per Semester	15 – 18	16-18	16-18
** Optional Courses may be included for Framework B (SIT in Semester 08 only)			
1 credit hour: (1) 1 contact hour per week, for a minimum of 16 weeks for theory: (2) 3 contact hours per week, for a minimum of 16 weeks for practical's			

Engineering Technology Domain Courses in Recommended Schemes of Studies as per Framework							
Knowledge Area	**Name of Course**	**Credit Hours** (Th+Lab)	**Contact Hours** (Th+Lab)	**Total Credit Hours**		**Number of Courses**	
				As per Scheme of Studies	**As per Framework**	**As per Scheme of Studies**	**As per Framework**
Computing	Introduction to Computing	1+1=2	1+3=4	4	-	2	2-3
	Computer Programming	1+1=2	1+3=4				
Garment Engineering Technology (Foundation)	Introduction to Textile & Garments Technology	2+0=2	2+0=2	17	-	7	7-10
	Technical Drawing & CAD	0+1=1	0+3=3				
	Textile Raw Materials	2+1=3	2+3=5				
	Garment Design Fundamentals	1+1=2	1+3=4				
	Fundamentals of Yarn Manufacturing	2+1=3	2+3=5				
	Fundamentals of Fabric Manufacturing	2+1=3	2+3=5				
	Fundamentals in Textile Chemical Processing	2+1=3	2+3=5				
Garment Engineering Technology (Breadth)	Garment Technology 1	2+1=3	2+3=5	20	-	7	7-10
	Garment Technology 2	2+1=3	2+3=5				
	Garment Finishing Processes	2+1=3	2+3=5				
	Functional Textile and Garments	3+0=3	3+0=3				
	Process Improvements in Garment Industry	3+0=3	3+0=3				
	Raw Materials for clothing	2+0=2	2+0=2				
	Compliances in Garment Industry	2+1=3	2+3=5				
Garment Engineering Technology (Depth)	Anthropometry and Garment Construction	1+2=3	1+6=7	15 / 31 Opt.	-	5 / 11 Opt.	5-7
	Sewn Product Technology	2+1=3	2+3=5				
	Computer Aided Pattern Making	1+2=3	1+6=7				
	Garment Production Machinery	2+1=3	2+3=5				
	Garment Merchandizing and Sourcing	2+1=3	2+3=5				
	Breadth Elective-I (Optional)	2+1=3	2+3=5				
	Breadth Elective-II (Optional)	2+1=3	2+3=5				
	Depth Elective-I (Optional)	2+1=3	2+3=5				
	Depth Elective-II (Optional)	2+1=3	2+3=5				

	Breadth / Depth Elective-III (Optional)	2+0=2	2+0=2				
	Breadth / Depth Elective-IV (Optional)	2+0=2	2+0=2				
IDTE	Workshop Practices	0+2=2	0+6=6	5	5	2	2
	Electrical & Electronic Technology	2+1=3	2+3=5				
Project	Project Part-I	0+3=3	0+9=9	6	6	2	2
	Project Part-II	0+3=3	0+9=9				
Training	Supervised Industrial Training-(Opt.)	0+16=16	0+48=48	16**		0	
	Supervised Industrial Training	0+16=16	0+48=48	16		0	
Total Credit Hours and Courses **(For Engineering Technology Domain Courses)**		39+60=99 / 51+48=99 (Opt.)	219 / 195 (Opt.)	99/ 99 (Opt.)		25 / 31 (Opt.) Courses	

** Optional Courses may be included for Framework B (SIT in Semester 8 only)

Non-Engineering Technology Domain Courses in Recommended Schemes of Studies as per Framework								
Knowledge Area	**Sub Area**	**Name of Course**	**Credit Hours** (Th+Lab)	**Contact Hours** (Th+Lab)	**Total Credit Hours**		**Number of Courses**	
					As per Scheme of Studies	**As per Framework**	**As per Scheme of Studies**	**As per Framework**
Humanities and Social Sciences	English (Expository Writing)	Communication & Presentation Skills	3+0=3	3+0=3	6	6	2	2
		Functional English	3+0=3	3+0=3				
	Culture	Islamic Studies / Ethics	3+0=3	3+0=3	6	6	2	2
		Pakistan Studies	3+0=3	3+0=3				
	Social Sciences	Social Sciences Elective 1	3+0=3	3+0=3	9	9	3	5
		Social Sciences Elective / Management Sciences Elective	3+0=3	3+0=3				
Management Sciences	Management Sciences	Management Sciences Elective 1	3+0=3	3+0=3				
Natural Sciences	Quantitative Reasoning	Applied Mathematics	3+0=3	3+0=3	6	6	2	2
		Applied Statistics	3+0=3	3+0=3				
	Physics	Applied Physics	2+1=3	2+3=5	3	3	1	1
	Chemistry	Applied Chemistry	2+1=3	2+3=5	3	3	1	1
Total Credit Hours and Courses ** Optional Courses may be included for Framework B (SIT in Semester 8 only)					Cr. Hrs. **33/33**		Courses **11 /13**	

List of Elective Topics	
Social Sciences	**Management Sciences**
➢ Professional Ethics ➢ Sociology for Technologist ➢ Critical Thinking ➢ Organizational Behavior ➢ Professional Psychology ➢ Elective Courses by HEI*	➢ Operations Management ➢ Project Management ➢ Entrepreneurship ➢ Leadership and Personal Grooming ➢ Elective Courses by HEI*
Breadth Electives*	**Depth Electives***
➢ Product Development ➢ Sustainable Garment Production ➢ High Performance Fibers ➢ Nonwoven and Technical Textiles ➢ Elective Courses by HEI*	➢ Color Science ➢ Surface Design ➢ Denim Processing Technology ➢ Clothing Comfort ➢ Elective Courses by HEI*
*Any related course can be included with approval of the HEI's Statutory Bodies (maximum: 3 courses per elective knowledge area)	

4. Admission Criteria

Criteria for admission in Bachelor of Garment Engineering Technology program is defined in NTC's Accreditation Manual, Clause 3.2.4.1. The salient feature for eligibility for admission are:

(1) At least 50% marks in DAE/FSc (Pre-engineering)
or other equivalent qualifications such as A-level/ICS/B.Sc. (sports and Hafiz-e-Quran marks are not included), and

(2) Entrance Test

(3) Weightage:

- 70% for academics (DAE/FSc etc.)
- 30% for Entrance Test

5. Semester-wise Scheme of Studies

Semester-wise scheme of studies for Bachelor of Garment Engineering Technology program spanning 4 years, spread over 8 semesters, and totaling 132 credit hours is presented below:

SEMESTER-I				
Course Codes	**Course Title**	**Knowledge Area/Domain**	**Credit Hrs. (Th+Lab)**	**Contact Hrs. (Th+Lab)**
GEH-111	Islamic Studies/Ethics	Art & Humanities	3+0	3+0
GEE-111	Functional English	Expository Writing	3+0	3+0
GEQ-111	Applied Mathematics	Quantitative Reasoning	3+0	3+0
GEN-111	Applied Physics	Natural Sciences	2+1	2+3
GEC-111	Introduction to Computing	Computing	1+1	1+3
GET-111	Introduction to Textile & Garment Technology	Garment Engineering Technology (Foundation)	2+0	2+0
GET-112	Technical Drawing and CAD	Garment Engineering Technology (Foundation)	0+1	0+3
	Subtotal		**14+3 =17**	**14+9 =23**
SEMESTER-II				
Course Codes	**Course Title**	**Knowledge Area/Domain**	**Credit Hrs. (Th+Lab)**	**Contact Hrs. (Th+Lab)**
GEH-121	Pakistan Studies	Art & Humanities	3+0	3+0
GEI-121	Workshop Practices	Inter Disciplinary Technology	0+2	0+6
GEE-121	Communication & Presentation Skills	Expository Writing	3+0	3+0
GEQ-121	Applied Statistics	Quantitative Reasoning	3+0	3+0
GET-121	Textile Raw Materials	Garment Engineering Technology (Foundation)	2+1	2+3
GEN-121	Applied Chemistry	Natural Sciences	2+1	2+3
	Subtotal		**13+4=17**	**13+12 =25**

SEMESTER-III				
Course Codes	**Course Title**	**Knowledge Area**	**Credit Hrs. (Th+Lab)**	**Contact Hrs. (Th+Lab)**
GEI-231	Electrical & Electronic Technology	Inter Disciplinary Technology	2+1	2+3
GET-231	Fundamentals of Yarn Manufacturing	Garment Engineering Technology (Foundation)	2+1	2+3
GET-232	Fundamentals of Fabric Manufacturing	Garment Engineering Technology (Foundation)	2+1	2+3
GET-233	Raw Materials for clothing	Garment Engineering Technology (Foundation)	2+0	2+0
GET-234	Garment Design Fundamentals	Garment Engineering Technology (Foundation)	1+1	1+3
GEM-231	Management Sciences Elective 1	Management Sciences	3+0	3+0
	Subtotal		**12+4 =16**	**12+12 =24**
SEMESTER-IV				
Course Codes	**Course Title**	**Knowledge Area**	**Credit Hrs. (Th+Lab)**	**Contact Hrs. (Th+Lab)**
GEC-241	Computer Programming	Computing	1+1	1+3
GES-241	Social Sciences Elective 1	Social Sciences	3+0	3+0
GET-241	Garment Technology 1	Garment Engineering Technology (Breadth)	2+1	2+3
GET-242	Garment Production Machinery	Garment Engineering Technology (Depth)	2+1	2+3
GET-243	Anthropometry and Garment Construction	Garment Engineering Technology (Depth)	1+2	1+6
GET-244	Fundamentals in Textile Chemical Processing	Garment Engineering Technology (Foundation)	2+1	2+3
	Subtotal		**11+6 =17**	**11+18 =29**

SEMESTER-V				
Course Codes	**Course Title**	**Knowledge Area**	**Credit Hrs. (Th+Lab)**	**Contact Hrs. (Th+Lab)**
GET-351	Computer Aided Pattern Making	Garment Engineering Technology (Depth)	1+2	1+6
GET-352	Functional Textile and Garments	Garment Engineering Technology (Foundation)	3+0	3+0
GET-353	Garment Technology 2	Garment Engineering Technology (Breadth)	2+1	2+3
GET-354	Garment Merchandizing and Sourcing	Garment Engineering Technology (Depth)	2+1	2+3
GET-355	Project-I	Garment Engineering Technology (Domain Project)	0+3	0+9
	Subtotal		**8+7 =15**	**8+21 =29**

SEMESTER-VI				
Course Codes	**Course Title**	**Knowledge Area**	**Credit Hrs. (Th+Lab)**	**Contact Hrs. (Th+Lab)**
GEM-361	Garment Finishing Processes	Garment Engineering Technology (Breadth)	2+1	2+3
GET-362	Process Improvements in Garment Industry	Garment Engineering Technology (Breadth)	3+0	3+0
GET-363	Sewn Product Technology	Garment Engineering Technology (Depth)	2+1	2+3
GET-364	Compliances in Garment Industry	Garment Engineering Technology (Breadth)	2+1	2+3
GES-361 / GEM-361	Social Science Elective / Management Sciences Elective	Social Sciences	3+0	3+0
GET-365	Project-II	Garment Engineering Technology (Domain Project)	0+3	0+9
	Subtotal		**12+6 =18**	**12+18 =30**

SEMESTER-VII				
Course Codes	**Course Title**	**Knowledge Area**	**Credit Hrs.** (Th+Lab)	**Contact Hrs.** (Th+Lab)
GET-471	Supervised Industrial Training/ Electives	Garment Engineering Technology (Domain SIT)	0+16	0+48
	Subtotal		**0+16=16**	**0+48=48**
SEMESTER-VIII				
GET-481	Supervised Industrial Training	Garment Engineering Technology (Domain SIT)	0+16	0+48
	Subtotal		**0+16= 16**	**0+48=48**
Total Credit Hours & Contact Hours in Four Years (SIT in both 7th and 8th Semesters)			**70+62 = 132**	**70+186=256**
Theory vs Practical with respect to Contact Hours			Theory Practical	70 (27.3%) 186 (72.7%)
Total Credit Hours & Contact Hours in Four Years (Optional courses in 7th, and SIT in 8th Semester only)			**82+50 = 132**	**82+150 =232**
Theory vs Practical with respect to Contact Hours			Theory Practical	82 (35.3%) 150 (64.7%)

6. Course Codes

Details pertinent to Course Code are presented below:

- Each Course has a unique three letter prefix, followed by a three-digit Code.
- Letters are acronyms for course description, and digits define the chronological position in the academic year, and sequence number in the program.
- The program spans over 4 years, with Spring and Fall semesters each year, with an additional Summer Semesters, if required.

Letters in Course Code Prefixes are defined below:

- First two letters pertain to the program (e.g., GE for Garment)
- Third letter pertains to specifics of the course (e.g., T for technology, E for expository writing etc.)

Some examples of Course Code Prefixes are shown in the table below.

Sr.	Course Code Prefix	Description
1	GE**T**	Garment Engineering Technology Foundation/ Breadth/ Depth
2	GE**E**	Expository Writing
3	GE**H**	Art & Humanities
4	GE**S**	Social Sciences
5	GE**Q**	Quantitative Reasoning
6	GE**N**	Natural Sciences
7	GE**C**	Computing
8	GE**M**	Management Sciences
9	GE**I**	Inter Disciplinary Technology Elective

Digits in Course Codes are defined in table below:

1st Digit	2nd Digit	3rd Digit
Denotes Year (1,2,3,4)	Denotes Semester (1,2,3…)	Denotes Sequence (1, 2, 3…)

7. Elective Courses

The lists of elective courses – grouped across depth and breadth categories – are presented below:

Breadth Elective Courses				
Course Code	**Title**	**Knowledge Area**	**Credit Hrs.** (Th+Lab)	**Contact Hrs.** (Th+Lab)
GET-471	Product Development	Breadth Elective-I	2+1	2+3
GET-472	Nonwoven and Technical Textiles	Breadth Elective-II	2+1	2+3
GET-473	Sustainable Garment Production	Breadth Elective-III	2+1	2+3
GET-474	High Performance Fibers	Breadth Elective-IV	2+1	2+3
	Elective Courses by HEI*			
*Any related breath course can be included with approval of the HEI's Statutory Bodies (maximum: 2 courses)				

Depth Elective Courses				
Course Code	**Title**	**Knowledge Area**	**Credit Hrs.** (Th+Lab)	**Contact Hrs.** (Th+Lab)
GET-481	Color Science	Depth Elective-I	2+1	2+3
GET-482	Surface Design	Depth Elective-II	2+1	2+3
GET-483	Clothing Comfort	Depth Elective-III	2+1	2+3
GET-484	Denim Processing Technology	Depth Elective-IV	2+1	2+3
	Elective Courses by HEI*			
*Any related depth course can be included with approval of the HEI's Statutory Bodies (maximum: 2 courses)				

Management Sciences Electives				
Course Code	**Title**	**Knowledge Area**	**Credit Hrs.** (Th+Lab)	**Contact Hrs.** (Th+Lab)
GEM-471	Operations Management	Management Sciences Elective-I	3+0	3+0
GEM-472	Project Management	Management Sciences Elective-II	3+0	3+0
GEM-473	Entrepreneurship	Management Sciences Elective-III	3+0	3+0
GEM-474	Leadership and Personal Grooming	Management Sciences Elective-IV	3+0	3+0
	Elective Courses by HEI*			
*Any related course can be included with approval of the HEI's Statutory Bodies (Maximum1 course from Management Sciences Electives)				

Social Sciences Electives				
Course Code	**Title**	**Knowledge Area**	**Credit Hrs.** (Th+Lab)	**Contact Hrs.** (Th+Lab)
GES-471	Professional Ethics	Social Sciences Elective-I	3+0	3+0
GES-472	Sociology for Technologist	Social Sciences Elective-II	3+0	3+0
GES-473	Organizational Behavior	Social Sciences Elective-III	3+0	3+0
GES-474	Professional Psychology	Social Sciences Elective-IV	3+0	3+0
	Elective Courses by HEI*			
*Any related course can be included with approval of the HEI's Statutory Bodies (Maximum: 1 course from Social Sciences electives)				

8. Course Contents

The primary goal of this curriculum is to be substantially in compliance with international standards set by relevant agencies such as the International Engineering Alliance (IEA) and the Sydney Accord (SA).

Program Learning Outcomes (PLO's), Course Learning Outcomes (CLO's) and Bloom's Taxonomy Levels are expected learning outcomes and are aligned with standards set by SA and IEA.

Course Content

8.1 Islamic Studies / Ethics

COURSE CODE & TITLE (GEH-111) **Islamic Studies/ Ethics**		**CREDITS HOURS** (3+0) **48 Theory + 0 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Art & Humanities**
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Recite** Holy Quran with correct pronunciation.	C-1	6
CLO-2	**Apply** understanding of basic concepts of teaching of Islam (faith, pillars, Dawit, preaching and Seerat).	C-3	8
CLO-3	**Present** Islam as a complete code of life.	A-3	12

Course Outline for theory

History of Islam: Compilation of the Holy Quran and Hadith, Fundamental doctrines of Islam i.e., Tawheed, oneness of Allah, Prophet hood, the day of Judgment, Revealed books, Ibadaat (worship) Philosophy of Ibadaat, Namaz, Zakat, Hajj & Sawm, Importance of preaching of Islam, its needs and effects, Difficulties in the ways of preaching of Islam, sectarianism, its causes and effects in Muslim society, definition of Right, classification of Right, importance of Rights, Khutba Hajjatul Wida (last address of the Holy Prophet, peace be upon him), Seeratun-Nabi (Peace be upon him).

Life of Holy Prophet (Peace be upon him): The life of the Holy Prophet before and after prophet hood. The Hijra (Migration to Madina), Treaty of Al Madina, Makki and Madani life of Holy Prophet Muhammad (Peace be upon him), importance of peace and causes of terrorism.

Islam and Civilization: Definition of civilization, Impacts of Islamic civilization on the Sub-continents, international impacts of Islamic civilization, Impacts of Human thoughts, social and humanistic effects, Importance of Ethics, Human rights (Hoqooq Ul Ibad) with detail.

Knowledge and Islam: Definition of Knowledge, Classification of knowledge, Importance of technology in the light of Holy Quran and Sunnah, relevant verses of the Holy Quran about Technology (Baqara 28,30,33,201, Nahal:76, Jasia: 13, Araf: 32, Noor: 55 etc), Islamic and scientific knowledge.

