PUNJAB BOARD OF TECHNICAL EDUCATION

21-A, Kashmir Block Allama Iqbal Town, Lahore

www.pbte.edu.pk- R&D Section Tel # 042-99260273

SAY NO TO CORRUPTION

No: PBTE/R&D/2025/625 Dated:- 26-08-25

NOTIFICATION

In pursuance of NAVTTC Notification No. DG(SS&C)/DAE/2024 dated 25-07-2025, it is notified that newly developed curricula of **"DAE E-Commerce Technology (03 years)"** and **"DAE Textile Technology with Specialization in Wool (03 years)"** have been approved by National Vocational & Technical Training Commission (NAVTTC) for its implementation in all institutes affiliated with PBTE.

The implementation of above said technologies shall apply on the students who shall be registered from Academic Session 2025-26 and onward. Punjab Board of Technical Education, Lahore shall conduct the examinations of the said technologies w.e.f. 1st Annual Examination 2026 and onwards accordingly. Soft copy of the curricula of the aforesaid technology may be downloaded from the website of PBTE i.e. http://www.pbte.edu.pk/Ptextbooks.aspx

SECRETARY

CC To.

1- PA to Chairperson, PBTE, Lahore.
2- PA to DG, PSDA, Lahore.
3- PA to DG Academics, TEVTA, Lahore.
4- PA to DG Operations, TEVTA, Lahore.
5- PA to Secretary, PBTE, Lahore.
6- PA to Controller of Examinations, PBTE, Lahore.
7- The Principals concerned.
8- Deputy Controller of Examinations (Conduct), PBTE, Lahore.
9- Deputy Controller of Examinations (Secrecy), PBTE, Lahore.
10- System Analyst, PBTE, Lahore.
11- Assistant Controller of Examinations (Technical), PBTE, Lahore.
12- Assistant Controller of Examinations (Conduct), PBTE, Lahore.
13- Assistant Controller of Examinations (Secrecy), PBTE, Lahore.
14- Assistant Controller of Examinations (P&P-I), PBTE, Lahore.
15- Assistant Controller of Examinations (P&P- II), PBTE, Lahore.
16- Assistant Secretary (Recognition), PBTE, Lahore.
17- IPS, PBTE, Lahore.
18- IOW, PBTE, Lahore.
19- Web Administrator, PBTE Lahore to upload on Board Website.

CURRICULUM

For

THREE YEARS' DIPLOMA OF ASSOCIATE ENGINEER

IN

TEXTILE TECHNOLOGY

(with Specialization in WOOL)

Developed, May-2025

Technical Education and Vocational Training Authority

TEVTA

CURRICULUM SECTION

ACADEMICS DEPARTMENT

96-H, GULBERG-II, LAHORE

Ph # 042-99263055-9, 99263064

gm.acad@tevta.gop.pk, manager.cur@tevta.gop.pk

GENERAL OBJECTIVES OF THE PROGRAM

The Diploma of Associate Engineering (DAE) in Wool Textile Program aims to produce industry-ready, innovative technicians who can effectively apply modern tools and technologies in functional wool textiles and related processes. The program is designed to meet the evolving demands of Pakistan's textile industry, particularly focusing on woolen, semi-worsted, worsted, cotton, manmade and blended textile production processes.

Key objectives of the program include:

Mastery of Core Processes and Materials:

Graduates will gain expertise in traditional and modern woolen textile manufacturing, encompassing 100% wool products, blends with cotton, and man-made fibers, as well as woven, knitted, and non-woven structures. The training ensures that students understand every step from fiber selection to finished product development.

Product Innovation and Development:

The program focuses on developing innovative and market-oriented products by integrating semi-worsted and worsted processes, cotton processing techniques, and blended materials. Students will be trained in designing and manufacturing textiles that meet the demands of both local and global markets.

Industry-Relevant Skill Development:

Through practical training, workshops, and project work, graduates will acquire problem-solving skills to address real-world challenges in production efficiency, product quality, and supply chain optimization. Critical thinking and decision-making skills will be honed to help students innovate in production management, quality control, and technical troubleshooting.

Comprehensive Knowledge of Core Sciences:

The curriculum integrates strong foundations in mathematics, physics, and chemistry, tailored to the requirements of textile applications. This will allow students to comprehend and apply advanced textile techniques, ensuring versatility and adaptability in the workplace.

Technical Competence in Emerging Textile Technologies:

The program includes exposure to technical textiles, modern manufacturing systems, and automation technologies. This training ensures that graduates are technically equipped to work in modern spinning, weaving, dyeing, and finishing units, and can handle industry-specific software and machinery.

Communication and Project Management:

Special emphasis is given to developing effective communication skills, teamwork, and leadership qualities. Graduates will have the ability to collaborate within multidisciplinary teams and lead project-based initiatives, which are crucial for professional success in Pakistan's textile industry.