Recommended Books

1. "A Guidebook for Muslims", by Syed. Abul Hasan Ali Nadvi. (Latest Edition)
2. "An Introduction to Islam", by Dr. Muhammad Hameedullah. (Latest Edition)
3. "What is Islam?" by Maulana Manzoor Nomani. (Latest Edition)
4. "Islamiat: A standard book for CSS", Prof. Dr. Arif Naseem. (Latest Edition)
5. "Islamiat: for Students O levels", Farkhanda Noor Muhammad. (Latest Edition)

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8.2 Functional English

COURSE CODE & TITLE (GEE-111) **Functional English**		**CREDITS HOURS** (3+0) **48 Theory + 0 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Expository Writing**
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Use** language skills and strategies in different situations for variety of functions.	A3	3
CLO-2	**Complete** academic writing tasks by following writing processes and appropriate strategies to suit the context and genre.	C3	10
CLO-3	**Deliver** effective presentations and participate actively in group discussions with acceptable level of oral proficiency.	A4	12
Course Outline for Theory			
Greetings; Reading skills: importance & strategies; Previewing; Reading practice through variety of reading texts and comprehension exercises; Skimming & Scanning; Summarizing; Types of listening: active: content: critical: selective Problems in listening and coping strategies; Listening skills and sub skills; Note Taking; Techniques for taking notes from lectures; from books; different forms paragraphs; points; figures; processes; tables; graphs; Vocabulary Development; Inferring meaning from context; Process of Writing and informal Writing strategies; Writing correctly: sentence structure and punctuation; error correction; Paragraphs writing; Unity; adequate development and coherence in paragraphs; Essays: Types of essays; narrative; descriptive; argumentative: Structure of essays; thesis statement and the paragraphs; informational and analytical reports; Letters: routine requests and intimation; invitation; thank you and condolence letters etc.; Presentation skills			
Recommended Books			
1) Kakarla, Gupta, Pundir, 2019, Functional English for Communication, ISBN: 9789353282073, Sage			

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8.3 Applied Mathematics

COURSE CODE & TITLE (GEQ-111) **Applied Mathematics**	**CREDITS HOURS** (3+0) **48 Theory + 0 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Quantitative Reasoning**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Explain** ideas of rate of change, derivatives, and their basic applications.	C-2	1
CLO-2	**Apply** integration techniques for solving and analyzing problems in integral calculus.	C-3	2
CLO-3	**Describe** vector calculus and analytical geometry in multiple dimensions for investigation of different problems.	C-2	4

Course Outline for Theory

Basic definition of derivatives: differentiation of different function, rule of differentiation, chain rule implicit differentiation,

Applications: slope, equation of tangent and normal. maxima, minima and point of inflection

Indefinite integral: different technique fhttps://askaribank.com or integration i.e integration by parts, integration by substitution, by partial fraction, integration of different trigonometric identity

Definite integral: application of definite integral, i.e., area under the curve; area between the curve, mean value theorem, finding the volume by slicing, volume of solid revolution; Disk and Washer method, moment, and center of mass etc.

Vector in space: vector calculus, divergence, curl of vector field, Directional derivatives, multivariable function partial derivatives, spherical, polar, cylindrical coordinates

Vector in plane: dot product and cross products, line, and plane in space; application: work, angle between two vectors, area of triangle, area of parallelogram etc.

Recommended Books

H. Anton, I. C. Bivens, S. Davis, "Calculus, Early Transcendental", 11th edition (or Latest Edition), John Wiley, New York, 2016.

Essential Calculus by James Stewart, 2nd Edition (or Latest Edition)

G. B. Thomas, A. R. Finney, "Calculus", 14th edition (or Latest Edition), Pearson, USA, 2017.

S.M Yousaf, "Calculus and Analytic Geometry" (or Latest Edition).

Advanced Engineering Mathematics by Erwin Kreyszig, 10th Ed. (or Latest Edition) Willey 2014.

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8.4 Applied Physics

COURSE CODE & TITLE (GEN-111) **Applied Physics**		**CREDITS HOURS** (2+1) **32 Theory + 16 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Natural Sciences**
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Explain** fundamental physical principles.	C2	1
CLO-2	**Apply** these principles, together with logical and mathematical reasoning, to situations of the physical world.	C3	2
CLO-3	**Analyze** different physical problems using the laws of physics.	C4	3
CLO-4 (Lab)	**Construct** basic circuits and demonstrate relevant theorems using Resistors and Capacitors.	P1	2
CLO-5 (Lab)	**Differentiate** classroom knowledge from laboratory techniques for learning of basic principle used in magnetism.	P1	4

Course Outline for Theory

Electric charge, Conductors and insulators, Coulomb's law, Electric field, Field due to a point-charge Electric dipole and line of charge, Flux of an electric field, Permittivity of a medium, Gauss's law, Application of Gauss's Law,

Electric potential, calculating the potential from electric field, Potential due to a point-charge and a group of point-charges. Potential due to a dipole, Potential due to a continuous charge distribution,

Capacitors, calculating capacitance, Capacitors in series and parallel, Factors affecting capacitance, Application of Capacitors, Current and Conductors, Electric current and current density, Resistance and resistivity, Ohm's law, The Steady Magnetic Field, Resistors in series and parallel, Temperature dependence of resistance and other factors affecting resistance, Application of resistors, the magnetic field, Magnetic force on a current carrying conductor, Torque on a current-loop. Magnetic field due to current, Force between two parallel current-carrying conductors, Biot Savart law and its applications, Ampere's law, Inductance and inductors, Factors affecting inductance Permeability Faraday's law of induction, Lenz's law, Energy stored in a magnetic field, Self-induction, Mutual Induction, Magnets and magnetic materials, Di-magnetic material, Para-magnetic material, Ferromagnetism.

Lab Outlines

1. Measurements of basic constants [Vernier calliper, Micrometer (Screw gauge, Spherometer].
2. Adjust the spectrometer-goniometer and determine the wavelengths of the mercury/sodium spectral lines.
3. Open ended Lab
4. Determination of the wavelength of laser light using Michelson Interferometer.
5. Measurement of the width of a given slit. Determine the intensity distribution of the diffraction pattern of the slit
6. Determine the plane of polarization of a linear polarized laser beam. The intensity of the light transmitted by the polarization filter is to be determined as a function of the angular position of the filter. Mauls' law must be verified.

7. Determine the optical rotation, specific rotation of given solution and unknown concentration of optically active material in given solution.
8. Determine the frequency of AC supply of Melde's Apparatus.
9. Compare the magnetization of two given bar magnets.
10. Determine the Earth's magnetic field and the reduction factor of Tangent Galvanometer.

Recommended Books

1. Halliday, Resnick and Walker, "Fundamentals of Physics" (Latest Edition)
2. Hugh D. Young and R.A. Freedman, University Physics. (Latest Edition)
3. Raymond A Serway and John W. Jawett, Jr. Physics for Scientists and Engineers with modern Physics, (Latest Edition)
4. Fundamentals of Electromagnetic Phenomenon by D. Corson & Lorrain. (Latest Edition)

Course Content

8.5 Introduction to Computing

COURSE CODE & TITLE (GEC-111) **Introduction to Computing**		**CREDITS HOURS** **(1+1)** **16 Theory + 16 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Computing**
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Understand** working of computer hardware and software.	C1	1
CLO-2	**Develop** small scale computer programs with skills learnt.	C2	3
CLO-3	**Understand** concepts of data communication and networks.	C3	2
CLO-1 (Lab)	**Describe** working of hardware components of computer.	P1	2

Course Outline for Theory

Introducing Computer Systems: Basic Definitions, Computer and Communication Technology, the applications of ICT - particularly for engineering technology. Basic Operations and Components of a Generic Computer System: Basic operations: Input, Processing, output, storage Basic components: Hardware, Software, Data, Users, types of storage devices. Processing Data: Transforming data into information, how computers represent and process data, Processing Devices, CPU architectures

The Internet: The Internet and the World Wide Web- browsers, HTML, URLs/ How DNS works, Email and other programs. Introduction to Embedded Systems: What is an Embedded System, Applications, Components, Programming Languages, Popular Development Platforms. Networking Basics: Uses of networks, Common types of networks (LAN, WAN, MAN etc.), Introduction to OSI Model, Future of Networks

Database Management: Hierarchy of Data, Maintaining Data, Database Management Systems. Exposure to ICT Tools and Blogs (Student Assignment)

Protecting your privacy, your computer and your data: Basic Security Concepts, threats to users, threats to hardware, threats to Data

Lab Outlines

1. How to use Windows? How to type? How to open a File in Windows? What is typewriter? Writing in a text editor, Writing in a typewriter to save time, reduce fatigue, improve posture.
   Improve Writing speed up to 30 words per minute.
2. MS Word 2016
   Create documents, Create a blank document, Create a document based on a template, Enter text in a document, Enter commonly used text by using AutoComplete, Entering text by using Click and Type, Understand different ways to select text, Move and copy text within document (cut, copy, paste), Drag and Drop, Copy Multiple items using Office Clipboard, Create a folder for storing documents.
3. Save a document
   Save a copy of document to a new location, Set document protection, Apply password to open or modify the document, Format text and character, Change fonts and character spacing in a document, Make text bold, italic and underline, Create a dropped capital letter at the beginning of a paragraph, Format text as superscript or subscript, Character Spacing and Text Effects, Formatting Paragraph, Adjust line and paragraph

spacing, Indent paragraphs and insert tab stops, Justify text in a paragraph, Add a border and shading to a paragraph.

4. Editing a document.
   Check spelling and grammar, and correct typing errors, Correct typing mistakes, Correct spelling and grammar, Replace a word using Thesaurus, How to use Proof Reading Tools? What is auto Text, Auto Correct, Auto Format? Find and replace specific words, Set landscape and portraits page layouts, Set Headers and Footers, Set Page margins, Printing the document, Previewing a Page before printing, Printing Specific Parts of a document, Use Screen Tips to get help as you work.
5. Controlling the appearance of Table.
   Insert and delete rows and columns, Resize columns in a Table, Align Text in a Table, Formatting the contents of Table, Automatically format a table, Change Table borders and shading, Modify the formatting of cell contents, Customizing and Sorting Tables, Split a Table.
   Draw a table inside another table.
6. Perform calculations in a table.
   Sort the contents of table, Inserting, Headers and Footer, Page Numbers, Images, Pictures, symbols and clip art, Text Box, Page Breaks, Writing Equations.
7. MS Excel 2016
   To work with workbooks & worksheets, Create new workbook, To create Blank document, To create Template, Save Workbook, Save to different location, Open workbook, Preview & Print an Entire workbook, Enter and select worksheet data, Rename sheet tabs, Select cells and worksheets.
8. Enter the same data on multiple worksheets, Fill in a series of numbers, dates, days, Enter the same data in several cells, Changing the appearance of worksheet, Edit cell contents and spelling, Move and remove information, Find and replace data and information, Copy & paste within and between worksheets in a workbook, Move and delete selected cells, Merge cells and Split merged cells.
9. Writing formulas and perform calculations, Draw graphs in excel, Formatting of graphs.
   Changing the appearance of worksheet, Edit the structure of workbook & worksheet, Insert, Rename, delete worksheets, Reposition, move worksheets within & between workbooks, Hide/unhide columns/row, Freeze pane, unfreeze pane, Resize rows/columns, Alignment of text in cells.
10. MS Power point 2016
    How to create Presentation/ Blank Presentation? How to use Templates, Inserting new slides to your presentation, Choosing layout of slides, Applying Design to your slides, Applying background to slides, Inserting Pictures and diagrams, Inserting Charts, Inserting Sounds and Videos, Slide Transition, Making Custom Animations, Duplicate / Hide slides, Different Views of your slides, Slide Sorter View, Slide Layout View, Slide Sorter, Slide Show, Rehearse Timing.
11. Using Google Cloud for Compute Engine (Virtual Machines Running in Google's datacenter), Cloud Storage (Objects/files storage that's secure, durable, and scalable), Cloud SDK (Command Line tools and libraries for Google Cloud), Cloud SQL (Relational database services for MySQL)
12. Using Google Cloud for Cloud CDN (Content Delivery Network for delivering web and video), Dataflow (Streaming Analytivs for stram and batch processing), Cloud Run (Fully managed environment to run stateless containers), Microsoft 365 products.
13. Microsoft Flow. Deploying Lists and Libraries with Power Automate, Populating a List OR Migrating a simple Excel Table contents to a SharePoint List, Provisioning an AAD (Azure Active Directory) User with Power Automate.
14. Automated approval process – From approval request to a response, UI Flows in Power Automate – Intake form process to on-premises data source.

Recommended Books

1. "Introduction to Computers", Peter Norton, McGraw-Hill. (Latest Edition)
2. "Computing Essentials", Timothy O'Leary and Linda O'Leary, McGraw-Hill. (Latest Edition)
3. Using Information Technology: A Practical Introduction to Computers & Communications", Williams Sawyer, McGraw-Hill. (Latest Edition)
4. "Discovering Computers, Complete: Your Interactive Guide to the Digital World. Cengage Learning" Shelly GB, Vermaat ME, (Latest Edition)

Course Content

8.6 Introduction to Textile & Garment Technology

COURSE CODE & TITLE (GET-111) **Introduction to Textile & Garment Technology**	**CREDITS HOURS** (2+0) **32 Theory + 0 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Garment Engineering Technology (Foundation)**	
After completion of this course, students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Describe** fibers, fabrics, garments, and their properties.	C1	1
CLO-2	**Explain** applications and uses of textile fibers, fabrics, and garments.	C2	1
CLO-3	**Demonstrate** the basic operations involved in the fabrication and quality control of fibers, fabrics, and garments.	C3	1

Course Outline for Theory

Definition of textiles (fiber, yarn, fabric, and garment) and basic terms and definitions. Divisions of textile products (Apparel, Home and Furnishing Textiles and Technical Textiles). Current Pakistani and International Textile Production, import, export, and growth. Classification of textile fibers and sources or origins of chief fibers.

Textile yarns, process flow charts of basic operations of yarn manufacturing. Common types of spinning e.g., Rotor and Ring. Yarn numbering systems. Weaving and Process flow of manufacturing of woven fabrics.

Introduction of winding, warping, sizing, and weaving process. Construction of woven fabric (basic weaves). Knitting, types of knitting processes and end uses. Main parts of weft and warp knitting machines and their function. Comparison of properties of woven and knitted fabrics.

Definition and application areas of nonwovens. Nonwovens markets and their world production. Web formation and bonding of nonwovens.

Textile and garment chemical processing, i.e., Pre-treatment, Dyeing, Printing, Finishing. Operations and objectives of chemical processes. Introduction to textile dyes and auxiliaries. General classification of textile dyes and their application.

Understand the processes sequence and operations of garment processes. Basics and importance of garment inspection and quality control and garment finishing

Recommended Books

- Textile Engineering: An Introduction, Edited by Yasir Nawab, De Gruyter, Oldenbourg, 2016
- Manual of Textile Technology, by W. Klien, The Textile Institute, Manchester, 1986
- Advanced Textile Engineering Materials by S. Islam and B.S. Butola, Scrivener Publishing LLC, 2018
- Handbook of Nonwoves, Edited by S. J. Russell, The Textile Institute, UK, 2007
- Engineering Textiles by Y. E. Mogahzy, Woodhead Publishing, 2008

Course Content

8.7 Technical drawing and CADs

COURSE CODE & TITLE (GET-112) **Technical drawing and CADs**	**CREDITS HOURS** (0+1) **0 Theory + 16 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Garment Engineering Technology (Foundation)**	
After completion of this course, students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1 (Lab)	**Prepare** CAD models from technical drawings.	C3	3
CLO-2 (Lab)	**Perform** and execute different commands in CAD software for modelling of mechanical components.	P4	5
CLO-2 (Lab)	**Contribute** actively while performing assigned lab work and follow provided instructions whether working individually or in groups.	A4	9

Course Outline for Theory

Definition, drawing instruments and their proper use, dimensions and dimensioning, lettering.

Orthographic projections, planes of projection, projection of points, projections of straight lines, traces, true length, and true inclinations of lines problems. projection of planes, types and traces of planes, problems, projection of solids, types of solids and problems (By Alteration of Projection), section and intersection of solids and problems on each type. Development of surfaces.

Draw and practice rivets and riveted joints, screws, threads, bolt & nut, couplings, bearing, keys & cotters, pulleys, and the assembly drawing of simple machine components.

Use of the CAD (SpectraCAD-M) software and understanding of Computer Aided Manufacturing (CAM) and Computer Numerical Control (CNC), Terminology of CAD, coordinate systems, Basic commands (DRAW, MODIFY, SNAP, MEASURE, FILLET, MIRROR, ARC, TRIM, PRINT), Creating text box, and dimensioning

Lab Outline

1. Use of MS-Word for:
   Formatting text, paragraphs, and pages
   Inserting tables, smart art, pictures/figures with caption, text boxes, breaks and page numbers & title
2. Use of MS-Word for:
   References, cross-referencing, endnote, table of contents, headings and continues numbering
   Document printing, document templates, formatting styles, and comments & reviewing documents
3. Use of MS-Excel to Understand and perform:
   Cells, rows, columns, data types, cell format, data entering, short keys, auto-numbering, cell naming, cell/range referencing, name ranges
   Cell color, border and shading, conditional format, formulas and function, symbols and parenthesis, data validation, Gantt chart
4. Use of MS-Excel to Understand and perform:

Data representation, bar charts, pie charts, error bars, confidence limits, regression analysis
PPC sheet, fabric GSM calculator, fabric inventory sheet, recipe calculator, material requirement, process schedule

5. Use of MS-Power Point for:
   Effective use of power point slides using themes, notes, control of side show, printing slides and notes
   Usage of templates, (slide master, handout master and notes master)
   Interacting and using media files in power point (images, videos, and audios) and using animations
6. Use of ANSYS for drawing objects:
   Introduction to space daim
   Interface basics of 3D space movement
   Accessing different viewports
   Basic of drawing simple objects
7. Usage of ANSYS for 3D objects creation:
   Introduction to different tools to create 3D objects
   Extrude, sweep, rotate and skin
   Accessing material library and defining custom materials
8. Use of Texgeb software for textile modeling
9. Introduction to MATLAB:
   Basic of interface (workspace, command window, editor window, directory, command history, figure window etc.)
   Type of variables basic
   Arithmetic and logical operations
10. Introduction to MATLAB:
    Concept of vectors, arrays, and cells
    Basic plotting difference of executing from command line and from script files
    Difference between functions and script files
11. Plotting in MATLAB:
    Different types of plotting possibilities in MATLAB
    Bar (column) charts, scatter plots, line charts, pie charts etc.
    Multiple graphs in one image
    Multiple graphs on one chart
12. Regression Analysis in MATLAB:
    Accessing data files storing in variables
    Performing regression analysis and reporting
    Saving reports and graphs to be use in other documents
13. CLO3D for design simulation:
    Practicing different types of models
14. CLO3D for design simulation:
    Practicing different types of models

Recommended Books

1. Engineering Drawing. by French & Vierck.
2. Geometrical Drawing by N.D. Bhatt. (1St Edition)

Course Content

8.8 Pakistan Studies

COURSE CODE & TITLE (GEH-121) **Pakistan Studies**	**CREDITS HOURS** (3+0) **48 Theory + 0 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Art & Humanities**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Describe** the difference between ideological and non-ideological states.	A-1	10
CLO-2	**Discuss** Pakistan Movement, political, and constitutional history of Pakistan.	A-3	9
CLO-3	**Study** current issues of Pakistan, identify their causes, and suggest solutions.	A-4	11

Course Outline for Theory

Pakistan ideology: Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah, Aims and objective of the creation of Pakistan. Indus Civilization, Location and Geo-Physical features, Reformist Movement in Subcontinent. Muslim League 1906, Lahore Resolution 1940, 3rd June plan and Independence 1947, Constitution and Law, Constitutional Assembly, Nature and Structure of Constitution, Features of 1956, 1973 Constitutions. Amendments in the Constitution (17th, 18th, 19th and 20th), Foreign Policy, Objectives, Contemporary Pakistan, Economic institutions and issues, Society and social structure, Ethnicity, Determinants of Pakistan Foreign Policy and challenges, Futuristic stance of Pakistan

Recommended Books

1. Amin, Tahir. Ethno – National Movement in Pakistan, Islamabad: Institute of Policy Studies, Islamabad. (Latest Edition)
2. Afzal, M. Rafique. Political Parties in Pakistan, Vol. I, II & III. Islamabad: National Institute of Historical and cultural Research, (Latest Edition)
3. Struggle for Pakistan by Mr. Ishtiaq Hussain Qureshi (Latest Edition)

Course Content

8.9 Workshop Practices

COURSE CODE & TITLE (GEI-121) **Workshop Practices**	**CREDITS HOURS** (0+2) **0 Theory + 32 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Inter Disciplinary Technology**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1 (Lab)	**Describe** basic workshop tools and practices.	C2	1
CLO-2 (Lab)	**Demonstrate** positive individualism for performing machining with safety and precision.	P3	6
CLO-3 (Lab)	**Conform** to the performing operations in workshops, and in case of group work, share the work by participating actively.	A4	9

Course Outline for Theory

Workshop Safety precaution for each workshop, Introduction to Machining theory & practice.
Bench fitting, like filling, sizing marking etc. Lathe & Milling Types Construction & Operation's.
Planning, Shaping, Broaching & Gear Hobbing Operations. Principle, Tools, Applications.
Carpentry tools, and procedure, types of woodworking joints. Precision Machining.
Introduction of NC CNC & DNC Machines, Coordinate Measuring Machine (CMM).
High Speed Machining, Mass Production through Machining.
Introduction to Grinding, Honing, Lapping, Polishing and Buffing.
Welding Techniques Welding Theory & types: Arc welding Tig & Mig Welding, Gas Welding, Spot Welding soldering & brazing. Fusion welding process:

Recommended Books

1. Fundamentals of Modern Manufacturing, 2nd Edition by M.P. Groover
2. Chapman W.A.J. "Workshop Technology (Part I, II & III)
3. Manufacturing Technology By M.L Begeman, Hazel Hurs (5th Edition)
4. Workshop Technology by Hajira Chohdry (2nd Edition)

Course Content

8.10 Communication & Presentation Skills

COURSE CODE & TITLE (GEE-121) **Communication & Presentation Skills**	**CREDITS HOURS** (3+0) **48 Theory + 0 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Expository Writing**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Explain** basic theories of communications.	C2	9
CLO-2	**Present** and report technical contents both orally and in writing.	C2	10
CLO-3	**Participate** in group discussions while practicing professional ethics.	A3	8

Course Outline for Theory

Importance; Theories; Barriers and components of communication; The seven C's of effective communication; Listening skills; Notes taking; Giving feedback; Active reading techniques; Skimming; General and careful reading; Planning; Drafting and editing; Emphasis and connections in writing; Technical and business vocabulary; Constructing formal sentences; Communication as a Tool For Effective Interpersonal Engagement; Communication barriers and their mitigation strategies; Preparing and presenting using modern tools.

Recommended Books

1. Murphy H. A., Hildebrandt H. W. and Thomas J.P. "Effective Business Communications". McGraw Hill, USA
2. Norman S. "We're in Business" Longman Group Ltd., UK 3. Thomson A. J. and Martinet A.V. "A practical English Grammar" Oxford University Press, UK.

Course Content

8.11 Applied Statistics

COURSE CODE & TITLE (GEQ-121) **Applied Statistics**	CREDITS HOURS (3+0) **48 Theory + 0 Lab Sessions**	KNOWLEDGE AREA/ DOMAIN **Quantitative Reasoning**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Understand** statistical concepts to solve and analyze the engineering technology problems.	C-2	1
CLO-2	**Apply** rules and algorithms of probability and statistics to engineering technology problems.	C-2	2
CLO-3	**Identify,** analyze, and interpret complex problems by using statistical techniques for validation of results.	C-3	3

Course Outline for Theory

Introduction of statistics, Summation sign, properties of summation sign, Data types, individual item data, discrete frequency distribution, grouped data, Representation of statistical data, Formation of frequency distribution, grouped data, continuous and discontinuous grouped data, Graphical representation of data

Measures of central tendency or averages, Arithmetic mean, arithmetic mean of ungrouped data, A.M of grouped data, properties of A.M., Geometric mean, definition, exercise of G.M, Harmonic mean, median, formula of median for grouped data, mode, Measures of dispersion, absolute measures and relative measure of dispersion, Computation of absolute and relative measures of dispersion, Range, Quartiles deviation

Mean deviation, standard deviation, variance, properties of S.D and Variance, combined mean and combined variance, Introduction and basic concepts of probability, Random experiment, trial, outcomes, sample space, Event, types of events, definition of probability

Classical definition of probability, Exercise on classical probability, Counting rules, Permutation, combination, Exercise on permutation and combination, Axiomatic definition of probability, laws of probability, Conditional probability, Bayes theorem, Random variable, types of random variable, Discrete random variables and its properties, Discrete probability distribution, mathematical expectation, mean and variance of discrete random variable, Continuous probability distribution, mathematical expectation, mean and variance of continuous random variable

Discrete Probability Distributions, Binomial probability distribution, derivation of formula of binomial distribution. Exercise on binomial probability distribution Derivation of mean and variance of binomial distribution, Discrete probability distributions: Poisson probability distribution, derivation of formula of Poisson distribution. Exercise on Poisson probability distribution, Derivation of mean and variance of Poisson distribution, Hypergeometric probability distribution, derivation of formula of Hypergeometric distribution,

Exercise on Hypergeometric probability distribution, Derivation of mean and variance of Hypergeometric distribution, Continuous probability distributions, Normal probability distribution, finding the probability of normal distribution using standard normal table, Properties of normal distribution, application of normal distribution, Exercise of normal

probability distribution, Exponential probability distributions: Properties of normal distribution, application of normal distribution,

Exercise of Exponential probability distribution, Basic concepts and definition about statistical inference Testing of hypotheses and confidence interval about population mean using Z-test and t-test, Testing of hypotheses and confidence interval about difference of two population means using Z-test, Testing of hypotheses and confidence interval about difference of two population means using t-test, Simple linear regression, model fitting of simple linear regression, Testing of hypothesis about regression coefficients,

Simple linear correlation and testing of hypothesis about 'r', Multiple linear regression and polynomial regression, model fitting using least square method, Multiple linear regression and polynomial regression, model fitting using matrices approach, Polynomial regression model fitting using Minitab, Application of multiple and polynomial regression, Analysis of variance (ANOVA)

Recommended Books

1. Susan Milton and Jesse C Arnold, "Introduction to Probability and Statistics: Principles and Applications for Engineering and the Computing Sciences," Fourth Edition, 2003, McGraw-Hill.
2. Introduction to Statistics by David Lane, Rice University (2003).
3. Statistics for Management by D. Levin and David S. Rubin (2011) Seventh Edition.
4. All of Statistics: A Concise Course in Statistical Inference by Larry A. Wasserman (2004)

Course Content

8.12 Textile Raw Materials

COURSE CODE & TITLE (GET-121) **Textile Raw Materials**		**CREDITS HOURS** (2+1) **32 Theory + 16 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Garment Engineering Technology (Foundation)**	
After completion of this course, students will be able to:			**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Identify** different textile raw materials, their structure, properties, processes, and applications.		C2	1
CLO-2	**Determine** use of different textile raw materials.		C3	3
CLO-3 (lab)	**Choose** raw materials for specific textiles applications.		A1	3
CLO-4 (lab)	**Select** different fibers, and suitable raw materials for end use and product development.		P3	5

Course Outline for Theory

Introduction of textile fibres, and characteristics of fibre forming polymers. Fibre classification – natural, regenerated, and synthetic fibres.

Cotton fibre, its cultivation, harvesting and picking. Differentiate varieties of Pakistani cotton and express cotton grading. Structure and morphology of natural plant/vegetable fibres including cotton, jute, flax, ramie, abaca and sisal etc. Production, processing, structure, morphology and application of bast fibres such as jute, flax, ramie etc. Physical and chemical properties, and end uses of natural fibres.

Natural animal hair fibers (such as wool, camel, mohair, cashmere, alpaca and angora) and their classification. Structure, production, properties, grading and uses of wool fibres.

Silk fiber, its production, processing, structure, properties, and end uses.

Introduction and processing, properties, and end uses of natural mineral fibres such as Asbestos and hazard associated with asbestos.

Regenerated fibres, their types (viscose, lyocel, bamboo and cellulose acetate and its derivatives like Tencel), raw material and manufacturing methods. Structure, properties, and end uses of regenerated fibres in textile industry.

Understanding of synthetic fibres and their classification. Manufacturing of polyester, polyamide, polypropylene, and acrylic fibres. Structure, properties, and end uses of synthetic fibres in textile industry.

Elastomeric fibres, manufacturing methods of various elastane fibres such as Lycra. Structure, properties and end uses of elastomeric fibres.

Introduction to High Performance and functional Fibres, Differentiate between high performance and functional fibers. Understanding of aramid, High-performance polyethylene, carbon, glass fibres, ceramic fibres, thermal resistant fibres, chemical resistant fibres, antibacterial fibers etc.

Lab Outline

1. Determination of cotton fibre 2.5 % span length, 50 % span length, UR % short fibre contents percentage on Spinlab Fibrograph 530.
2. Determination of effective staple length short fibre percentage of the cotton sample comparison of result with comb sorter method.

3. Determination of cotton fibre maturity of cotton on Spinlab Fibrograph 530.
4. Determination of cotton fibre maturity by NaOH Soaking method.
5. Determination of cotton fibre maturity using differential dyeing method.
6. Determination of Cotton fiber Bundle Strength by Pressley Strength Tester.
7. Determination of cotton fiber fineness on Spinlab Micronaire 675.
8. Determination of moisture regains, moisture content, correct invoice weight of cotton fiber lot of 7000 Kg.
9. Determination of moisture regains, moisture content, correct invoice weight of polyester fiber lot of 7000 Kg.
10. Identification of cotton fiber, viscose rayon (both physical and chemical test).
11. Identification of nylon, polyester (both physical and chemical test).
12. Analysis of filament yarn and establishment of yarn linear density.
13. Determination of blend ratio of given polyester cotton blended sample.
14. Demonstrate fibre structure using SEM/ Video microscope.
15. Analysis of fibre mixing for mélange yarn.

Recommended Books

1. Handbook of Textile Fibres: Vol-1 Natural Fibres by J. G. Cook (1st Edition). Butter worth, 1984
2. Handbook of Textile Fibres: Vol-II Man-Made Fibres by J. G. Cook (1st Edition). Butter worth, 1984
3. Regenerated Cellulosic Fibres by C. Woodings. Woodhead Publishing, 2001
4. Handbook of Technical Textiles Eds. S A. Richard Horrocks, Woodhead Publishing, CRC Press UK, 2000
5. Handbook of Textile Fibre Structure by S. Eichhorn, J. W. S. Hearle, M Jaffe, T Kikutani, Woodhead Publishing, 2009

Course Content
8.13 Applied Chemistry

COURSE CODE & TITLE (GEN-121) **Applied Chemistry**	**CREDITS HOURS** (2+1) **32 Theory + 16 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Natural Sciences**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Understand** rules and principles of chemistry governing physical and chemical properties of materials.	C2	1
CLO-2	**Explain** differences among acids, bases and organic chemicals using fundamental principles of chemistry.	C4	3
CLO-3	**Apply** the acquired knowledge to identify, formulate and solve engineering technology problems of chemical nature.	C3	2
CLO-4 (Lab)	**Perform** different experiments to measure physical properties, purity, and detection of various chemicals.	P3	4
CLO-5 (Lab)	**Measure** the percentage yield of some organic compounds after their preparation, effect of optimum conditions on yield of product, and identification of organic and biochemical compound using laboratory apparatus.	P5	5

Course Outline for Theory

Chemical kinematics and catalysis: Introduction to rate equation and reaction order, reaction mechanism, relation between rate equation and reaction mechanism, thermodynamics, and electrochemical phenomenon: Heat, work and energy, reversible and irreversible processes, work done in an isothermal reversible expansion of ideal gas. Enthalpy, entropy, electrochemical and galvanic series, polarization, decomposition potential, over voltage. Theories of corrosion. Types of corrosion and corrosion control of corrosion. Sources and conservation of fresh water, impurities in water and their effects. WHO guideline and BIS guideline for drinking water. Chemistry involved in sedimentation, coagulation, and sterilization. Softening of water, lime-soda, ion-exchange process. Engineering materials: glass, ceramics, refractory, composites, magnetic materials, polymers, and structure property relationship. Thermoplastic and thermosetting plastics. Preparation, properties and applications of some commodity and engineering polymers. Conducting polymers

Lab Outline

1. To determine % age purity of a given commercial acid.
2. To determine % age purity of a given commercial base.
3. To determine % age composition of mixture solution of Na_2CO_3 and NaOH.
4. Determine % age composition of mixture solution of $Na_2 CO_3$ and $NaHCO_3$.
5. To estimate available chlorine in given commercial sample of bleaching powder/ liquid bleach
6. To estimate total, temporary and permanent hardness values of a given water sample
7. To determine surface tension and parachor of a given liquid using stalagmometer.
8. To determine equivalence point by titration curves for acid and base using potentiometric titration.

9. Introduction to Preliminary investigations and detection of elements and functional group analysis.
10. Detection of carboxylic acids.
11. Detection of phenols.
12. Detection of amines.
13. Detection of carbohydrates.
14. Detection of aldehydes and ketones.

Recommended Books

1. Brown and Holmes, 2018, Chemistry for Engineering Students 4th Edition, ISBN-13: 978-0357026991, Cengage
2. Atkins, Paula and Keeler, 2014, Atkins' Physical Chemistry 11th Edition, Oxford.

Course Content

8.14 Electrical & Electronic Technology

COURSE CODE & TITLE (GEI-231) **Electrical & Electronic Technology**	**CREDITS HOURS** (2+1) **32 Theory + 16 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Inter Disciplinary Technology**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1 (Theory)	**Explain** the basic concepts of voltage, current, resistance, capacitance, inductance, series circuits, parallel circuits, series-parallel combination, and Ohm's law.	C2	1
CLO-2 (Theory)	**Choose** suitable DC and AC circuits solving techniques based on their properties.	C3	2
CLO-1 (Lab)	**Operate** the lab equipment correctly during experiments.	P2	5
CLO-2 (Lab)	**Comply** with the lab protocols related to conduct of experiments in individually assigned tasks and actively participate in group tasks.	A3	10

Course Outline for Theory

Basic concepts of voltage, current, resistance, capacitance,

Inductance, series circuits, parallel circuits, series parallel combination, calculations, Ohm law, law of resistance.

Construction and Working principles of DC Machines and their types,

Speed control of DC motors, working principles and applications of AC machines.

Construction and working principles of single and three phase transformers. Insulators, semiconductors,

Type of semiconductors, doping, PN-junction diode,

Rectifier and their types, construction and working principles of Bipolar junction transistors,

Construction and working principles of BJT amplifiers.

Lab Outline

1. Identification, specifications and testing of resistor, capacitor, and breadboard
2. Determine the use of Trainer by connecting resistors in series and parallel
3. Use the Cathode-Ray Oscilloscope (CRO) to determine and examine the DC and AC voltage waveforms
4. Identify and test the diode, and determine its V-I characteristics
5. Demonstrate the behavior of semiconductor Diodes in half-wave and full wave rectifiers both with and without capacitor filter
6. Identify and test the transistor, and operate it as a switch

7. Introduction to Proteus Professional software for designing Electrical and Electronics systems
8. Use Switches and Relays in Proteus Professional to Model and Control Different Electrical and Electronic circuits
9. Use Transistor as an amplifier in Proteus Professional
10. Determine the voltage regulation of transformer
11. Identify the essential parts of a DC machine and tabulate their functions
12. Determine the power factor of an inductive load

Recommended Books

1. B.L. Theraja A textbook of Electrical Technology Vol-2
2. Edward Huges- Electrical Technology (10th-edition)
3. Electronics devices By Floyd (11th edition)
4. Lab Manuals for lab practice

Course Content

8.15 Fundamentals of Yarn Manufacturing

COURSE CODE & TITLE **GEI-231** **Fundamentals of Yarn Manufacturing**	**CREDITS HOURS** (2+1) **32 Theory + 16 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Garment Engineering Technology /Foundation**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Understand** different types of yarn manufacturing techniques, and illustrate preparatory and manufacturing processes of cotton, manmade, blended, carded, and combed spun yarns.	C1	1
CLO-2	**Apply** the knowledge of yarn manufacturing system for manufacturing of yarns for desired product.	C2	5
CLO-2 (Lab)	**Choose** appropriate yarn for specific product.	A1	3
CLO-3 (lab)	**Design** the gearing diagram to manufacture different yarn varieties.	P3	5

Course Outline for Theory

Definition of yarn, its types and classification. Yarn numbering system (count measurement) and its effect on cost and quality of yarn. Fibre quality parameters such as length, strength, fineness, maturity and color etc. and effect of these parameters on yarn quality.
Objectives, working principle and modus operandi of complete spinning line i.e. Blow room, Carding, Drawing frame, Lap former, Combing, Roving frame, Ring frame and yarn winding departments. Effect of process variables on quality and cost of the yarn produced. Illustrate the sketches showing different parts and flow of material through these manufacturing processes. Basic spinning calculations related to production, draft and twist of the yarn. Various types of special/Fancy yarns (core-spun, slub, compact, SIRO, Mélange yarn, elastic yarns etc.), their manufacturing techniques, their end uses/applications, their aesthetic effects and their downstream performance. Objectives and working of two-for-one twister machine. Advance spinning systems such as rotor spinning, air jet spinning, MVS. Cost and quality comparison of yarns produced on these systems and which end uses can these yarns be applied for.
Sampling and testing of yarn for assessment of quality parameters such as Count, Strength, Evenness, Hairiness, Twist etc. and effect of these parameters on yarn appearance and down-stream performance.