Pathway to Higher Education and Career Growth:

The program provides a strong academic foundation for students aiming to pursue BS programs in Textile Engineering and related disciplines. DAE graduates will be well-prepared for career opportunities in woolen textile mills, technical textile firms, research and development centers, and export-oriented textile production units.

Contributing to the National Economy and Export Sector:

With a focus on practical and technical skills, graduates will be positioned to strengthen Pakistan's textile exports, enhance local production capacities, and introduce value-added products that meet international standards. This aligns with national goals for economic growth, employment generation, and export enhancement.

LEARNING OUTCOMES

After studying this DAE, passing out students will be able to

1. Understand a solid foundation in basic sciences (i.e., physics, mathematics, chemistry) and fundamentals, and apply this knowledge to solve practical problems.
2. Demonstrate the ability to design and develop useful wool and textile-related products, processes, and/or other systems.
3. Design, conduct experiments, analyze results, and interpret data related to textile engineering and wool processing.
4. Work in teams and appreciate the value of diversity in team-based problem solving.
5. Adapt changes and developments in the field of textiles.
6. Demonstrate integrity and ethics in engineering practice and life.
7. Demonstrate the ability to communicate effectively.
8. Prove his/her broad-based educational background, enabling them to pursue careers within or outside of textile engineering.

CURRICULUM SALIENTS:

Entry Level: -	Matriculation (Science)
Duration of Course: -	3-Years
Credit Hours:	SEVENTY (70) (Annual System)
Methodology:	Theory 40%
	Practical 60 %
Examination & Certification Body:	Punjab Board of Technical Education
Examination System:	Annual System (same as for all the DAE programs)

DAE TEXTILE TECHNOLOGY WITH SPECIALIZATION IN WOOL 3-YEARS
SCHEME OF STUDIES, Developed, March-2025
1st Year

Subject Code	Subject	T	P	C
GEN-111	Islamic Studies & Pakistan Studies	1	0	1
TTQ-111/Civic-111	Tarjumat-ul-Quran / Civics	1	0	1
ENG-112	English	2	0	2
Math-113	Applied Mathematics	3	0	3
CH-112	Applied Chemistry	1	3	2
PHY-122	Applied Physics	1	3	2
Mech-173	Engineering Drawing & Graphics	1	6	3
TTW-112	Textile Raw Materials	2	0	2
TTW-123	Introduction to Textile Technology	2	3	3
TT-123(Rev.)	Workshop Practices	0	6	2
TTW-132	Computer Applications in Textiles	0	6	2
	Total	**14**	**27**	**23**

2nd Year

Sub. Code	Subject	T	P	C
GEN-201	Islamic studies & Pakistan Studies	1	0	1
TTQ-211/Civic-211	Tarjumat-ul-Quran / Civics	1	0	1
Math-223	Applied Mathematics	3	0	3
MGM-211	Business Communication	1	0	1
MGM- 221	Business Management and Industrial Economics	1	0	1
PHY-242	Applied Mechanics	1	3	2
TTW- 214	Textile and Woolen Yarn Manufacturing	3	3	4
TTW-223	Textile and Woolen Fabric Manufacturing	2	3	3
TTW-232	Mill Engineering and Services	1	3	2
TTW-243	Textile and Wool Chemical Processing	2	3	3
TTW-254	Textile and Woolen Garments and Made Ups	3	3	4
Elect.-212	Applied Electricity & Electronics	1	3	2
TTW-261	Workplace Ethics & OHSE	1	0	1
	Total	**21**	**21**	**28**

3rd Year

Sub. Code	Subject	T	P	C
GEN-301	Islamiat and Pakistan studies	1	0	1
MGM-391	Entrepreneurship & Industrial Management	1	0	1
TTW-313	Textile Calculations	2	3	3
TTW-321	Technical Textiles	1	0	1
TTW-333	Textile Testing and Quality Control	2	3	3
TTW-343	Advance Spinning Techniques and Specialty Yarns	2	3	3
TTW-353	Textile & Wool Coloration and Finishing	2	3	3
TTW-361	Sustainability in Textiles	1	0	1
TTW-373	Special Project on Wool	0	9	3
	Total	**12**	**21**	**19**

1st Year

اسلامیات/مطالعہ پاکستان

		ٹی	پی	سی
حصہ اول اسلامیات	GEN III	1	0	1
حصہ دوم مطالعہ پاکستان				
موضوعات حصہ اول اسلامیات	سال اول	کل وقت: 20 گھنٹے		

کتاب و سنت

(ا) قرآن مجید

-1 تعارف قرآن مجید 2- نزول قرآن 3- مکی و مدنی سورتوں کی خصوصیات 4- وحی کی اقسام 5- پندرہ منتخب آیات مع ترجمہ