Lab Outline

1. To measure the single yarn strength for cotton and blended yarn.
2. To determine the lea strength for cotton and blended yarn.
3. To determine the yarn hairiness.
4. To analyze slub specification for a given sample of slub yarn.
5. To identify blend % age for given sample of PC yarn.
6. To identify blend % age for given sample of PC yarn.
7. To determine the lycra %age for a given sample of cotton lycra yarn.
8. Measurement of twist per inch by contraction and direct method and calculate the twist multiplier of given sample of yarn.

9. To find out the evenness of the given yarn sample.
10. Practical observation of different types of cotton yarns and yarn faults.
11. Practical observation of different types of PC yarns and yarn faults.
12. To prepare gearing diagram and perform roller speed calculations for a given set of gearing drive.
13. To calculate the total length, weight and count for a given sample of yarn cone.
14. Open ended lab.

Recommended Books

1. Eric Oxtoby “Spun Yarn Technology” (1987).
2. W. Klein “Short Staple Spinning” (vol-I) (1998).
3. An introduction to textiles (vol.II) (Eurotex)
4. Short Staple yarn Manufacturing (1997) Dan J. McCreight
5. Manual of cotton spinning. Vol. II Part-II (Opening and Cleaning) (C. Shringley)
6. Wool Handbook (Werner Von Bergen)
7. Rieter Manual Vol, II, III
8. Textiles: Fibre to Fabric (Bernard P. Corbman)
9. A Practical Guide to Opening and Carding (W. Klein)
10. Wool and Worsted Handbook
11. Fibre and Yarn Quality in Jute Spinning

Course Content

8.16 Fundamentals of Fabric Manufacturing

COURSE CODE & TITLE (GET-232) **Fundamentals of Fabrics Manufacturing**	**CREDITS HOURS** (2+1) **32 Theory + 16 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Garment Engineering Technology/Foundation**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Understand** various fabric manufacturing techniques.	C1	1
CLO-2	**Apply** knowledge of fabric formation processes, including weaving, knitting, nonwoven, and braiding to prepare fabrics for specific use.	C2	5
CLO-1 (Lab)	**Compare** various fabric samples and check their quality using standard testing and characterization techniques.	A4	4
CLO-3 (lab)	**Determine** the quality and production parameters of a fabric, and reproduce the same fabric.	P3	5

Course Outline for Theory

Classification of various types of fabrics, fabric forming methods, flow chart of Weaving, Objectives of Weaving, fabric constructions, Objectives of Warping, Types of warping and parts of warping machine parts, Working Principle of High-speed warping machine and Sectional Warping, working principle of Ball warping and Draw set warping, Different types of size ingredients, process of application of size materials, Drawing In draft, Peg Plan, Reed plan and repeat unit of a weave design, drawing-in and tying-in, Identify the primary & secondary motions of a loom, Shedding and different types of shedding systems, Different parts of the loom involved in weaving, Picking and different weft insertion types, Different weaves and denim fabrics being used in denim garment industry, Denim washing and finishing process, flow chart of warp & weft knitting structures, Applications of knitting structures in apparel manufacturing, Types of needles and types of stitches, functioning of circular weft knitting machines, Mechanism of Socks Knitting machine, Functioning of Flat weft knitting machines, Types of needles and types of stitches, knitting structure, warp Knitting machine, Basic concepts and features of non-woven, Manufacturing process for non-woven fabric, Basic concepts and features of Braiding, manufacturing process for braided fabric, common fabric defects, their causes and value loss.

Lab Outlines

1. Identification of different fabrics made by cotton and PC yarn.
2. To study the shedding mechanism of the loom.
3. To study the weft insertion mechanism of the loom.
4. Determination of number of end and picks/inch for a given fabric sample.
5. Identification of cotton and core spun lycra fabrics.
6. Identification of different weave structures in given samples of denim fabrics.

7. To analyze the given sample of Jacquard fabric.
8. Determination of construction and Weight per square meter of fabric.
9. To calculate the crimp % of yarn in a given fabric sample.
10. To calculate the cover factor is a given fabric sample.
11. To measure size take up for a given sample of sized yarn.
12. To determine the width of a given fabric sample.
13. To perform the grading of a sample of fabric through 'four points' grading system.
14. Compare the pilling propensity of knitted and woven, fabric.
15. Open ended lab

Recommended Books

1. Principles of Fabric Formation (2018) By: Prabir Kumar Banerjee, CRC Press New York, USA.
2. Textile Engineering. An introduction (2016) By: Nawab, Y., De Gruyter Oldenbourg, Berlin, Boston.
3. Handbook of Weaving (2001) By: Sabit Adanur
4. Knitting Technology (2001) By: D.J. Spencer.

Course Content

8.17 Raw Materials for Clothing

COURSE CODE & TITLE (GET-233) **Raw Materials for Clothing**		**CREDITS HOURS** (2+0) **32 Theory + 0 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Garment Engineering Technology (Foundation)**	
After completion of this course students will be able to:			**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Define** fabric types, threads, buttons, zippers, hooks, and loop tape.		C1	1
CLO-2	**Recognize** different types of linings, interlining, trims, elastics, labels, snaps etc.		C2	1

Course Outline for Theory

Fabric types, their characteristics and evaluation according to end use. Sewing threads, their types, characteristics and importance. Types of buttons (Flat Buttons, Shank Buttons, Stud Buttons, Toggle Buttons, Decorative Buttons) their specifications. Introduction to zippers, their significance and invasion of plastic zippers. Importance of interlinings, their uses, and difference between interlining and interfacing.

Elastic and its types (braided elastic, woven elastic, elastic thread, special purpose elastic). Trims, their importance, and usage in garment industry. Labels, their types (brand label, size label, care label, flag label, manufacturer label, batch mark label, special label, etc.) and importance. Loop tapes, their types, and characteristics. Snaps (post-style, prong-style, parts of a snap) and hooks.

Recommended Books

Prasanta Sarkar-April 05, 2013

Jenny Udale, Textiles and fashion, 2008

6. Sundaresan, G. Hari, P K. & Salhotra, K R.(1994) "Sewing thread properties" Textile Asia Vol 25 No 9,pp 46.

27. Ferriera, F B N. Harlock, S C. & Grosberg, P. (1994) "A study of thread tension on a lockstitch machine(Part-I)", International Journal of Clothing Science & Technology, Vol. 6 No1, pp- 14-19.

28. Ferriera, F B N. Harlock, S C. & Grosberg, P.(1994), "A study of thread tension on a lockstitch machine (Part- II)", International Journal of Clothing Science & Technology, Vol. 6, No5, pp26-29

Course Content

8.18 Garment Design Fundamentals

COURSE CODE & TITLE (GET-234) **Garment Design Fundamentals**		**CREDITS HOURS** (1+1) **16 Theory + 16 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Garment Engineering Technology (Foundation)**
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Describe** elements of garments, body types, sizing systems, and factors affect clothing and styles.	C1	1
CLO-2	**Explain** history of garments, and garment design research process.	C2	1
CLO-1 (Lab)	**Select** different type of boards for design research process (research board, inspiration board, mood board, fabric board etc.).	A2	3
CLO-2 (Lab)	**Make** technical drawings (Tech pack), design, and illustrate with complete boards.	P7	11

Course Outline for Theory

General introduction, garment history - evolution of dress from ancient times through the nineteenth century, integrating clothing and fashion change with key social, artistic, and political concurrent movements. Specific terminology related to garment types (Like Jackets, Hoodies etc.), understanding of why people wear clothing, how styles change across cultures and the influence of art, environment, politics, technology, religion and culture on dress and clothing customs.

Introduction to silhouette, body types, standardization of sizing, basic illustration & technical drawing. Garment elements including collar, cuff, pocket, yoke and sleeves and their types.

Planning and developing theme, understanding of different boards (research board, inspiration board, mood board, fabric board) predicting trends and concepts of collection.

Lab Outlines

1. Theme selection: Students will select one theme inspiration to start their design process and will write a 2–3 pages brief description about the theme.
2. Collect images about the theme and will make research boards and inspirations boards accordingly. They will make A3 size research boards by cutting and pasting the images.
3. Make A3 size mood boards according to the theme and then extract some colors from that board to make color board.
4. Create sketches of the designs of their own according to the theme on 10"/10" sheet without colors. This activity will help the students to enhance their skills and creativity.
5. Selected designs from the pencil sketches, students will start rendering the designs with the colors from mood board or color board.
6. Create technical drawings of the colored illustrations on A4 page. After this activity, students will be able to understand the importance of adding the details and importance of technical drawings in construction

7. Make a spec sheet of one of the selected illustrations manually on A4 page.
8. Create a tech pack of another illustration manually of 5-6 A4 pages.
9. Draw a technical drawing from the illustrations on any software.
10. Create a specification sheet in any software of one of the illustrations or convert their manually created specification sheet into digitized specification sheet.
11. Create a tech pack using software.
12. Selection of the garment from their wardrobe and will create a technical drawing manually and digitally with colors and size chart.
13. Create a complete tech pack of the same previous garment with same details about the size, trims, accessories, and tags.
14. Make a prototype of any garment from the illustrations to check its functionality and manufacturing process.

Recommended Books

1. Costume and Fashion: A Concise History by James Laver, Amy de la Haye, Aug 2002
2. Survey of Historic Costume by Phillis G. Tortora, Keith Eubank, 5th Edition.
3. History of Costume by Karl Köhler, Emma von Sichart , 1981

Course Content

8.19 Computer Programming

COURSE CODE & TITLE (GEC-241) **Computer Programming**		**CREDITS HOURS** (1+1) **16 Theory + 16 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Computing**	
After completion of this course students will be able to:			**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Know** the working of computer hardware and software.		C1	1
CLO-2	**Develop** small scale computer programs with learnt skills.		C2	3
CLO-3	**Understand** concepts of data communication and networks.		C3	2
CLO-4 (Lab)	**Describe** the working of hardware components of computer.		P1	2
CLO-5 (Lab)	**Type** with good speed and develop office application skills.		P3	3
CLO-6	**Use** problem-solving skills to develop computer programs.		P2	4

Course Outline for Theory

Introducing Computer Systems: Basic Definitions, Computer and Communication Technology, the applications of ICT - particularly for engineering technology

Basic Operations and Components of a Generic Computer System: Basic operations: Input, Processing, output, storage Basic components: Hardware, Software, Data, Users, types of storage devices

Processing Data: Transforming data into information, how computers represent and process data, Processing Devices, CPU architectures

The Internet: The Internet and the World Wide Web- browsers, HTML, URLs/ How DNS works, Email and other programs

Introduction to Embedded Systems: What is an Embedded System, Applications, Components, Programming Languages, Popular Development Platforms.

Networking Basics: Uses of networks, Common types of networks (LAN, WAN, MAN etc.), Introduction to OSI Model, Future of Networks

Database Management: Hierarchy of Data, Maintaining Data, Database Management Systems

Exposure to ICT Tools and Blogs: (Student Assignment)

Protecting your privacy, your computer, and your data: Basic Security Concepts, threats to users, threats to hardware, threats to Data

Lab Outlines

1. Theme selection: Students will select one theme inspiration to start their design process and will write a 2–3 pages brief description about the theme.
2. Collect images about the theme and will make research boards and inspirations boards accordingly. They will make A3 size research boards by cutting and pasting the images.
3. Make A3 size mood boards according to the theme and then extract some colors from that board to make color board.
4. Create sketches of the designs of their own according to the theme on 10”/10” sheet without colors. This activity will help the students to enhance their skills and creativity.
5. Selected designs from the pencil sketches, students will start rendering the designs with the colors from mood board or color board.
6. Create technical drawings of the colored illustrations on A4 page. After this activity, students will be able to understand the importance of adding the details and importance of technical drawings in construction
7. Make a spec sheet of one of the selected illustrations manually on A4 page.
8. Create a tech pack of another illustration manually of 5-6 A4 pages.
9. Draw a technical drawing from the illustrations on any software.
10. Create a specification sheet in any software of one of the illustrations or convert their manually created specification sheet into digitized specification sheet.
11. Create a tech pack using software.
12. Selection of the garment from their wardrobe and will create a technical drawing manually and digitally with colors and size chart.
13. Create a complete tech pack of the same previous garment with same details about the size, trims, accessories, and tags.
14. Make a prototype of any garment from the illustrations to check its functionality and manufacturing process.

Recommended Books

1. “Introduction to Computers”, Peter Norton, McGraw-Hill. (Latest Edition)
2. “Computing Essentials”, Timothy O’Leary and Linda O’Leary, McGraw-Hill. (Latest Edition)
3. Using Information Technology: A Practical Introduction to Computers & Communications”, Williams Sawyer, McGraw-Hill. (Latest Edition)
4. “Discovering Computers, Complete: Your Interactive Guide to the Digital World. Cengage Learning” Shelly GB, Vermaat ME, (Latest Edition)

Course Content
8.20 Garment Technology 1

COURSE CODE & TITLE (GET- 241) **Garment Technology 1**	**CREDITS HOURS** (2+1) **32 Theory + 16 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Garment Engineering Technology (Breadth)**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Define** terms related to garment preparatory processes (lay, marker, spreading, cutting, sewing etc.).	C1	1
CLO-2	**Explain** the basic types of machines, explain safety measures, sewing rules, quality measures, process of marker making, cutting, bundling, tagging, spreading, and stitch/seam classes.	C2	1
CLO-1 (Lab)	**Identify** different parts of garment preparatory machines and elaborate terminologies related to garment manufacturing.	A1	4
CLO-2 (Lab)	**Construct** a basic garment article (i.e. skirt) using different sewing techniques.	P4	5

Course Outline for Theory

Process flow chart of different finished products (e.g. denim trousers, work wears, t-shirt, polo shirt, bed sheet etc) , Garment preproduction operations and its importance, spreading quality measures (ply direction, tension, static charge, shade etc) , Spreading techniques, Tables process, Faults of spreading, Safety Precautions, Lay planning and its importance, Manual and automatic lay planning, Pattern Digitizing, Marker making ,its types, splicing, its importance during spreading, Cutting process, types, machines, safety precautions, Cutting quality Bundling, tagging/numbering Cutting room wastages, advancements in cutting and stitch/seam classes.

Lab Outlines

1. Introduction to Sewing Lab/ Layout
2. Introduction to single needle lock stitch machine and its parts identification
3. Single needle lock stitch machine threading and bobbin winding
4. Oiling, cleaning and maintenance of single needle lock stitch machine
5. Machine control practice
6. Paper exercises 1-6 without thread
7. Paper exercises 1-6 on fabric with thread
8. Introduction to over lock machine, parts identification and machine threading
9. Introduction to Chain machine, parts identification and machine threading
10. Fabric joining practice, edge stitch and top stitch practice
11. Hemming practice
12. Stitching of basic article i.e. skirt

Recommended Books
1. Textile Engineering: An Introduction, by Yasir. Nawab, 2016 2. Industrial cutting of textile materials by I. Viumsone, 2012 3. Clothing Manufacturing: Sewn Product Analysis by R. E Glock, 2004 4. Clothing Technology by H. Eberle, 2002 5. Garment Manufacturing Technology by R. Nayak, 2015 6. Textiles and fashion by Jenny Udale, 2008 7. Apparel Manufacturing Technology by T. Karthik, 2020

Course Content

8.21 Garment Production Machinery

COURSE CODE & TITLE (GET-242) **Garment Production Machinery**	**CREDITS HOURS** (2+1) **32 Theory + 16 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Garment Engineering Technology (Depth)**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Define** machinery and equipment used for garment production processes.	C1	1
CLO-2	**Explain** basic working mechanisms of the garment production machinery.	C2	1
CLO-3 (Lab)	**Demonstrate** different mechanisms for garment production machinery.	A3	4
CLO-4 (Lab)	**Calibrate** any garment production machinery.	P5	2

Course Outline for Theory

Mechanical Terminologies (gears, bearings, belts, pulleys and Couplings), Different type of motors used in garment industry, Fabric inspection machinery, spreading machinery involved in spreading (feed control mechanism, tensioning devices, and width indicator, etc.), Various types of cutters used in the cutting section including portable cutters, stationary cutters, servo cutters and automatic cutting workstations, Sewing machine types with respect to stitch and bed type, Sewing machine parts, their functions and types Sewing machine feeding systems, Stitch formation mechanisms, washers, dryers, squeezers, hydro extractors and ovens used in the garment wet processing, Uses of laser technology in garment finishing, Pressing equipment like buck press, iron press, Maintenance of garment machinery.

Lab Outline

1. Study of the Drive Mechanisms of Thread Take-Up Lever, Needle Bar, in a Lockstitch Sewing Machine.
2. Study of the Drive Mechanisms of Upper Looper, Oil Pump, Upper Knife, Needle Bar, and Thread
3. Take-Up lever in an Over lock Stitch Sewing Machine.
4. Study of the Lower Looper & Feed Drive Mechanism of an Overlocks Stitch Sewing Machine.
5. Study of the Drive Mechanisms of Oil Pump, Thread Take Up Lever, Spreader and Needle Bar in a Flatlock (Cover stitch) Sewing Machine.
6. Study of the Drive Mechanisms of the looper and Needle Guards in a Flatlock (Cover stitch) Sewing Machine.
7. Study of the Main Frame and cover Components in Vertical Straight Knife Cutting Machine.
8. Study of the Feed Drive Mechanism in a Flatlock (Cover stitch) Sewing Machine.
9. Study of the Crankshaft Mechanism in a Lockstitch Sewing Machine in Relation to the Needle Bar.
10. Study of the Thread Take-up Lever Mechanism in a Lockstitch Sewing Machine in relation to the Crankshaft.
11. Study of sewing Machine for working of feed & Hook / Looper Mechanism.