1.1 لن تنالو البر حتی تنفقوا مما تحبون

1.2 واعتصموا بحبل اللّٰہ جمیعا" ولا تفرقو

1.3 ولا یجرمنکم شنان قوم علی ان لا تعدلوا

1.4 ان اللّٰہ یامرکم ان تودوا الامانات الی اھلھا

1.5 ان اللّٰہ یامر بالعدل والاحسان

1.6 ان الصلوتہ تنھی عن الفحشاء والمنکر

1.7 لقد کان لکم فی رسول اللّٰہ سوۃ حسنتہ

1.8 ان اکرمکم عند اللّٰہ اتقاکم

1.9 وما آتاکم الرسول فخرزو ومانھی عنھوانتھوا

1.10 ولوفو بالعھد

1.11 وماشروھن بالمعروف

1.12 یمحق اللّٰہ الربوویر بی الصمدقات

1.13 واصبر علی ما اصابک

1.14 وقولو قولا سدیدا

1.15 ان الدین عند اللّٰہ السلام

(ب) سنت

-1 سنت کی اہمیت

-2 دس منتخب احادیث مع ترجمہ و تشریح

1- انما الاعمال بالنیات

2- انما بعثت لاتمم مکارم الاخلاق

3- لا یومن احدکم حتی یحب لاخیہ ما یحب لنفسہ

4- المسلم من سلم المسلمون من لسانہ ویدہ

5- قل امنت باللہ ثم استقم

6- خیرکم خیرکم لاھلہ

7- سباب المسلم فسوق وقتالہ کفر

8- المومن اخو المومن

9- کل المسلم علی المسلم حرام دمہ ومالہ وعرضہ

10- اٰیۃ المنافق ثلاث اذا حدیث کذب واذا اوتمن خان واذا وعد اخلف

دین اسلام

2.1 اسلام کے بنیادی مقاصد کی وضاحت اور انسان کی انفرادی و اجتماعی زندگی پر ان کے اثرات

1- توحید

2- رسالت

3- آخرت

4- ملائکہ

5- آسمانی کتب

2.2 عبادات

1- نماز 2- روزہ 3- حج 4- زکوٰۃ

مندرجہ بالا عبادات کی اہمیت و فضیلت، حکمتیں اور انسان کی انفرادی و معاشرتی زندگی پر ان کے اثرات

حصہ اول

حصہ اسلامیات

تدریسی مقاصد

۱۔ قرآن مجید

عمومی مقصد: طالب علم یہ سمجھنے کے قابل ہو کہ اسلام کی تعلیمات کا اصل سرچشمہ قرآن مجید ہے

خصوصی مقاصد: طالب علم اس قابل ہو جائے گا کہ

☆ قرآن مجید کی تعریف کر سکے گا

☆ قرآن مجید کے نزول کی صورت بیان کر سکے

☆ قرآن مجید کی کی دو مدنی سورتوں کی پہچان کر سکے

☆ منتخب آیات کا ترجمہ و تشریح کر سکے

عمومی مقصد: یہ سمجھنے کے قابل ہو جائے گا کہ منتخب قرآنی آیات کے ذریعے اسلامی تعلیمات کا مفہوم کیا ہے

☆ قرآنی آیات کا ترجمہ تشریح کر سکے

☆ قرآنی تعلیمات کی روشنی میں اپنی اور معاشرتی اصلاح کر سکے

2۔ سنت

عمومی مقصد: طالب علم سنت نبوی کی اہمیت اور ضرورت کو اچھی طرح سمجھنے کے قابل ہو جائے گا

خصوصی مقصد:

☆ سنت کی تعریف بیان کر سکے

☆ سنت کی اہمیت و ضرورت کی وضاحت کر سکے

☆ سنت کی روشنی میں اسوہ حسنہ پر عمل کر سکے

3۔ منتخب احادیث نبویہ

عمومی مقصد: احادیث کی روشنی میں اخلاقی اقدار سے آگاہی حاصل کر سکے

خصوصی مقصد: احادیث کا ترجمہ و تشریح کر سکے

رسول اللہ ﷺ کے اسوۂ حسنہ کی پیروی کا جذبہ پیدا ہو سکے

دین اسلام

عمومی مقاصد: دین اسلام کے بنیادی مقاصد اور عبادات کے بارے میں جان سکے اور بیان کر سکے

خصوصی مقاصد

لفظ دین اسلام کے لغوی اور اصطلاحی معنی بیان کر سکے

اسلام کے بنیادی مقاصد کی اہمیت بیان کر سکے

اسلام کے بنیادی مقاصد سے انسان کی انفرادی و اجتماعی زندگی پر پڑنے والے اثرات بیان کر سکے

عبادت کے لغظی و اصطلاحی معنی بیان کر سکے

عقیدے اور عبادت کا فرق بیان کر سکے

عبادات (نماز، روزہ، حج، زکواۃ) کے فوری، اخلاقی اور انسانی زندگی پر ان کی اثرات بیان کر سکے