12. Analysis of Drive Mechanism and relationship between motor rpm, needle reciprocation, and movement of the thread take up lever and feed dogs in Combination.
13. Study and adjustment of different stitch types (Class100,300,400,500,600)
14. Comparison of Machine adjustment for knitted and Woven Fabrics.
15. Determination of different stitch Densities and Calculation of Thread Consumption for different Stitch Types

Recommended Books

1. Machine Elements in Mechanical Design by Robert L. Mott, 2017
2. Carr and Latham's Technology of Clothing Manufacture by David J. Tyler, 2009
3. Introduction to Clothing Manufacture by Gerry Cooklin ,2006
4. Clothing Manufacturing: Sewn Product Analysis by Glock Ruth and Kunzs, 2005
5. The Complete Handbook of Sewing Machine Repair by Howard Hutchison

Course Content

8.22 Anthropometry and Garment Construction

COURSE CODE & TITLE (GET-243) **Anthropometry and Garment Construction**		**CREDITS HOURS** (1+2) **16 Theory + 32 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Garment Engineering Technology (Depth)**
After completion of this course, students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Describe** anthropometry, human figure, and standard sizing system for the development of garment patterns.	C1	1
CLO-2	**Explain** the effect of fabric grain line and drape behavior on garment patterns, pattern manipulation (Dart, Pleat, Gathers etc.).	C2	1
CLO-1 (Lab)	**Understand** different terminologies used in anthropometry and garment construction.	A2	5
CLO-2 (Lab)	**Construct** and develop complete basic patterns according to given body measurements, and investigate problems in developing the pattern and grading system.	P4	3

Course Outline for Theory

Anthropology, its history, and new trends, Understanding the body measurement techniques, Body Landmarks Sizing systems and Size intervals Eight head theory, Grain lines, Types, importance, Different terms/tools used in pattern making, Pattern on different scales, Pattern making of Bodice block, Sleeve, Skirt, Collars, Cuffs, Pockets and placket, Introduction to draping, its history and importance, Draping tools and their usage, understanding basic proportion of a mannequin, Classic bodice drape, Dart variations, pleats and gathers, Tracing and truing of paper patterns, Understanding the before and after wash measurement, Advancements in pattern technology (e.g. 3D body scanning)

Lab Outlines

1. Identification of body Landmarks and their measurement
2. Construction of different types of pockets, cuffs and plackets
3. Construction of different types of collars
4. Construction of basic bodies block (front and back)
5. Dart addition and manipulation
6. Construction of different types of sleeves for knitting garments (One-piece sleeve, Reglan sleeve)
7. Construction of different types of sleeves for woven garments (One-piece sleeve, two-piece sleeve)
8. Construction of different types of knitted shirts
9. Construction of pattern for formal shirt
10. Construction of basic and circular skirts
11. Construction of pattern for basic trouser
12. Construction of pattern for denim trousers
13. Construction of caps, hoods and bags
14. Grading of different types of shirts and trousers

Recommended Books
1. Patternmaking for Fashion Design by Helen Joseph – Armstrong, 2010 2. Dress Pattern Designing by Natalie Bray, 2008 3. Karolyn Kiisel, Draping the complete course, Published in 2013 by Laurence King Publishing Ltd. 4. Helen Joseph-Armstrong, Draping for Apparel Design, 3rd Edition. USA: Bloomsbury Publishing Inc, 2013. 5. Hilde Jaffe, Nurie Relis, Draping for fashion design, Fifth Edition. USA: Pearson education, Inc, prentice Hall 2012.

Course Content

8.23 Fundamentals in Textile Chemical Processing

COURSE CODE & TITLE (GET-244) Fundamentals of Textile Chemical Processing	CREDITS HOURS (2+1) 32 Theory + 16 Lab Sessions	KNOWLEDGE AREA/ DOMAIN Garment Engineering Technology/Foundation	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Understand** basic principles of pretreatment, dying, printing, and finishing of textile for wet processing of fabrics.	C1	1
CLO-2	**Develop** recipes, process routes, and parameters of efficient processing of fabrics.	C2	5
CLO-2 (lab)	**Design** the operating parameters for pre-treatment, dyeing and printing of various fabrics.	A1	3
CLO-3 (lab)	**Perform** applications of chemical finishes on fabrics using different methods.	P4	10

Course Outline for Theory

Introduction to wet processing, flow chart of material in a wet processing mill. Description of major processes involved in wet Processing. Understanding of different fabric pretreatment processes (singeing, desizing, scouring, bleaching and mercerization), their types and objectives. Enzymatic desizing, effect of pH, temperature and time, evaluation of desizing process. Problems associated with acid desizing process. Scouring chemicals and auxiliaries. Bleaching with hydrogen peroxide, risks involved with peroxide bleaching, effect of pH, time, temperature and stablizer on peroxide bleaching. Evaluation of desized, scoured, bleached and mercerizing fabric. Basics of dye, light and color, and color mixing. Different types of dyes and their classification based on application and dye structure. Theory and application of different types of dyes (direct, reactive, disperse, vat, sulphur, acid, basic etc.), and their general fastness properties. Understanding of different dyeing methods. Differentiate Printing and Dyeing. Textile printing, its types and steps involved in printing. Paste formulation for pigment and reactive printing, and effect of chemicals. Comparison of properties of reactive and pigment printed fabric. Fabric finishing, need of finishing, classification of chemical, mechanical and combined chemical and mechanical finishing. Learning of various quality tests used in industry such as light fastness, rubbing fastness, crocking, washing fastness , air permeability etc. for quality assessment of dyed/printed fabrics.

Lab Outlines

1. To desize the given woven fabric by Enzymatic desizing technique using exhaust method.
2. To scour the given fabric and analysis of absorbency.
3. To bleach the given fabric with hydrogen peroxide and analysis of whiteness.
4. Dyeing of 100% cotton fabric with direct dye by exhaust method.
5. Application of cold reactive dye on 100% cotton fabric by exhaust method.

6. Application of Hot reactive dye on 100% cotton fabric by exhaust method.
7. Application of Sulphur dye on 100% cotton fabric by exhaust method.
8. Application of Vat dye on 100% cotton fabric by exhaust method.
9. Application of Disperse dye on 100% polyester fabric by exhaust method.
10. Printing of 100% Cotton fabric using pigments.
11. Printing of 100% Cotton fabric using Reactive dyes.
12. To observe the effect of soft finish on textile fabric.
13. To observe the effect of Resin finish on cotton fabric.
14. Open ended lab.

Recommended Books

1. Textile Science, E.P.G. Gohl and L.D. Vilensky, Second Edition, CBS Publishers & Distributors.
2. -Chemistry & Technology of Fabric Preparation & Finishing, Dr. Charles Tomasino, Department of textile engineering, chemistry and science college of textiles, North Carolina state university
3. -Textile Printing, W. C. Miles, Revised second edition, Society of dyers and colorists.
4. Dyeing and Chemical Technology of Textile Fibers, By: E.R. Trotman.
5. -Colour Measurement –Fundamentals- Vol. I, By: J. Lucas
6. Eurotex Vol. IV, Textile Wet Processing.
7. Chemical Processes in the pretreatment processes of Textiles. BY:
8. S.R. KARMAKAR

Course Content

8.24 Computer Aided Pattern Making

COURSE CODE & TITLE (GET-351) **Computer Aided Pattern Making**		**CREDITS HOURS** (1+2) **16 Theory + 32 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Garment Engineering Technology (Depth)**
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Define** graphic designing, and terms related to pattern making/digitizing (marker types and efficiency, digitizer, plotter, rule table, splice marks etc.).	C1	1
CLO-2	**Explain** process of grading, notching, digitizing system, its functions, and pattern designing software.	C2	1
CLO-1 (Lab)	**Understand** different terminologies used in computer aided pattern designing software.	A2	5
CLO-2 (Lab)	**Create** digitized pattern using computer aided design software and relevant tech packs.	P7	3

Course Outline for Theory

Digital communication ,Graphic design (Raster and Vector), Resolution, DPI, PPI ,CAD soft wares in Garment industry, tools and their working with respect to 2D pattern making, digitizer and plotter, Marker making, Grading, Notch types and Evaluation of tech pack.
3D CAD in clothing industry. Uses of different tools of 3D CAD software. Analysis of virtual fit simulation of various basic garments (e.g. skirt, trouser, t-shirt/polo shirt etc.) in static as well as in dynamic posture.

Lab Outlines

1. Pattern development of Skirt
2. Pattern development of Trouser
3. Pattern development of t-shirt/polo shirt
4. Pattern development of formal shirt
5. Overview of the tools and their working with respect to 3D simulation
6. Grading of all the patterns using selected softwares.
7. Marker making of a Skirt, Trouser,T-shirt etc.
8. Virtual fit evaluation of Skirt, Trouser, T-shirt
9. Virtual dynamic fit evaluation

Recommended Books

1. 3D Fashion Design: Technique, Design and Visualization by Thomas Markryniotis , 2015
2. Computer-aided pattern design and product development by Alison Beazley and Terry Bond ,2003
3. Advances in Clothing Production by Catherine Fairhurst,2008
4. Computer-Aided Pattern Design and Product Development by Alison Beazley 1st Edition

Course Content

8.25 Functional Textile and Garments

COURSE CODE & TITLE (GET-352) **Functional Textile and Garments**		**CREDITS HOURS** **(3+0)** **48 Theory + 0 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Garment Engineering Technology (Foundation)**	
After completion of this course, students will be able to:			**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Understand** concepts of functional textiles and clothing, including materials, design, production, and performance evaluation.		C2	1
CLO-2	**Apply** the knowledge of functional materials and technologies for textiles that meet the needs of end-users.		C3	3
CLO-3	**Evaluate** performance of functional textiles through testing and analysis, and optimize the design and production processes.		C4	4

Course Outline for Theory

Introduction to functional clothing, Design and engineering of functional clothing, Classification based on application. Performance clothing for environmental protection, textiles for cold weather apparel, use of smart textile materials in cold weather, smart textiles for heating purposes. Thermal protective clothing for fire fighters, its design and testing procedures. Chemical protective clothing, Vapor protective clothing, UV protective clothing.
Wearable clothing for medical applications. Therapeutic/rehabilitation. Introduction to pressure garments and application.
Smart textiles and their functions, applications, innovation and development in smart textiles. Personal protective equipment.
Performance sportswear, Problems with traditional apparel used in sportswear, Functions required for sportswear, Compression garments in sports clothing, Clothing designed for body sculpting, Textile material and fabric structure for sportswear, Design and testing procedures for Sports Clothing

Recommended Books

- Textile Engineering: An Introduction, Edited by Yasir Nawab, De Gruyter, Oldenbourg, 2016
- Manual of Textile Technology, by W. Klien, The Textile Institute, Manchester, 1986
- Advanced Textile Engineering Materials by S. Islam and B.S. Butola, Scrivener Publishing LLC, 2018
- Handbook of Nonwoves, Edited by S. J. Russell, The Textile Institute, UK, 2007

Course Content
8.26 Garment Technology 2

COURSE CODE & TITLE (GET-353) **Garment Technology 2**		**CREDITS HOURS** (2+1) **32 Theory + 16 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Garment Engineering Technology (Breadth)**
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Define** various terms related to garment lining, interlining, care labels, machine types, production systems, washing, drying, and pressing techniques.	C1	1
CLO-2	**Explain** work aids, inventory management systems, sewing machine mechanisms, care labels, and garment packing processes.	C2	1
CLO-1 (Lab)	**Identify** different parts of sewing machines, and explain terminologies related to garment sewing.	A1	4
CLO-2 (Lab)	**Construct** advance garment article using different sewing techniques.	P4	5

Course Outline for Theory

Introduction to stitching, stitch properties, stitch size and factors that affect stitch choice, Stitch classes, seam lasses
Basic sewing machine types (lock stitch, overlock, single needle chain stitch),Compatibility of sewing machine needle, fabric and sewing thread, seam strength measuring techniques and factors that are involved in seam strength, different production systems used in stitching section of garments industry
sewing faults, root causes and corrective actions, Sewing production wastages, Advancements in sewing,
Joining techniques other than stitching , Garment inspection (inline, final etc.), Care instructions.

Lab Outlines

1. Introduction to specialized Sewing machines.
2. Introduction to (available machines), parts identification, machine threading, Machine Oiling, sewing machines needles and sewing thread for Lock stitch machines.
3. Introduction to (available machines), parts identification, machine threading, Machine Oiling ,sewing machines needles and sewing thread for Overlock machine
4. Introduction to (available machines), parts identification, machine threading, Machine Oiling, sewing machines needles and sewing thread for specialized machine.
5. Usage of machine attachment (Folders, Work aids etc.)
6. Proper maintenance of sewing machines
7. Stitching of ladies wear (Front panel, Back panel, Assembly and finishing)
8. Stitching of Men's wear (Front panel, Back panel, Assembly and finishing)

Recommended Books
1. Textile Engineering: An Introduction, by Yasir. Nawab, 2016 2. Industrial cutting of textile materials by I. Viumsone, 2012 3. Clothing Manufacturing: Sewn Product Analysis by R. E Glock, 2004 4. Clothing Technology by H. Eberle, 2002 5. Garment Manufacturing Technology by R. Nayak, 2015 6. Textiles and fashion by Jenny Udale, 2008 7. Apparel Manufacturing Technology by T. Karthik, 2020

Course Content

8.27 Garment Merchandizing and Sourcing

COURSE CODE & TITLE (GET-354) **Garment Merchandizing and Sourcing**	**CREDITS HOURS** (2+1) **32 Theory + 16 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Garment Engineering Technology (Depth)**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Explain** the concepts, principles, practices, tools, and techniques involved in garment merchandizing.	C2	1
CLO-2	**Demonstrate** the process of garment sourcing, costing, export, and documentation.	C3	3
CLO-3 (Lab)	**State** different garment merchandising activities related to product development, order execution, costing, and documentation.	P2	4
CLO-4 (Lab)	**Perform** different, merchandising, sourcing, costing and documentation tasks effectively.	A2	10

Course Outline for Theory

Introduction to Merchandising, its importance and role of merchandisers as well as their responsibilities in apparel industry. Introduction to forecasting and its application in garment industry. Sampling, types of samples, and role of merchandiser in sampling.

Planning of order and its execution, consumption estimation such as fabric and yarn weight, yarn, fabric, sewing thread and other materials. line planning and line development, time and action plans and their development. Capacity calculations and production planning

Introduction to sourcing, its processes and strategies, factors affecting on sourcing process, role of merchandiser in sourcing process. Vendor management, types of vendors and their evaluation methods for garment industry.

Cost Concepts such as material cost, labor cost, overheads, and expenses, factors affecting, cost calculation for all garment stages (yarn, fabric, cutting, sewing, packing, shipment etc...)

Export procedure for clothing industry, terms of payment (Advance payment, letter of credit, documents against acceptance and documents against payment), delivery terms and export finance, pre-shipping inspection, shipment modes, custom clearance procedure and export documentation, internal documentation for merchandiser.

Lab Outline

1. Identification of different types of trims
2. Identification of different types of accessories (Sewing & Packing)
3. Costing Sheet Development on Excel for Knitted Garments
4. Costing Sheet Development on Excel for Denim Products
5. Costing Sheet Development on Excel for Home Textile Products
6. Identification of different types of samples required by buyer.
7. Fabric development for different type of samples
8. Lab Dips of different type of fabrics for sampling

9. Testing of developed samples of fabrics
10. Sewing of different types of samples after developed fabrics
11. Checking of inline quality control parameters of samples with buyer's standards
12. Packing of samples with approved accessories as per buyer's standards
13. Quality Assurance Audit of Packed Products as per Buyer's standards
14. Rehearsal of Compliance Audit as per buyer's requirement for factory selection
15. Preparations to participate in trade exhibitions, fairs/shows to interact with buyers

Recommended Books

1. Apparel Merchandising by R. Rathinamoorthy R. Surjit, Woodhead Publishing India, 2017
2. Apparel Merchandising: The Line Starts Here, by J. A. Rosenau and D. L. Wilson, 3RD Edition, Fairchild Books, 2014
3. Apparel Costing by A. Kennedy, A. Reyes, F. Venezi. Bloomsbury Publishing, 2020
4. Global Sourcing in the Textile and Apparel Industry by Jung Ha-Brookshire, Bloomsbury Academic, 2014
5. Source-it: Global Material Sourcing for the Clothing Industry, David Birnbaum, International Trade Centre UNCTAD/WTO, Geneva, 2005

Course Content
8.28 Project-I

COURSE CODE & TITLE (GET-355) **Project-I**		**CREDITS HOURS** (0+3) **0 Theory + 48 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Textile Engineering Technology** **Domain Project**
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Apply** background knowledge of engineering technology fundamentals to the proposed idea, and compare with earlier related projects.	C-3	1
CLO-2	**Analyze** the problem statement through research and literature review.	C-4	2
CLO-3	**Defend** impact of the proposed idea in societal and environmental contexts, and explain alignment with sustainable development goals.	C-5	6
CLO-4	**Develop** a working prototype using technical skills and latest design tools, that has passed through design, implementation, testing and evaluation stages.	C-6	3
CLO-5	**Integrate** the solution of Broadly Defined Engineering Technology Problems for improvement of society or environment.	A-4	7
CLO-6	**Practice** various methods to avoid plagiarism in reports to adapt ethical values.	A-5	8
CLO-7	**Work** effectively as an individual and in a team.	A-4	9
CLO-8	**Display** communication skills through presentations, technical reports, and posters.	A-5	10
CLO-9	**Display** the results of Hardware components testing which could be used for software development.	P-5	5

Course Content

8.29 Garment Finishing Process

CODE & TITLE (GEM-361) Garment Finishing Process	CREDIT & CONTACT HOURS (2+1) 32 Theory +16 Lab	KNOWLEDGE AREA/ DOMAIN Garment Engineering Technology Breadth	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Choose** various types of chemicals for specific washes to improve the softening and comfort properties of finished garments.	C-3	3
CLO-2	**Analyze** effect of dry processes and their developments to optimize the aesthetic appeal of finished garments.	C-4	4
CLO-3 (Lab)	**Apply** different wash techniques, i.e., desize wash, enzyme wash, stone wash, bleach wash, soft wash, etc., to integrate desirable properties in the finished garments.	A3	6
CLO-4 (Lab)	**Design** and develop the whiskers and crinkle effects, etc., to produce a new and attractive look to the finished garments.	P4	5

Course Outline

Introduction to garment wet processing including desize wash, enzyme wash, stone wash, bleach wash, etc. Garment dry processes including whisker's, laser processing, hand scraping, $KMnO_4$, crinkle, grinding, etc., Garment trimming, garment printing techniques and their types. Garment ironing, sizing, shade variation, and problems related to use of accessories in garment finishing process. Techniques and their objective for embroidery, surface embellishments for apparels. Garment faults mending and remedies in apparel finishing. Importance of sustainability in finishing processes of garment

Lab Outlines

1. Application of Whiskers and Scrapping Effect
2. Study the Ripping, Grinding and wrinkle Effect
3. Study the effect of $KMnO_4$ Spray
4. Process of Garment Desizing
5. Application of Stone Wash/ Enzyme Wash/ Acid Wash etc.
6. Study the Bleach Effect and Softener Application
7. Identification of different printing techniques
8. Study the surface embellishment using different embroidery techniques
9. Understand different sustainable garment finishing techniques

Recommended Books

1. Quality Characterization by Subrata Das (2021)
2. Apparel Finishing and Clothing Care by M Parthiban, & M. R. Srikrishnan (2021)
3. Sewing for the Apparel Industry by Claire B. Shaeffer (2001)
4. Apparel Finishing and Clothing Care (Woodhead Publishing India in Textiles) by by M. Parthiban & M. R. Srikrishnan (2020)

5. Circular Economy in Textiles and Apparel: Processing, Manufacturing, and Design (The Textile Institute Book Series) 1st Edition by Subramanian Senthilkannan Muthu (2018)
6. Apparel Quality: A Guide to Evaluating Sewn Products by Janace E. Bubonia (2021).
7. Roshan Paul “Denim: Manufacture, Finishing and Applications” (Woodhead Publishing Ltd.), latest edition.