اسلامی مقاصد و عبادات کے مطابق اپنی زندگی ڈھال کر ایک اچھا مسلمان بن سکے

(غیر مسلم طلباء کے لئے)

نصاب اخلاقیات سال اول — GEN III

حصہ دوم مطالعہ پاکستان

ک	ع	ی
1	0	1

کل وقت - 20 گھنٹے

موضوعات

اخلاقیات کی تعریف اور اہمیت

اخلاقیات کا معیار (قانون، عقل، الہی کتب)

مندرجہ ذیل اخلاق کی وضاحت

- ☆ دیانت داری
- ☆ وفاداری
- ☆ نظم و ضبط
- ☆ راست گوئی
- ☆ صبر و استقلال
- ☆ حوصلہ مندی
- ☆ وقت کی پابندی
- ☆ صفائی
- ☆ ایثار
- ☆ باہمی احترام
- ☆ مصلحت

نصاب اخلاقیات (سال اول)

تدریسی مقاصد

عمومی مقاصد: اعلیٰ اخلاق کی وجہ سے ملکی ترقی میں قابل قدر اضافہ کر سکے

خصوصی مقاصد: طالب اس علم سے اس قابل ہو گا کہ

- ☆ موضوعات کا مطلب بیان کر سکے
- ☆ عملی زندگی سے مثالوں کی نشاندہی کر سکے
- ☆ اپنی شخصیت اور معاشرے پر موضوعات کے مثبت اثرات پیدا کرنے کے طریقے بیان کر سکے
- ☆ دیانت داری کی اہمیت بیان کر سکے
- ☆ وفاداری کی اہمیت بیان کر سکے
- ☆ نظم و ضبط کی افادیت بیان کر سکے
- ☆ صدق بیان کی ضرورت بیان کر سکے
- ☆ حوصلہ مندی کے فوائد بیان کر سکے
- ☆ وقت کی پابندی کے فوائد بیان کر سکے
- ☆ صفائی اور باہمی اختیار سے حسن کارکردگی کو بیان کر سکے
- ☆ مصلحت کے فوائد بیان کر سکے

نصاب (سال اول) Gen III

حصہ دوئم	مطالعہ پاکستان	کل وقت 12 گھنٹے

موضوعات

☆ حریت فکر: مسلمان قوم میں آزادی فکر کی تاریخ مسلمانوں میں سیاسی آزادی کی اہمیت اور ضرورت - ذہنی، جسمانی غلامی کے نقصانات

☆ نظریہ پاکستان

قیام پاکستان کی اساس (دین اسلام) قیام پاکستان کی غرض و غایت نظریہ پاکستان کی وضاحت نظریہ پاکستان اور مسلم اقبال اور قائداعظم کے ارشادات کی روشنی میں

☆ نظریہ پاکستان کا تاریخی پس منظر

محمد بن قاسم کی آمد، مجدد الف ثانی اور شاہ ولی اللہ کی تبلیغی خدمات سید احمد شہید کی تحریک مجاہدین

☆ تعلیمی تحریکیں

علی گڑھ - ندوۃ العلماء (لکھنؤ - مدرسۃ الاسلام - (کراچی) اسلامیہ کالج (پشاور) انجمن حمایت اسلام (لاہور)

مطالعہ پاکستان (حصہ دوئم)

تدریسی مقاصد

حریت فکر:

عمومی مقصد

طالب علم یہ جان لے کہ اسلام میں اور مسلمان قوم میں آزادی فکر کی کیا اہمیت ہے

خصوصی مقاصد

☆ حریت فکر کا معنی و مفہوم بیان کر سکے

☆ آزادی فکر کی اہمیت بیان کر سکے

☆ خصوصاً اسلام میں آزادی اظہار رائے کی اہمیت بیان کر سکے

☆ ذہنی غلامی کے قومی سطح پر نقصانات کے بیان کر سکے

☆ جسمانی غلامی قومی سطح پر نقصانات بیان کر سکے

نظریہ پاکستان

عمومی مقصد:

نظریہ پاکستان (دین اسلام) سے پوری طرح واقفیت ہو جائے

خصوصی مقاصد:

☆ نظریہ کی تعریف بیان کر سکے اور اس کی وضاحت کر سکے

☆ نظریہ پاکستان کی تعریف کر سکے اور اس کا مفہوم بیان کر سکے

☆ علامہ اقبال اور قائداعظم کے فرمودات کی روشنی میں نظریہ پاکستان بیان کر سکے

نظریہ پاکستان کا تاریخی پہلو

عمومی مقصد

☆ نظریہ پاکستان کے تاریخی پس منظر سے واقفیت حاصل کر سکے

خصوصی مقاصد:

☆ محمد بن قاسم کے بارے میں بیان کر سکے

- محمد بن قاسم کے ہندوستان پر حملہ کی وجہ بیان کر سکے
- محمد بن قاسم کے ہندوستان پر حملہ کے اثرات بیان کر سکے
- بیان کر سکے کہ ہندوستان میں ہندو مسلم دو قومی نظریہ کا نکتہ آغاز کیا ہے
- مجدد الف ثانی کی علمی خدمات بیان کر سکے
- شاہ ولی اللہ کی علمی خدمات بیان کر سکے
- مجدد الف ثانی اور شاہ ولی اللہ کے جو تبلیغ دین اور مسلمانوں میں سیاسی شعور پیدا کیا اسے بیان کر سکے

علمی تحریکیں

عمومی مقصد

- برصغیر کی علمی تحریکوں سے آگاہی حاصل ہو سکے

خصوصی مقاصد:

- علی گڑھ - دیوبند - ندوۃ العلماء مدرسۃ السلام ، اسلامیہ کالج۔ انجمن حمایت اسلام نے تعلیم کے ذریعہ سیاسی شعور مسلمانوں میں پیدا کیا اسے بیان کر سکے
- آزادی ہند کے سلسلہ میں تحریک مجاہدین کی خدمات بیان کر سکے

TTQ-111 / Civic-111;

Tarjumat-ul-Quran / Civics

T	P	C
1	0	1

Total Contact Hours:

Theory: 32

Practical: 0

Note: Syllabi for these subject would be as per BISEs / General education, developed by Punjab Curriculum TextBook Board (PCTB)

Eng-112 ENGLISH

Total contact hours:	**64 Hrs**	**T**	**P**	**C**
Theory:	**64 Hrs**	**2**	**0**	**2**
Practical	**0 Hrs**			

LEARNING OUTCOMES: At the end of the course, the students will be equipped with cognitive skill to enable them to present facts in a systematic and logical manner to meet the language demands of dynamic field of commerce and industry for functional day-to-day use and will inculcate skills of reading, writing and comprehension.

COURSE CONTENTS

ENGLISH PAPER "A"

1 PROSE/TEXT 16 Hrs

1.1 First eight essays of Intermediate English Book-II

2 CLOZE TEST 4 Hrs

2.1 A passage comprising 50-100 words will be selected from the text. Every 11th word or any word for that matter will be omitted. The number of missing words will range between 5-10. The chosen word may or may not be the one used in the text, but it should be an appropriate word.

ENGLISH PAPER "B"

1. GRAMMAR 26 Hrs

1.1 Sentence Structure.
1.2 Tenses.
1.3 Parts of speech.
1.4 Punctuation.
1.5 Change of Narration.
1.6 One word for several
1.7 Words often confused

2. COMPOSITION 12 Hrs

2.1 Letters/Messages
2.2 Job application letter
2.3 For character certificate/for grant of scholarship
2.4 Telegrams, Cablegrams and Radiograms, Telexes, Facsimiles
2.5 Essay writing
2.6 Technical Education, Science and Our life, Computers, Environmental Pollution, Duties of a Student.

3. TRANSLATION 6 Hrs

3.1 Translation from Urdu into English.
3.2 For Foreign Students: A paragraph or a dialogue.

RECOMMENDED BOOKS

Technical English developed by Mr. Zia Sarwar, Mr. Habib-ur –Rehman, Evaluated by Mr.Zafar Iqbal Khokhar, Mr. Zahid Zahoor, Vol - I, National Book Foundation

Eng-112 ENGLISH

INSTRUCTIONAL OBJECTIVES

PAPER-A

1. DEMONSTRATE BETTER READING, COMPREHENSION AND VOCABULARY

1.1 Manipulate, skimming and scanning of the text.
1.2 Identify new ideas.
1.3 Reproduce facts, characters in own words
1.4 Write summary of stories

2. UNDERSTAND FACTS OF THE TEXT

2.1 Rewrite words to fill in the blanks recalling the text.
2.2 Use own words to fill in the blanks.

PAPER-B

3. APPLY THE RULES OF GRAMMAR IN WRITING AND SPEAKING

3.1 Use rules of grammar to construct meaningful sentences containing a subject and a predicate.
3.2 State classification of time, i.e present, past and future and use verb tense correctly in different forms to denote relevant time.
3.3 Identify function words and content words.
3.4 Use marks of punctuation to make sense clear.
3.5 Relate what a person says in direct and indirect forms.
3.6 Compose his writings.
3.7 Distinguish between confusing words.

4. APPLY THE CONCEPTS OF COMPOSITION WRITING TO PRACTICAL SITUATIONS

4.1 Use concept to construct applications for employment, for character certificate, for grant of scholarship.
4.2 Define and write telegrams, cablegrams and radiograms, telexes, facsimiles
4.3 Describe steps of a good composition writing.
4.4 Describe features of a good composition.
4.5 Describe methods of composition writing
4.6 Use these concepts to organize facts and describe them systematically in practical situation.