Course Content

8.30 Process Improvement in Garment Industry

COURSE CODE & TITLE GET-362 **Process Improvements in Garment Industry**		**CREDIT & CONTACT HOURS** (3+0) **48 Theory + 0 Lab**	**KNOWLEDGE AREA/ DOMAIN** **Garment Engineering Technology (Breadth)**	
After completion of this course students will be able to:			**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Understand** fundamental concepts, practices, tools, and techniques involved in total quality management for process improvement		C1	P1
CLO-2	**Apply** the tools and techniques to lean manufacturing, six sigma individuals, and in teams to improve processes		C2	P5
CLO-3	**Analyze** problems of garment manufacturing industry using best practices of lean manufacturing and six sigma		C3	P4

Course Outline

Introduction of process improvement, basics of total quality management, leadership, employee involvement, supplier partnership, statistical process control tools and techniques, basic quality control tools and their importance with examples, basic concepts of lean manufacturing, their tools and techniques. Basic concept of six sigma and its methodology. Tools and techniques for the implementation of six sigma.

Recommended Books

1. Total Quality Management by Dale H Besterfield, Carol besterfield, Glen H besterfield, Mary besterfield. 2011
2. Lean manufacturing tools, techniques, and how to use them William M Feld, 2000
3. Total Quality Management and Operational Excellence: Text with Cases by John S. Oakland, 2014
4. Six Sigma: A Complete Training and Reference Guide: a Complete Step-By-Step Guide, by Craig Joseph Setter, Harmony Living, LLC, 2018.
5. Success using lean Six Sigma in terms of operations and business processes by Dinesh Gupta, 2015.
6. Six Sigma Handbook, by Pyzdek, Thomas, and Paul Keller McGraw-Hill Education, 2014.

Course Content

8.31 Sewn Product Technology

COURSE CODE & TITLE (GET-363) **Sewn Product Technology**		**CREDIT & CONTACT HOURS** **(2+1)** **32 Theory + 16 Lab**	**KNOWLEDGE AREA/ DOMAIN** **Garment Engineering Technology (Depth)**
After completion of this course students will be able to:			**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Understand** basics of sewn product technology that includes wok study techniques, and terminologies related to industrial engineering technology.		C1	P1
CLO-2	**Apply** knowledge affectively by doing production-relevant calculations, designing style bulletins, and evaluating employee's learning rate.		C2	P3
CLO-3 (Lab)	**Systematically** investigate resource consumption in garment manufacturing that includes time, material, human resource.		A4	P3
CLO-4 (Lab)	**Conduct** physical experiments, collect data, analyze, infer conclusions, and suggest practical solutions of different garment products.		P4	P9

Course Outline

Introduction of sewn product technology, operation of garment industry, work study techniques like method study, time study, and micro motion study along with their basic terminologies. Identification and conduction of systematic recording of work methods used in apparel industry. Operation breakdown and importance of line balancing. Calculations of IE in the garment industry, Layout & Material Handling, Ergonomics & Human Factor, Operator selection and training, Learning curves

Lab Outlines

1. Analysis of a garment with respect to stiches and seams
2. Develop outline and process flow chart
3. Develop multiple activity chart
4. Develop two handed process charts
5. To conduct method study
6. To conduct time study
7. To calculate consumption of thread in garment top
8. To calculate consumption of thread in garment bottom
9. Analysis of the facility layout
10. Analysis of the floor layout
11. Operation Break down of a top garment

12. Operation Break down of a top garment
13. Operation breaks down of bottom garment
14. Operation breaks down of bottom garment
15. Analysis of workstation ergonomic

Recommended Books

1. Industrial Engineering in Apparel Manufacturing by Prabir Jana, Manoj Tiwari, 2020.
2. Industrial Engineer's Digest: Learn, Practice and Improve Factory Performance by Prasanta Sarkar, 2021
3. Industrial engineering in apparel production by V Ramesh Babu, 2012.
4. Sewn Product Analysis by Ruth. E. Glock 2007.
5. Introduction to Clothing Production Management by A.J.Chutter, 2001.

Course Content

8.32 Compliances in Garment Industry

CODE & TITLE (GET-364) Compliances in Garment Industry	CREDIT & CONTACT HOURS (2+1) 32 Theory + 16 Lab	KNOWLEDGE AREA/ DOMAIN Garment Engineering Technology (Breadth)	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Comprehend** and differentiate requirements of different types of compliances, their needs and usages.	C-2	4
CLO-2	**Implement** the techniques and tools to control the social and environmental issues related to the garment industry.	C-3	5
CLO-3 (Lab)	**Create** and develop standards for industrial workforce, including process, product, and safety living conditions.	A4	3
CLO-4 (Lab)	**Evaluate** standard practices of product quality and certification requirements in the garment industry.	P4	6

Course Outline

Social/labor compliance and its different types that are being followed in the garment industry, set by National/International Organizations. Importance of compliances in practice in the clothing industry such as Social/labor compliance, Occupation, health, and safety (OHS) compliance, Environmental Compliance, Product quality compliance, Security Compliance, Structural/building compliance, and Certification of compliance. Failure to conformance that leads towards Non-Compliance and their serious consequences like stoppage of business from the concerned customer, sealing of the company by the legal authorities and cancellation of the certifications from the certifying body.

Lab Outlines

Intellectual property compliance complies with intellectual property laws related to trademarks, patents, and copyrights. Customs compliance related to customs regulations related to documentation, licensing, and inspection. Social compliance includes providing safe and clean-living conditions, access to education and healthcare, and fair wages. Ethical compliance includes ethical manner, treating their workers, customers, and suppliers with integrity and respect. This includes compliance with standards related to bribery and corruption, and adherence to ethical sourcing practices.

Information security compliance related to information security standards to protect confidential information and prevent data breaches. This includes compliance with standards related to data protection, storage, and transmission.

Product safety compliance related to product safety standards to ensure that their products are safe for consumers. This includes compliance with standards related to flammability, lead content, and chemical content. Quality control compliance comply with quality control standards to ensure that their products meet customer expectations. This includes compliance with standards related to product testing, inspection, and documentation.

Recommended Books
1. Product Safety and Restricted Substances in Apparel by Subrata Das, 2016. 2. Labour and Industrial Laws by P. K. Padhi, 2019 3. Textiles and Environment by N. N. Mahapatra, 2016 4. Procedures and Compliances: A Practical Approach to the Companies Act by Milind Kasodekar, Shilpa Dixit, 2013 5. Compliances Under Labour Laws by H. L. Kumar, 2010

Course Content
8.33 Project-II

COURSE CODE & TITLE (GET-365) **Project-II**		**CREDITS HOURS** (0+3) **0 Theory + 48 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Textile Engineering Technology** **Domain Project**
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Devise** an experimentally verified system which can solve a Broadly Defined Engineering Technology Problem.	C6	2
CLO-2	**Implement** proposed design using modern technology for solution of Broadly Defined Engineering Technology Problem.	C3	3
CLO-3	**Investigate** and analyze the results obtain from the implemented design.	C4	4
CLO-4	**Practice** ethical principles with specific reference to solution of engineering technology related problems.	A5	8
CLO-5	**Display** effectiveness as an individual and in a teamwork management.	A4	9
CLO-6	**Display** communication skills through presentations, technical report, and posters.	A5	10
CLO-7	**Demonstrate** management skills as a member or leader to manage the project.	A4	11
CLO-8	**Alter** and modify conventional solutions by adapting modern technology.	P6	5

Course Content

8.34 Nonwoven and Technical Textiles

COURSE CODE & TITLE (TET-4704) **Nonwovens and Technical Textiles**	**CREDITS HOURS** (3+0) **48 Theory + 0 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Textile Engineering Technology Breadth**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Identify,** understand, and classify technical textiles based on their functionalities.	C2	1
CLO-2	**Explain** the web forming and web laying methods and procedures.	C2	3
CLO-3	**Differentiate** web bonding techniques based on structural and functional properties of non-wovens.	C4	4

Course Outline for Theory

Introduction to Non-Wovens, classification, dry, wet, and polymer-laid nonwovens. Dry-laid web formation, Selection of raw materials for carding, opening of fibers, mixing, and blending. Carding, working, and stripping principles, roller operations, card clothing.

Introduction to Cross-lapping, vertically lapped (perpendicular-laid) web formation**:** airlaid web formation, bonding and web consolidation, physical properties and Practicals applications of airlaid fabrics. Wet-laid web formation, Polymer-laid web formation, Spunbond fabric production, spunbond production systems, spunbond fabric applications, meltblown fabric production, characteristics and properties of meltblown fabrics, meltblown fabric applications.

Stitch bonding, needle punching, hydro-entanglement, applications of stitch bonded, needle punched and hydro-entangled fabrics. Thermal bonding, Principle of thermal bonding, thermally bonded fabric structure, applications of thermally bonded fabrics. Chemical bonding, mechanism of chemical bonding, methods of binder application, applications of chemically bonded nonwovens. Nonwoven fabric finishing, Wet finishing, lamination, mechanical finishing, surface finishing,

Classification of technical textiles, Agrotech, Buildtech, Geotech, Medtech, Mobiltech, Oekotech, Packtech, Protech, Sporttech, Indutech, Clothtech, Hometech. History and development of technical textiles; Global market of technical textiles; production and consumption statistics of technical textiles.

Recommended Books

1. Grayson, M. 1984. Encyclopedia of Textiles, Fibers and Non-Woven Fabrics. John Wiley and Sons, New York. USA.
2. Horrocks, A.R. and Anand, S.C. 2000. Handbook of Technical Textiles. CRC Press, Woodhead Publishing, Cambridge, UK.
3. Russell, S.J. 2007. Handbook of Non-wovens, CRC Press, Woodhead Publishing, Cambridge, UK.
4. Jeon, H.Y. 2016. Non-woven Fabrics: IntechOpen, London, UK

Course Content

8.35 High Performance Fibers

COURSE CODE & TITLE (TET-4703) **High Performance Fibers**	**CREDITS HOURS** (2+0) **32 Theory + 0 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Textile Engineering Technology Breadth**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Understand** the sources, structure, properties, and end use of high-performance fibers, along with their manufacturing and processing methods.	C2	1
CLO-2	**Explain** preparation, properties, and uses of high- performance fibers based on scientific approaches.	C2	3
CLO-3	**Differentiate** various physical and mechanical properties of various high-performance fibers.	C4	4

Course Outline for Theory

Introduction: new generation of fibers, molecular dimensionality, contrasting mechanical properties, economics

Aramids: Introduction, polymer preparation, spinning, structure and properties, applications.

Gel-spun high-performance polyethylene fibers: Introduction, manufacturing, fiber characteristics, yarn, and fabric processing. Other high modulus-high tenacity (HM-HT) fibers from linear polymers

Carbon fibers: Introduction, physical properties, PAN-based carbon fibers, pitch-based carbon fibers, vapor-grown carbon fibers, carbon nanotubes, applications.

Glass fibers: Introduction, glass for fibers, fiber manufacturing, fiber finishing, glass fiber properties, composites.

Ceramic fibers: Introduction, silicon carbide-based fibers, alumina-based fibers, single-crystal oxide fibers, manufacturing, structure, properties, end uses.

Chemically resistant fibers: Introduction, chlorinated fibers, fluorinated fibers, manufacturing, structure, properties, end uses.

Thermally resistant fibers: Introduction, thermosets, aromatic polyamides and polyaramids, semi-carbon fibers.

Recommended Books

1. Hearle, J. W. S. 2001. High-performance Fibers. CRC Press, Woodhead Publishing, Cambridge, UK.
2. Hongu, T. G.O. Phillips and M. Takigami, 2005. New Millennium Fibers, CRC Press, Woodhead Publishing, Cambridge, UK.
3. Horrocks, A.R. and S. Anand. 2000. Handbook of technical textiles, CRC Press, Woodhead Publishing, Cambridge, UK.
4. Starr, T. 2012. Carbon and High-Performance Fibers Directory and Databook: Springer, Berlin, Germany.

Course Content
8.36 Clothing Comfort

COURSE CODE & TITLE (GEI-231) **Clothing Comfort**		**CREDITS HOURS** (3+0) **48 Theory + 0 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Depth**
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Explain** a comprehensive understanding of clothing comfort, including its fundamental concepts, different types, and the key clothing characteristics that influence comfort.	C2	1
CLO-2	**Demonstrate** the desired features in garments pertaining to thermal comfort, skin sensorial comfort, and ergonomic comfort, considering specific end uses and wearer preferences.	C3	2
CLO-3 (Lab)	**Analyze** the comfort of clothing using various standard testing techniques and methods, including subjective assessments and objective measurements, to assess factors such as breathability, moisture management, thermal insulation, and tactile properties.	P2	5

Course Outline for Theory

Definition and types of comfort, Human physiological aspect of comfort, Energy metabolism and physical work, Human heat balance, Clothing as near environment, Various aspects of clothing comfort, Comfort variables, Effective temperature and the comfort chart, Response to extreme temperature, Development of heat stress and its control, comfort and Protective clothing.

Internal and external factors, Comfort properties of fibers, yarn and fabrics, how consumer percieves comfort. Measurement of thermo-physiological comfort and analysis the effects of air permeability, water vapour permeability, thermal resistance, wicking, buffering and absorbency on clothing comfort.

Approaches for improving the thermal comfort of clothing. Transport of perspiration, Fundamentals of moisture transfer between the human body and the environment, Factors influencing moisture transport, Improving moisture transport, Clothing requirements for different environmental Conditions. Human tactile sensation, Fabric mechanical properties and tactile-pressure sensations, Warmth or coolness to the touch of fabrics, Improving the textile surface properties for tactile sensation. fundamental principles of fit in apparel, Clothing comfort and fit, Manual and mechanical stretch testing, fundamental principles of movement in apparel, Fashion and functional apparel: aesthetics, protection, performance and movement, Movement and garment stretch/pressure/compression.

Recommended Books

1. Thermal Comforts Properties of Knitted Fabrics Produced from Bamboo blended yarns by Dr. Shivaraj R Kulkarni, 2020.
2. Standard Methods for Thermal Comfort Assessment of Clothing by Ivana Špelic, Alka Mihelic Bogdanic, Anica Hursa Sajatovic · 2019
3. C. Fairhurst "Advances in apparel production", Woodhead publishing, 2008., 1st Edition.

4. J. Fan and W. Yu “Clothing appearance and fit: science and technology”, 2004, 1st Edition
5. 3.G. Song “Improving comfort in clothing”, Woodhead publishing, 2011, 1st Edition.

Course Content

8.37 Denim Processing Technology

COURSE CODE & TITLE (TET-4707) **Denim Processing Technology**	**CREDITS HOURS** (2+1) **32 Theory + 16 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Textile Engineering Technology Depth**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Illustrate** wet and dry processing of denim garments.	C3	2
CLO-2	**Apply** acquired knowledge to optimize process parameters related to denim manufacturing.	C3	4
CLO-3 (Lab)	**Demonstrate** machine mechanisms and material processing through various departments in the denim Industry.	P3	1
CLO-4 (Lab)	**Select** proper safety gadgets and other resources, and take safety precautions.	A5	6

Course Outline for Theory

Denim Processing flow charts; Cotton yarn manufacturing for denim.

Indigo dye and reduction techniques; Indigo dyeing technology for denim yarns; dyeing of denim yarns with non-indigo dyes.
Weaving technologies for denim manufacturing; finishing of denim fabric; stitching of denim fabric; Developing before-wash measurements for a denim trouser.

Washing techniques for denim jeans; Bio washing of denim jeans, reduction of water in washing of denim garments; Reduced water washing of denim garments: ozone fading.

Finishing of jeans and quality control; Role of denim and jeans in the fashion industry; Novel varieties of denim fabrics; Recovery and recycling of denim waste; Laser engraving of denim; Effluent treatment in denim and jeans manufacturing; Environmental impacts of denim manufacturing.

Lab outlines

1. Application of Whiskers and Scrapping Effect
2. Study the Ripping, Grinding and wrinkle Effect
3. Study the effect of KMnO4 Spray
4. Process of Garment Desizing
5. Application of Stone Wash/ Enzyme Wash/ Acid Wash etc.
6. Study the Bleach Effect and Softener Application
7. Identification of different printing techniques
8. Study the surface embellishment using different embroidery techniques
9. Understand different sustainable garment finishing techniques

Recommended Books
1. R. Paul, 2015. Denim: manufacture, finishing and applications, Woodhead Publishing. Cambridge United Kingdom. 2. S.S. Muthu. 2017. Sustainability in Denim, The Textile Institute, Manchester. United Kingdom. 3. Piero Turk. 2017. A Life with Denim Vol.2, Woodhead Publishing. Cambridge United Kingdom

Course Content

8.38 Sociology for Technologist

COURSE CODE & TITLE (GEI-231) **Sociology for Technologist**	**CREDITS HOURS** (3+0) **32 Theory + 16 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Social Science**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Understand** various social phenomena and processes through the lens of sociology, and their importance in the industry.	C3	4
CLO-2	**Analyze** role of socialization, social diversity, social movements in the process of socio-cultural change, and identify challenges in respect of Pakistani society.	C4	5

Course Outline for Theory

Introduction and history of sociology. Importance and scope of sociology in society, subject matters of sociology and their individual worth, importance of everyday interactions between individuals as the basis for the development of society, importance of social structures that shape society as a whole, social world as riddled with tension and strife, concept of social interaction and its promoting elements, types and forms of social interaction, ways of social interaction (competition, co-operation, accommodation), three approaches of social interaction in everyday life, basic social institutions of society (family, religion, political, economic and education), their individuals functions and their scope, concept of group and characteristics of groups, role of and importance of groups in our social structure, types of groups and social diversity (race, gender, and class), meaning of socialization, role of agents in socialization, socialization and life course, role of socialization in personality development, patterns around which society is organized, micro aspects of social structure, (roles, status and expectation), macro sociology (institutions vs organizations),importance and characteristics of culture, elements and types of culture, features of Pakistani culture.