5. APPLIES RULES OF TRANSLATION

5.1 Describe confusion.
5.2 Describe rules of translation.
5.3 Use rules of translation from Urdu to English in simple paragraph and sentences.

Math-113 APPLIED MATHEMATICS

Total contact hours:	**96 Hrs**	**T**	**P**	**C**
Theory:	**96Hrs**	**3**	**0**	**3**

LEARNING OUTCOMES: After completing the course the students will be able to

1. Solve problems of Algebra, Trigonometry, vectors. Menstruation, Matrices and Determinants.
2. Develop skill, mathematical attitudes and logical perception in the use of mathematical instruments as required in the technological fields.
3. Acquire mathematical clarity and insight in the solution of technical problems.

COURSE CONTENTS

1.	**QUADRATIC EQUATIONS**	**6 Hrs**
1.1	Standard Form	
1.2	Solution	
1.3	Nature of roots	
1.4	Sum & Product of roots	
1.5	Formation	
1.6	Problems	
2.	**ARITHMETIC PROGRESSION AND SERIES**	**3Hrs**
2.1	Sequence	
2.2	Series	
2.3	nth term	
2.4	Sum of the first n terms	
2.5	Means	
2.6	Problems	
3.	**GEOMETRIC PROGRESSION AND SERIES**	**3Hrs**
3.1	nth term	
3.2	sum of the first n terms	
3.3	Means	
3.4	Infinite Geometric progression	
3.5	Problems	
4.	**BINOMIAL THEOREM**	**6 Hrs**
4.1	Factorials	
4.2	Binomial Expression	
4.3	Binomial Co-efficient	
4.4	Statement	
4.5	The General Term	
4.6	The Binomial Series.	
4.7	Problems	
5.	**PARTIAL FRACTIONS**	**6 Hrs**
5.1	Introduction	
5.2	Linear Distinct Factors Case I	
5.3	Linear Repeated FactorsCase II	
5.4	Quadratic Distinct Factors Case III	

5.5 Quadratic Repeated Factors Case IV
5.6 Problems

6. FUNDAMENTALS OF TRIGONOMETRY 6 Hrs

6.1 Angles
6.2 Quadrants
6.3 Measurements of Angles
6.4 Relation between Sexagesimal & circular system
6.5 Relation between Length of a Circular Arc & the Radian Measure of its central angle
6.6 Problems

7. TRIGONOMETRIC FUNCTIONS AND RATIOS 6 Hrs

7.1 Trigonometric functions of any angle
7.2 Signs of trigonometric Functions
7.3 Trigonometric Ratios of particular Angles
7.4 Fundamental Identities
7.5 Problems

8. GENERAL INDENTITIES 6 Hrs

8.1 The Fundamental Law
8.2 Deductions
8.3 Sum & Difference Formulae
8.4 Double Angle Identities
8.5 Half Angle Identities
8.6 Conversion of sum or difference to products
8.7 Problems

9. SOLUTION OF TRIANGLES 6 Hrs

9.1 The law of Sines
9.2 The law of Cosines
9.3 Measurement of Heights & Distances
9.4 Problems

10. MENSURATION OF SOLIDS 30 Hrs

10.1 Review of regular plane figures and Simpson's Rule
10.2 Prisms
10.3 Cylinders
10.4 Pyramids
10.5 Cones
10.6 Frusta
10.7 Spheres

11. VECTORS 9 Hrs

11.1 Sealers & Vectors
11.2 Addition & Subtraction
11.3 The unit Vectors I, j, k
11.4 Direction Cosines
11.5 Sealer or Dot Product
11.6 Deductions
11.7 Dot product in terms of orthogonal components
11.8 Deductions
11.9 Analytic Expression for a x b.
11.10 Problems.

12. MATRICES AND DETERMINANTS **9 Hrs**

12.1 Definition of Matrix
12.2 Rows & Columns
12.3 Order of a Matrix
12.4 Algebra of Matrices
12.5 Determinants
12.6 Properties of Determinants
12.7 Solution of Linear Equations
12.8 Problems

RECOMMENDED BOOKS

Applied Mathematics Math-113, Developed by Nasir -ud-Din Mahmood, Sana-ullah Khan, Tahir Hameed, Evaluated by Syed Tanvir Haider, Javed Iqbal, Vol - I, National Book Foundation

Math-113 APPLIED MATHEMATICS

INSTRUCTIONAL OBJECTIVES

1 USE DIFFERENT METHODS FOR THE SOLUTION OF QUADRATIC EQUATIONS

1.1 Define a standard quadratic equation.
1.2 Use methods of factorization and method of completing the square for solving the equations.
1.3 Derive quadratic formula.
1.4 Write expression for the discriminant
1.5 Explain nature of the roots of a quadratic equation.
1.6 Calculate sum and product of the roots.
1.7 Form a quadratic equation from the given roots.
1.8 Solve problems involving quadratic equations.

2 UNDERSTAND APPLY CONCEPT OF ARITHMETIC PROGRESSION AND SERIES

2.1 Define an Arithmetic sequence and a series
2.2 Derive formula for the nth term of an A.P.
2.3 Explain Arithmetic Mean between two given numbers
2.4 Insert n Arithmetic means between two numbers
2.5 Derive formulas for summation of an Arithmetic series
2.6 Solve problems on Arithmetic Progression and Series

3 UNDERSTAND GEOMETRIC PROGRESSION AND SERIES

3.1 Define a geometric sequence and a series.
3.2 Derive formula for nth term of a G.P.
3.3 Explain geometric mean between two numbers.
3.4 Insert n geometric means between two numbers.
3.5 Derive a formula for the summation of geometric Series.
3.6 Deduce a formula for the summation of an infinite G.P.
3.7 Solve problems using these formulas.

4 EXPAND AND EXTRACT ROOTS OF A BINOMIAL

4.1 State binomial theorem for positive integral index.
4.2 Explain binomial coefficients: (n,0), (n,1)……..(n,r),…….(n,n)
4.3 Derive expression for the general term.
4.4 Calculate the specified terms.
4.5 Expand a binomial of a given index. -
4.6 Extract the specified roots
4.7 Compute the approximate value to a given decimal place.
4.8 Solve problems involving binomials.

5 RESOLVE A SINGLE FRACTIONINTO PARTIALFRACTIONS USINGDIFFERENT METHODS.

5.1 Define a partial fraction, a proper and an improper fraction.
5.2 Explain all the four types of partial fractions.
5.3 Set up equivalent partial fractions for each type.
5.4 Explain the methods for finding constants involved.
5.5 Resolve a single fraction into partial fractions.
5.6 Solve problems involving all the four types.

6 UNDERSTAND SYSTEMS OF MEASUREMENT OF ANGLES.

6.1 Define angles and the related terms.

6.2 Illustrate the generation of angle.
6.3 Explain sexagesimal and circular systems for the measurement of angles
6.4 Derive the relationship between radian and degree.
6.5 Convert radians to degrees and vice versa.
6.6 Derive a formula for the circular measure of a central angle.
6.7 Use this formula for solving problems.

7 APPLY BASIC CONCEPTS AND PRINCIPLES OF TRIGONOMETRICFUNCTIONS

7.1 Define the basic trigonometric functions/ratios of an angle as ratios of the sides of a right triangle.
7.2 Derive fundamental identities.
7.3 Find trigonometric ratios of particular angles.
7.4 Draw the graph of trigonometric functions.
7.5 Solve problems involving trigonometric functions.

8 USE TRIGONOMETRIC IDENTITIES IN SOLVING ECHNOLOGICALPROBLEMS

8.1 List fundamental identities
8.2 Prove the fundamental law
8.3 Deduce important results
8.4 Derive-sum and difference formulas
8.5 Establish half angle, double angle & triple angle formulas
8.6 Convert sum or difference into product& vice versa
8.7 Solve problems

9 USE CONCEPTS, PROPERTIES AND LAWS OF TRIGONOMETRIC FUNCTIONS FOR SOLVING TRIANGLES

9.1 Define angle of elevation and angle of depression.
9.2 Prove the law of sins and the law of cosines.
9.3 Explain elements of a triangle.
9.4 Solve triangles and the problems involving heights and distances.

10 USE PRINCIPLES OF MENSTRUATION IN FINDING SURFACES, VOLUMEAND WEIGHTS OF SOLIDS.

10.1 Define menstruation of plane and solid figures
10.2 List formulas for perimeters & areas of plane figure.
10.3 Define pyramid and cone.
10.4 Define frusta of pyramid and cone.
10.5 Define a sphere and a shell.
10.6 Calculate the total surface and volume of each type of solid.
10.7 Compute weight of solids.
10.8 Solve problems of these solids.

11 USE THE CONCEPT AND PRINCIPLES OF VECTORS IN SOLVINGTECHNOLOGICAL PROBLEMS.

11.1 Define vector quantity.
11.2 Explain addition and subtraction of vector
11.3 Illustrate unit vectors I, j, k.
11.4 Express a vector in the component form.
11.5 Explain magnitude, unit vector, direction cosines of a vector.
11.6 Derive analytic expression for dot product and cross product of two vector.
11.7 Deduce conditions of perpendicularly and parallelism of two vectors.
11.8 Solve problems

12 USE THE CONCEPT OFMATRICES & DETERMINANTS IN SOLVING TECHNOLOGICAL PROBLEMS

12.1 Define a matrix and a determinant.
12.2 List types of matrices.
12.3 Define transpose, ad joint and inverse of a matrix.
12.4 State properties of determinants.
12.5 Explain basic concepts.
12.6 Explain algebra of matrices.
12.7 Solve linear equation by matrices.
12.8 Explain the solution of a determinant.
12.9 Use Crammers Rule for solving linear equations

CH – 112 APPLIED CHEMISTRY

Total contact hours:	**128 Hrs**	**T**	**P**	**C**
Theory:	**32 Hrs**	**1**	**3**	**2**
Practical	**96 Hrs**			

LEARNING OUTCOMES: After studying this course a student will be able to:

1. Understand the significance and role of chemistry in the development of modern technology
2. Become acquired with the basic principles of chemistry as applied in the study of relevant technology.
3. Know the scientific methods for production, and use of materials of industrial & technological significance.
4. Gains skill for the efficient conduct of Practical in a chemistry lab.