Mass media and functions of mass media, contribution of mass media in national development, contribution of mass media in teaching and learning, role of mass media in socialization, positive and negative role of mass media in Pakistani society, meaning of globalization, promoting facts of global inequality, extreme Poverty vs Extreme Wealth, possibilities to eradicate global inequality, meaning of gender and Distinguish between Sex and Gender, gender role and gender stereotype in world scenario, role and status of women in Pakistan society, women empowerment by discussing case study, women inequality by discussing case study, women inequality by discussing case study, meaning of social movement, types of social movement, levels of social movement. (Local, Regional, National, Global), social change and the environment, factors of social change, resistance of social change, models of social change, environmentalism and Social Change, meaning and aims of rationalization, characteristics of Rationalization, advantages and disadvantages of rationalization.

Recommended Books

1. Sociology, John J. Macionis.
2. An introduction to sociology, Vidya Bhushan & D.R. Sachdeva.

Course Content
8.39 Entrepreneurship

COURSE CODE & TITLE (GEI-231) **Entrepreneurship**	**CREDITS HOURS** (3+0) **48 Theory + 0 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Management Science**	
After completion of this course students will be able to:		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Develop** business models for new ventures.	C5	3
CLO-2	**Perform** a self-analysis to demonstrate the ability for an entrepreneurial career.	C£	6

Course Outline for Theory

Basic Concept of Entrepreneurship - entrepreneurial mind set, problem analysis, idea generation, profitable ventures, team building, finding and creating opportunities. Concept of Why, How and What, effectuation and bird in hand approach.

Personality of Entrepreneur, Business attitude, Business for purpose, Individual assessment of interests, and personality traits. Persistency, persuasiveness, empathy, decision making, negotiations and skill of closing deals, power of listening and speaking. Leadership skills

Invention vs. Innovation, Process of innovation, idea conversion into a business venture, Startup and Upstart. SMEs. Technopreneurship, Social Entrepreneurship, Disruption

Importance of IPR for Entrepreneurs, Understanding of IPR, Patents, Copyrights, GIs, Trade secret, Trade Mark and Registration, Managing IPs. Licensing, Deeds and agreements. Logos and Labels

Pricing strategy, Up-selling and cross-selling, Turning Customers into Clients, CRM, Sales demo, Designing deals and offers, eCommerce, B2B, B2C, role of webpage and social media, Traditional marketing, Marketing strategies, digital marketing, content marketing, affiliate marketing, Social media marketing, Guerilla marketing, Marketing vs. Branding. Brand development, brand identity, power of branding. Product/service and personal branding.

Share capital, Loans, Retained profit, Fixed assets, working capital, Turnover/revenue. Balance sheet, profit and loss statement, The cash flow statement, Financial ratios, Budgeting, costing, Capital expenditure appraisal (CAPEX), Financial reporting. Legal modalities, Company registration, types of company, Taxation obligations.

Ideation, value proposition, understanding and development of Busines model, product, Product, customer, market and vehicle, Revenue, expenses and resources, Promotion, sales, team and funding. The art of pitching, elevator pitch. Successful case studies of Pakistan, the stories of struggle, failure and success

Recommended Books

1. William D. Bygrave and Andrew Zacharak, (2012) "Entrepreneurship" 2nd Edition, or latest edition.
2. 2. Hisrich, R. D., Peters, M. P., & Shepherd, D. A. (2017). Entrepreneurship. McGraw-Hill Education. Latest edition
3. Cotrell, (2012), Principles of Marketing, McGraw- Hill.
4. Entrepreneurship: New venture Creation, David H. Holt, International edition
5. Effectual Entrepreneurship, 2nd Edition, Routledge, 2017
6. Barringer, Bruce R. and Ireland, D. Entrepreneurship: Successfully Launching New Ventures, 3rd Edition, Prentice Hall, 2010
7. Timmons, J., New Venture Creation Entrepreneurship for 21st Century, 7th Edition, McGraw-Hill International, 2007

Course Content

8.40 Management Sciences Elective 1/Operation Management

COURSE CODE & TITLE (GES-241) **Management Sciences Elective 1**		**CREDITS HOURS** (3+0) **48 Theory + 0 Lab Sessions**	**KNOWLEDGE AREA/ DOMAIN** **Management Sciences**
After completion of this course students will be able to		**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Understand** the strategic role of operations management to enhance the competitive advantage of garment industry.	C-1	P1
CLO-2	**Apply** the methods of operations management for the improvement of garment manufacturing processes.	C-2	P5
CLO-3	**Analyze** the operations problem of garment industry using analytical skills and problem-solving tools.	C-3	P2

Course Outline for Theory

Define the term operations management, Identify the three major functional areas of organizations and describe how they interrelate.

Identify similarities and differences between manufacturing (production) and service operations. Explain the characteristics of goods and services Describe the operations function and the nature of the operations manager's job. Identify the critical decisions and activities of operation managers. Elaborate the transformation process. Define the term Strategy and how it is formulated and implemented? What is the difference between an order winner and an order qualifier? Tell how you have used the two concepts in a purchasing decision.

What is the balanced scorecard? How does it relate to operations? Explain the Key performance indicators (KPI's) and its application. Define the role of industrial globalization in competitiveness. Define productivity and competitiveness Identify the multiple measures of productivity.
Explain the Industrial Revolution in operations management. What makes a good design and how to measure design quality?
To learn about rapid prototyping, concurrent design, quality function deployment and other tools and techniques for improving the design process. To explore the sustainability considerations in design such as design for environment and design for robustness.

Describe the design of working systems: learning curves. Explain service design? List eight characteristics of services and explain what impact each characteristic has on the design process.
List the elements that define a queuing system. How can the results of queuing analysis be used by a decision maker for making decisions? What is the major cost factors considered in process selection? How is breakeven analysis used for process selection? Discuss the types of decisions that are involved in creating a process strategy. Explain the concept of Decision Making, Transportation models, waiting lines models, Learning curves
Explain the concept of Decision Making, Transportation models, waiting lines models, Learning curves, List some of the operations and functions in a company that are dependent on a forecast for product demand.

Discuss the role of forecasting in supply chain management. Describe the difference between short- and long-range forecasts. What is the difference between quantitative forecast methods and qualitative forecast methods? What kinds of forecasting methods are used for long-range strategic planning? What is the difference between a trend and a cycle and a seasonal pattern? How is the moving average method similar to exponential smoothing?
How does the linear trend line forecasting model differ from a linear regression model for forecasting?

The role of inventory management and types. Explain the ABC inventory classification system and indicate its advantages. Explain how the order quantity is determined using the basic EOQ model.

Define the term Scheduling and its objectives Discuss the concept of JIT & MRP and its application. How is a master production schedule created, and how is it used?
Explore the advance planning and scheduling systems.
What is the importance of good quality and the cost of poor quality? To understand how quality management systems have evolved.

What is the difference between acceptance sampling and process control?
Describe and use of the different quality-control methods/charts. Explain the difference between attribute control charts and variable control charts. How are mean and range charts used for analyzing process? How are mean and range charts used for analyzing process?

How are c-chart and p-chart charts used for analyzing process? How are c-chart and p-chart charts used for analyzing process? What determines the width of the control limits in a process chart?
Under what circumstances a c-chart should be used instead of a p-chart? Define the strategic goals of supply chain management.

Indicate how transportation and distribution have an impact on supply chain goals.
Identify the types of facilities. Explain the location analysis techniques. Explore the factors that are important to consider when locating facility national/ international level.
Define project management and why it is important. Identify the different ways for structuring the projects. What is purpose of lean production? Describe value stream mapping. How calculate lead time, cycle time and Takt time? What is Poka-yoke?

Recommended Books

1. Operations Management by Jay Heizer & Barry Render (12th Edition)
2. Contemporary Management by Garwth . Jones and Jennefir M. Jeorge (7th Edition)
3. Management by Robbins and Coulter 11th Edition
4. Operations Management: Processes and Supply Chains by Larry P. Ritzman, Lee J. Krajewski, and Manoj K. Malhotra (12th Edition)

Course Content

8.41 Supervised Industrial Training/ Electives

COURSE TITLE (TET-4701 & TET-4801) **Supervised Industrial Training/ Electives**		**CREDITS HOURS** (0+16)(0+16) **Seventh Semester** **Eight Semester**	**KNOWLEDGE AREA/ DOMAIN** **Textile Engineering Technology Domain SIT**	
After completion of this course students will be able to:			**Bloom's Taxonomy Level**	**PLO**
CLO-1	**Apply** knowledge of engineering technology fundamentals to industrial processes.		C6	1
CLO-2	**Acquire** in-depth technical competence during the industrial training and write a report to present problem analysis and findings.		P5	3
CLO-3	**Understand** environmental health & safety practices of industry.		C5	7
CLO-4	**Apply** the relevant references, guidelines, and code of ethics related to engineering technology practices.		A5	8
CLO-5	**Apply** interpersonal communication skill with technical and non-technical staff in the workplace.		A5	10
CLO-6	**Plan** (industrial training) activities and execute them in a systematic manner.		A5	11
CLO-7	**Work** effectively as an individual or team player, and recognize the need for life-long learning.		A5	9
CLO-8	**Easily** learn new things.		A5	12

9. Supervised Industrial Training (SIT)

9.1 Background

Supervised Industrial Training (SIT) refers to students supervised, hands-on experience in an environment where engineering technology is practiced and familiarizing them with professional engineering work prior to graduation. The training curriculum consists of a minimum of 16 weeks of continuous industrial training, comprised of 8 hours per day, 5 working days per week. A Bachelor of Engineering Technology student must either undergo, 1) a mandatory 16-week SIT during the 8th semester, or, 2) a 32-week SIT in 7th and 8th semesters, depending on the resources of the HEI. SIT starts after he/ she has passed all subjects up to the 6th semester.

SIT covers a range of activities, such as design implementation, production processes, laboratory experiments, on-site field works, and maintenance. It is a mechanism to integrate curriculum and engineering technology practices to achieve Program Learning Outcomes that cover Engineering Technologists Graduate Attributes, outlined in the Sydney Accord. While SIT provides practical exposure to engineering technology processes and helps develop professional skills required for an Engineering Technologist, it also offers an opportunity to the prospective employers to assess potential skills of future employees.

9.2 Objectives:

Through the SIT, students will:

a. Learn to apply engineering technology knowledge learned in a classroom environment to real industrial situations.
b. Be exposed to professional practices in the industries.
c. Understand the role, responsibilities, and code of ethics that Engineering Technologists should uphold.
d. Develop awareness about general workplace behavior and build interpersonal skills.
e. Maintain professional work records and reports.
f. Learn to write reports, and network with probable future employers.

9.3 Responsibility of HEI: Placement in SIT Program

During 7th (Optional), and 8th semester (Mandatory), Bachelor of Textile Engineering Technology students shall undergo continuous SIT of 32 (or 16) weeks. This training shall be arranged by HEIs in leading industry, and preferably should sign MoU's for the SIT. A designated HEI Administrator/Coordinator must complete all preparatory work and documentation 12 weeks prior to the commencement of the training, and issue Training Schedule for 32 (or 16) weeks, so that all stakeholders are aware and prepared to undergo SIT training in 7th (optional), and 8th (Mandatory) semester according to a scheduled timeline.

9.4 Responsibilities of Students

a. Bachelor of Engineering Technology students must get enrolled for the SIT during the 6th semester, and before commencement of the 7th semester.
b. Students shall undergo continuous SIT training of 32 (or 16) weeks. One week's training of 8 hours daily, for 5 days (40 contact hours), will be counted as 1 credit hour. Accordingly, a 16-week SIT will earn students 16, and a 32-week SIT 32 credit hours.
c. Student contact hours for a 16-week SIT in 8th semester only are 640 (16 weeks per semester x 5 working days per week x 8 hours per day = 640).

d. Student contact hours for a 32-week SIT in 7th and 8th semesters are 1280 (16 weeks per semester x 5 working days per week x 8 hours per day x 2 semesters = 1280)
e. Students shall maintain a daily Logbook, signed by the SIT supervisor at site, the Training Administrator appointed by HEI, and the student.
f. Students must observe safety and security rules of the Organization where they receive training.
g. Students must wear specified working clothes during training.
h. Students must obey all rules, regulations, and code-of-conduct of the organization.
i. Students must abide by the work timings of the training Organization.
j. With prior approval of the HEI's training Administrator/Coordinator, students may be allowed a total of 10 days leave during the training period for genuine personal emergencies.
k. Leave during training will be deducted from training hours and must be made up later.
l. Unsanctioned leaves shall be marked "absent" and may trigger disciplinary action.
m. Public holidays shall not be counted as working hours.

9.5 Training Progress Assessment and Review by HEI

Every HEI should appoint a focal person as SIT Administrator/Coordinator for each program to monitor progress through random site visits, phone calls, or emails to the industrial organization's counterpart focal person. Progress reports will be maintained after coordination with training supervisor(s) as well as the students.

Monitoring by Training Administrator/Coordinator is necessary to:

a. Ensure the training organization provides suitable and appropriate training to students.
b. Obtain feedback on students' performance and training progress through discussion with training supervisor(s).
c. Make courtesy visits and establish industrial relations between the HEI and the industries where students receive their SIT.
d. Discuss the possibility of students' job placement with the training organization.
e. Survey new industries as potential training placement locations in the future.

9.6 Changing Student Placement During SIT

a. Students are discouraged to change placement during the training period from one organization to another.
b. However, if a new placement is available in another organization, and provided the student does not suffer loss of training hours due to this changeover, a written permission may be granted by the HEI's training Administrator/Coordinator for the student's new placement.
c. After getting written permission from the HEI's training Administrator/Coordinator, a fresh approval is needed for the new placement.

9.7 Daily Training Logbook

All training activities must be recorded daily in the Daily Training Logbook [See Appendix F]. Students must get it signed daily by an on-the-job Trainer.

The Daily Training Logbook must reflect:

a. The student's learning experience during the SIT.
b. Training records, evidence of supervision, evidence of student participation, and evidence of on-the-job Trainer and HEI's training Administrator/Coordinator.
c. Professional practice in engineering technology profession where incidences and evidence are properly documented.
d. Sufficient information that becomes a reference source in preparing the Industrial Training Report [See Section 9.8].
e. The Logbook must be submitted along with the Industrial Training Report.

9.8 Industrial Training Report

An Industrial Training Report will be submitted upon completion of SIT. The Report must describe a student's learning and development in technical knowledge, engineering practices and professional skills acquired through practical experience. The Industrial Training Report should also reflect a student's ability in communication skills and understanding of engineering technology practices. Students should seek advice from their on-the-job Trainer to ensure that no confidential materials are included in the Report. The Report shall be submitted to the HEI's Training Administrator. The student may present a copy of the Report to a prospective employer. Any references made in preparation of the Report should be recognized using standard referencing formats. Students should refer to the Industrial Training Report Template [See Appendix G], and guidelines given in 9.9 below in preparing the Report. The Daily Training Logbook should be submitted together with the Report.

9.9 Guidelines for Preparation of Industrial Training Report

Under the guidance of supervisors, students need to properly document their experience and learning during the SIT in form of an Industrial Training Report. A properly prepared Report must portray their practical experience precisely, and in an orderly manner. The Report must be prepared according to the format and the guidelines below:

9.9.1 Contents of Industrial Training Report

(a) Table of Contents

This section of the report shall consist of:

i. Headings
ii. Sub-headings
iii. Page numbers

Every appendix requires a title, and each page needs to be numbered.

(b) Background and Profile of the Training Organization

Provide a brief and concise description of the organization in which the student is undertaking the SIT.

The main items are:

i. Background and profile of the organization
ii. Vision and Mission Statements
iii. Organogram
iv. Title and position of the supervisor in charge
v. Other relevant information (not more than three pages)

(c) Schedule of Duties Performed as Trainee

Briefly describe the time, duration and types of duties performed during the training. The description must follow the schedule of the training, i.e., in chronological order (for 16 or 32 weeks). The days when the student was not on duty must be properly recorded with cogent reasons.

(d) Experience During SIT

In this section, the student must describe the industrial training experience gained.

Some suggested areas are:

i. Project (s) carried out
ii. Supervisory work done
iii. Problems encountered
iv. Problems solving process or approach
v. Hands-on skills acquired
vi. How can productivity be further enhanced
vii. Quality Management System in the organization
viii. Safety at work

(e) Conclusions

Students must provide an overall assessment in this section and arrive at conclusions regarding the SIT undergone.

Contents may include:

i. Types of major work performed during SIT
ii. Different modules of SIT
iii. Comments whether SIT met the training objectives
iv. Suggestions and recommendations for improvement of the SIT

(f) References

A complete list of references used in the report must be included according to standard referencing format.

(g) Appendixes

Appendixes are additional information appended to support the main text of the Report. A copy of the letter of permission from the Training Organization must be attached as an Appendix.

Other suggested appendixes are:

i. Investigation and project report during SIT
ii. Technical drawings that are not confidential, or have proprietary limitations etc.
iii. Any other document that improves quality of the Report

(h) Figures and Tables

All figures, tables and similar content must be captioned, labeled, and mentioned in the main text of the Report.

(i) Notations, Symbols & Acronyms

If the report contains notations, symbols, and acronyms, these must be defined before they first appear in the main text. It is good practice to put list of notations, symbols, and acronyms on a separate page, appropriately titled, and placed after 'Tables of Contents' page.

Every appendix must have a title and be mentioned in the main text of the Report. All page numbers for appendixes must be in continuation of page numbers of the main Report.

9.9.2 Format of the Report

(a) General

i. Students are advised to start writing the SIT Report as soon as training commences to ensure a timely completion and submission.
ii. Do not include irrelevant materials, e.g., brochures from the organizations, or any publicity materials in the report.
iii. The Report must be typewritten on plain white A4 size paper, with 12-point Times New Roman font type and line spacing of 1.5 (recommended).

(b) Abstract or Preface

The Report should start with an abstract of maximum 2 pages, and should briefly describe:

i. Description of Organization providing SIT
ii. Summary of the Report
iii. Acknowledgements

9.10 SIT Assessment by the HEI

Assessment of the SIT should be based on the following parameters:

i.	On-the-Job Trainer Report	(20% marks)
ii.	HEI's Training Advisor Report through visits or survey	(10% marks)
iii.	Industrial Training Report	(50% marks)
iv.	Viva voce	(20% marks)

Please note that:

i. Minimum 50% marks are required to pass the SIT.
ii. Students are advised to be diligent in writing their Reports.
iii. The Report must be of good quality and portray in full the industrial experience and knowledge gained.
iv. The Report should not be in the form of short notes or in a figurative form.
v. If the Report is not satisfactory, students shall rewrite the Report until it is deemed satisfactory.

9.11 Completion of Industrial Training

i. Upon completion of a 16 or 32-week continuous SIT, a Confirmation Letter to this effect must be obtained from the training organization.
ii. The Confirmation Letter must be submitted to the HEI's Industrial Training Administrator/Coordinator, together with, (1) On-the-Job Trainer's Report, (2) Student Feedback Form, and (3) Industrial Training Report for grading.

APPENDIX A: Sydney Accord Knowledge and Attitude Profile

(Retrieved from www.ieagreements.org)

A Sydney Accord program provides:
SK1: A systematic, theory-based understanding of the natural sciences applicable to the sub-discipline and awareness of relevant social sciences.
SK2: Conceptually based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed consideration and use of models applicable to the sub-discipline.
SK3: A systematic, theory-based formulation of engineering fundamentals required in an accepted sub-discipline.
SK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for an accepted sub-discipline.
SK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations using the technologies of a practice area.
SK6: Knowledge of engineering technologies applicable in the sub-discipline.
SK7: Knowledge of the role of technology in society and identified issues in applying engineering technology, such as public safety and sustainable development (represented by the 17 UN-SDGs).
SK8: Engagement with the current technological literature of the discipline and awareness of the power of critical thinking.
SK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

APPENDIX B: Engineering Technologist Graduate Attribute Profile

(Retrieved from www.ieagreements.org)

As per Sydney Accord, Engineering Technologist Graduate is expected to have the following attributes:
Engineering Technology Knowledge: **SA1:** An ability to apply knowledge of mathematics, natural science, Engineering Technology fundamentals and Engineering Technology specialization to defined and applied Engineering Technology procedures, processes, systems, or methodologies.
Problem Analysis **SA2:** An ability to Identify, formulate, research literature and analyze Broadly Defined Engineering Technology problems reaching substantiated conclusions using analytical tools appropriate to the discipline or area of specialization.
Design/Development of Solutions **SA3:** An ability to design solutions for broadly- defined Engineering Technology problems and contribute to the design of systems, components, or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
Investigation **SA4:** An ability to conduct investigations of broadly defined problems; locate, search and select relevant data from codes, data bases and literature, design and conduct experiments to provide valid conclusions.
Modern Tool Usage **SA5:** An ability to Select and apply appropriate techniques, resources, and modern technology and IT tools, including prediction and modelling, to Broadly Defined Engineering Technology problems, with an understanding of the limitations.
The Engineering Technologist and Society **SA6:** An ability to demonstrate understanding of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to Engineering Technology practice and solutions to broadly defined Engineering Technology problems.
Environment and Sustainability **SA7:** An ability to understand and evaluate the sustainability and impact of Engineering Technology work in the solution of broadly defined Engineering Technology problems in societal and environmental contexts.
Ethics: **SA8:** Understand and commit to professional ethics and responsibilities and norms of Engineering Technology practice.
Individual and Teamwork **SA9:** An ability to Function effectively as an individual, and as a member or leader in diverse teams.

Communication **SA10:** An ability to communicate effectively on broadly defined Engineering Technology activities with the Engineering Technologist community and with society at large, by being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
Project Management **SA11:** An ability to demonstrate knowledge and understanding of Engineering Technology management principles and apply these to one's own work, as a member or leader in a team and to manage projects in multidisciplinary environments.
Lifelong Learning: **SA12:** An ability to recognize the need for and have the ability to engage in independent and life-long learning in specialist Engineering Technologies.

APPENDIX C: Engineering Technologist Professional Competence Profile

(Retrieved from www.ieagreements.org)

As per Sydney Accord, Engineering Technologist Graduate is expected to demonstrate the following competencies:
Comprehend and apply universal knowledge: **TC1:** Comprehend and apply the knowledge embodied in widely accepted and applied procedures, processes, systems, or methodologies.
Comprehend and apply local knowledge: **TC2:** Comprehend and apply the knowledge embodied procedures, processes, systems, or methodologies that is specific to the jurisdiction of practice.
Problem analysis: **TC3:** Identify, clarify, and analyze broadly defined problems using the support of computing and information technologies where applicable.
Design and development of solutions: **TC4:** Design or develop solutions to broadly defined problems considering a variety of perspectives.
Evaluation: **TC5:** Evaluate the outcomes and impacts of broadly defined activities.
Protection of society: **TC6:** Recognize the foreseeable economic, social, and environmental effects of broadly defined activities and seek to achieve sustainable outcomes (represented by the 17 UN-SDGs).
Legal, regulatory, and cultural: **TC7:** Meet all legal, regulatory, and cultural requirements and protect public health and safety during all activities.
Ethics: **TC8:** Conduct activities ethically
Manage engineering activities: **TC9:** Manage part or all of one or more broadly defined activities.
Communication and Collaboration: **TC10:** Communicate and collaborate using multiple media clearly and inclusively with a broad range of stakeholders during all activities.
Continuing Professional Development (CPD) and Lifelong learning: **TC11:** Undertake CPD activities to maintain and extend competences and enhance the ability to adapt to emerging technologies and the ever-changing nature of work.

Judgement: **TC12:** Choose appropriate technologies to deal with broadly defined problems. Exercise sound judgement in the course of all broadly defined activities.
Responsibility for decisions: **TC13:** Be responsible for making decisions on part or all of one or more broadly defined activities.

APPENDIX D: Minutes of Preliminary Meeting of NCRC

The preliminary meeting of National Curriculum Review Committee (NCRC) in the discipline of Garment Engineering Technology for bachelor's degree program was held on 08-02-2023 to 10-02-2023 for 3 days at the Punjab Tianjin University of Technology (PTUT), Lahore.

Welcome session was started with recitation of Holy Quran, and it was chaired by Honorable Engr. Imtiaz Hussain Gilani, Chairman NTC. In a welcome speech, objectives, and arrangements for NCRC were presented by the host respected Prof. Dr. Abdul Sattar Shakir, VC, PTUT, Lahore. Then, the Chairman NTC elaborated upon the importance of curriculum development for Bachelors of Engineering Technology programs by focusing more on practical work, keeping in mind the sharp global pivot towards hands-on skills, market demand, and societal needs. The curriculum must follow NTC guidelines and be aligned with the Sydney Accord.

Mr. Hafiz Ghulam Muhammad of NTC highlighted the agenda of this meeting and emphasized adoption of general rules of curriculum development.

Later, Prof. Dr. Abdul Aziz Mazhar, shared the procedure and execution of agenda in NCRC. Then he invited the house to nominate the Convener, Co-Convener, and Secretary of the NCRC for smooth functioning. After discussion with Members Dr. Nabeel Amin and Dr. Abher Rasheed were nominated as Convenor and Co-convenor respectively. Further, Dr. Muhammad Awais and Dr. Samander Ali Malik were nominated as Secretary and Co- Secretary for the Committee, respectively. Following nominated Members represented various HEIs from all over the Pakistan in NCRC for B.Sc. Garment Engineering Technology.

Sr. No.	Name	Role
1.	Prof. Dr. Nabeel Amin, Dean, Superior University, Lahore	Convenor
2.	Dr. Abher Rasheed, Associate Prof. / Chairman National Textile University (NTU), Faisalabad	Co-Convenor
3.	Dr. Muhammad Awais, Assistant Professor, University of Agriculture (UAF), Faisalabad	Secretary
4.	Dr. Samander Ali Malik, Associate Professor, Mehran University of Engineering & Technology (MUET), Jamshoro.	Co-Secretary
5.	Dr. Babar Ramzan, Assistant Professor, National Textile University (NTU), Faisalabad	Member
6.	Dr. Sarmad Aslam, Assistant Professor, Bahauddin Zakaria University (BZU), Multan	Member
7.	Prof. Dr. Abdul Aziz Mazhar, Ex-Dean Institute of Space Technology (IST), Islamabad	Member
8.	Dr. Nazakat Ali, Assistant Professor, BUITEMS, Quetta	Member

9.	Mr. Shah Hamid, Assistant Professor, Iqra National University, Peshawar	Member
10.	Engr. Muhammad Junaid Saleem, Lecturer, Punjab Tianjin University of Technology (PTUT), Lahore	Co-opted Member
11.	Engr. Sameen Aslam Lecturer, Punjab Tianjin University of Technology (PTUT), Lahore	Co-opted Member
12.	Dr. Tayyab Naveed, Associate Professor, University of Management & Technology (UMT), Lahore	Co-opted Member
13.	Hafiz Ghulam Muhammad Accounts Officer NTC	Member

After taking charge by the nominated committee, Convenor, Dr. Nabeel Amin chaired the meeting and emphasized to ensure the reflection of Sydney Accord in curriculum and course titles as well as to develop curriculum that provides a unified framework for offering degrees under the title of Garment Engineering Technology. In continuation of above guidelines, Dr. Abher Rasheed, Co-Convener and Dr. Muhammad Awais, Secretary also briefed the objectives to the participants as follows.

Recommendations:

Objectives of the meeting were presented and assigned to sub-committees, where Honorable Members of NCRC thoroughly reviewed and after detailed discussion the following work was done, and the recommendations were made.

1. An undergraduate curriculum of garment engineering technology should be at par with international standards in line with Sydney accord.
2. Course learning outcomes (CLOs) with Bloom's Taxonomy levels, and course contents were aligned with program learning outcomes (PLOs).
3. The relevant latest reading materials and references were incorporated. It was also decided that exact year of publication should be mentioned instead of writing latest edition.
4. Course learning outcomes (CLOs) with Bloom's Taxonomy levels, and course contents were aligned with program learning outcomes (PLOs).
5. The relevant latest reading materials/ references were incorporated. It was also decided that exact year of publication should be mentioned instead of writing latest edition.
6. It was decided that preferably CLOs for theory and lab should be 3 each.
7. It was also decided that number of labs (practical per semester for each subject) should be in the range 12-16.
8. It was suggested that the contents have uniformity across other disciplines without overlapping.
9. The recommendations were shared keeping in view the futuristic needs of society.
10. Preface, objectives of the programs, PLOs, methods of instruction, learning environment, assessment and operational framework were discussed. Furthermore, list of courses (core & elective) and semester wise breakup of courses were also discussed thoroughly and the same was unanimously finalized. Admission/intake criteria were discussed and finalized. Moreover, adoption of supervised industrial training (SIT) was discussed in detail, which included offering elective courses instead of offering SIT in the 7th semester, number of credit hours and other related issues. It was decided that it is the discretion of degree offering universities.

11. After long deliberation, the committee proposed the curriculum framework, the duration of the program, number of semesters, number of weeks per semester, total number of credit hours, weightage of technology domain and non-technology domain courses and weightage of theory and practical of undergraduate 4-years program in garment engineering technology.
12. Keeping in view the experience and expertise of the NCRC Members, the list of courses of various domains were distributed among the sub-committees. These committees were assigned responsibility for reviewing course objectives, adding course learning outcomes, appropriate mapping with Bloom's Taxonomy and PLOs, updating list of contents, adding teaching-learning methods and assessment, and updating bibliography/ references/ suggested books. Following core committee along with four sub-committees were constituted with their separate Convenors and Secretaries.

NCRC Garment Engineering Technology Core Committee		
Sr#	**Name**	**Role**
1	Dr. Nabeel Amin	Convenor
2	Dr. Abher Rasheed	Co-Convenor
3	Prof. Dr. Abdul Aziz Mazhar	Member
4	Dr. Muhammad Awais	Secretary
5	Dr. Samander Ali Malik	Co-Secretary
Sub-Committee 1:		
Sr#	**Name**	**Role**
1	Dr. Sarmad Aslam	Convenor
2	Dr. Samander Ali Malik	Secretary
3	Prof. Dr. Abdul Aziz Mazhar	Member
Sub-Committee 2:		
Sr#	**Name**	**Role**
1	Mr. Junaid Saleem	Convenor
2	Mr. Shah Hamid	Member
3	Ms. Sameen Aslam	Secretary
Sub-Committee 3:		

1	Dr. Babar Ramzan	Convener
2	Dr. Nazakat Ali	Secretary
3	Dr. Tayyab Naveed	Co-opted Member

14. The following tentative deadlines for upcoming activities were decided the:

i) Final submission of contents – February 23, 2023
ii) Compiling the contents and sharing with all the members by Dr. Muhammad Awais – February 28, 2023
iii) Second meeting (online) – 1st week of March 2023 (tentative)
iv) Initial draft wetted by foreign expert/ Benchmarking – 3rd week of April 2023 (Tentative)
v) Third meeting - Last week of April 2023

The meeting was adjourned with vote of thanks.

APPENDIX E: Minutes of the Final Meeting of NCRC

The second/final meeting of the National Curriculum Review Committee (NCRC) in the discipline of Textile Engineering Technology of a bachelor's degree program was held on 30-05-2022 to 01-06-2022 for 3 days at the National Textile University (NTU), Faisalabad.

Welcome session was started with recitation of Holy Quran, and it was chaired by Honorable Engr. Imtiaz Hussain Gilani, Chairman NTC. In a welcome address, objectives, and arrangements for NCRC were presented by the host respected Prof. Dr. Tanveer Hussain, Rector, NTU, Faisalabad. Then, the Chairman NTC explicitly elaborated the importance of curriculum development for B.S Engineering Technology Programs through more practical work engagement as well as keeping in view the futuristic approach, market demand and societal needs as per the scope of NTC and guidelines of Sydney Accord. Mr. Hafiz Ghulam Muhammad represented NTC. Later, Dr. Yasir Nawab, Convenor of NCRC, shared the status on the development of curriculum of BS Textile Engineering Technology.

Following Members attended the meeting:

Sr. No.	Name	Role
1.	Dr. Yasir Nawab Associate Prof. / Dean NTU, Faisalabad	Convener
2.	Dr. Assad Farooq Associate Prof. / chairman University of Agriculture (UAF), Faisalabad	Co-Convenor
3.	Dr. Sheraz Ahmed Associate Prof. / Chairman National Textile University (NTU), Faisalabad	Secretary
4.	Eng. Prof. Dr. Mudassar Habib Professor, UET Peshawar	Member
5.	Prof. Dr. Muhammad Shahid Khalil Professor, NSU, Islamabad	Member
6.	Dr. Muhammad Mohsin Professor/ Chairman UET, Lahore (Faisalabad Campus)	Member
7.	Dr. Naeem Akhtar Qaisrani Assistant Prof. KFUEIT, Rahim Yar Khan	Member
8.	Prof. Dr. Abdul Aziz Mazhar	Member

	Ex-Dean Institute of Space Technology (IST), Islamabad	
9.	Dr. Saira Faisal Associate Prof. NED UET, Karachi	Member
10.	Dr. Muhammad Owais Raza Siddiqui Associate Prof. NED UET, Karachi	Member
11.	Dr. Ghulam Ullah Khan Associate Prof BUITEMS, Quetta	Member
12.	Dr. Rehan Abbasi Associate Prof BUITEMS, Quetta	Member (Attended online)
13.	Hafiz Ghulam Muhammad Accounts Officer	NTC Rep

After the introductory session, the deliberation on the agenda of the second meeting formally commenced which was headed by Convener Dr. Yasir Nawab, Co-Convener Dr. Assad Farooq, and Secretary Dr. Sheraz Ahmad.

It was informed to Honorable Members that valuable feedback received from the following International Experts:

Sr#	Foreign Expert Name	Affiliation
1	Prof. Dr. Mehmet Karahan	Bursa Uludag University, Turkey
2	Prof. Dr. Abdel Fattah Seyam	Wilson College of Textiles, NC State University, USA

In this regard, international experts appreciated the efforts made by NCRC to compose a balanced and standardized curriculum for Textile Engineering Technology. However, their proposed suggestions are also incorporated.

Recommendations:

All objectives of meeting were presented and assigned to subcommittees, where Honorable Members of NCRC thoroughly reviewed and submitted following resolutions after detailed discussion

- Agreed upon curriculum preface, mission, vision, preamble, rationale, scope, course scheme etc.
- Finalized bench marking of the Recommended Scheme of Studies, Engineering Technology domain and non-Engineering technology domain courses in Comparison with HEC Framework.

- Approved the Semester-wise break-up of courses, credit hours allocations and Breadth & Depth courses for BS Textile Engineering Technology.
- Recommended the sample course profiles and contents of BS Textile Engineering Technology.

The final draft is compiled by Secretary Dr. Sheraz Ahmad. After review by the Members and with the approval of Convener Dr. Yasir Nawab and Co-Convener Dr. Assad Farooq is submitted to the NTC.

The meeting was adjourned with vote of thanks.

APPENDIX F: Supervised Industrial Training Logbook Sample Format

Personal Details:

Student Name:
Student Roll Number:
Address:
Email:

Course of Study:
Year/Semester of Study:
Training Start Date:
Training End Date:

Training Organization Details:

Name:
Address:
Contact Person:
Contact Number:
On-the job Trainer:

Daily Training Log

Please specify training information by descriptive statements, tables, sketches, figures, photographs, and so forth. Feel free to incorporate attachments wherever necessary.

Training Week: _____

Date	Time	Training Log

Declaration:

I, _____ with student roll number _____, do hereby declare that all information provided above is true and correct to the best of my knowledge.

_____
Student signature with date

_____
Supervisor signature with date

APPENDIX G: Supervised Industrial Training Report Sample Format

Sample table of content for supervised industrial training report is provided so that students can develop an understanding of what is expected of them when making the submission. Students are encouraged to expand upon the content presented below. A declaration page validating the originality of work duly signed by the student and the trainee is also to be attached at the beginning of the submitted report.