COURSE CONTENTS

1.	**INTRODUCTION AND FUNDAMENTAL CONCEPTS**	**2 Hrs**
1.1.	Orientation with reference to this technology	
1.2.	Terms used & units of measurements in the study of chemistry	
1.3.	Chemical reactions & their types	
2.	**ATOMIC STRUCTURE**	**2 Hrs**
2.1	Sub atomic particles	
2.2	Architecture of atoms of elements. Atomic no. & atomic weight	
2.3	The periodic classification of elements periodic law	
2.4	General characteristics of a period and group	
3.	**CHEMICAL BOND**	**2 Hrs**
3.1.	Nature of chemical bond	
3.2.	Electrovalent bond with examples	
3.3.	Covalent bond (polar and non-polar, sigma & pie bonds with examples)	
3.4.	Co-ordinate bond with examples	
4.	**WATER**	**2 Hrs**
4.1.	Chemical nature and properties	
4.2.	Impurities	
4.3.	Hardness of water (types, causes and removal)	
4.4.	Scales of measuring hardness (degrees Clark French, PPM, Mg- per liter)	
4.5.	Boiler feed water, scales and treatment	
4.6.	Sea water desalination, sewage treatment	
5.	**ACIDS, BASES AND SALTS**	**2 Hrs**
5.1.	Definitions with examples	
5.2.	Properties, their strength, basicity and acidity	
5.3.	Salts and their classification with examples	
5.4.	Ph – value and scale	
6.	**OXIDATION & REDUCTION**	**2 Hrs**
6.1.	The process, definition and examples	
6.2.	Oxidizing and reducing agents	
6.3.	Oxides and their classifications	

7.	**NUCLEAR CHEMISTRY**	**2 Hrs**
7.1.	Introduction	
7.2.	Radioactivity (alpha, beta and gamma rays)	
7.3.	Half-life process	
7.4.	Nuclear reaction and transformation of elements	
8.	**CEMENT**	**2 Hrs**
8.1.	Introduction	
8.2.	Composition and manufacture	
8.3.	Chemistry of setting and hardening	
8.4.	Special purpose cements	
9.	**GLASS**	**2 Hrs**
9.1.	Composition and raw material	
9.2.	Manufacture	
9.3.	Varieties and uses	
10.	**PLASTICS AND POLYMERS**	**2 Hrs**
10.1.	Introduction and importance	
10.2.	Classification	
10.3.	Manufacture	
10.4.	Properties and uses	
11.	**PAINTS, VARNISHES AND DISTEMPER**	**2 Hrs**
11.1.	Introduction	
11.2.	Constituents	
11.3.	Preparation and use	
12.	**CORROSION**	**2 Hrs**
12.1.	Introduction with causes	
12.2.	Types of corrosion	
12.3.	Rusting of iron	
12.4.	Protective measures against corrosion	
13.	**REFRACTORY MATERIALS AND ABRASIVE**	**2 Hrs**
13.1.	Introduction to refractories	
13.2.	Classification of refractories	
13.3.	Properties and uses	
13.4.	Introduction to abrasives	
13.5.	Artificial and natural abrasives and their uses	
14.	**ALLOYS**	**2 Hrs**
14.1.	Introduction with need	
14.2.	Preparation and properties	
14.3.	Some important alloys and their composition	
14.4.	Uses	
15.	**FUELS AND COMBUSTION**	**2 Hrs**
15.1.	Introduction of fuels	
15.2.	Classification of fuels	
15.3.	Combustion	
15.4.	Numerical problems of combustion	
16.	**LUBRICANTS**	**1 Hrs**
16.1.	Introduction	
16.2.	Classification	
16.3.	Properties of lubricants	

16.4. Selection of lubricants

17. POLLUTION 1 Hr

17.1. The problems and its dangers

17.2. Causes of pollution

17.3. Remedies to combat the hazards of pollution

RECOMMENDED BOOKS

Text Book of Ch-112, Vol-I, developed by Curriculum Section, Academics wing TEVTA and published by National Book Foundation (NBF)

CH – 112 APPLIED CHEMISTRY

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND THE SCOPE, SIGNIFICANCE AND FUNDAMENTAL ROLE OF THE SUBJECT

1.1. Define chemistry and its important terms
1.2. State the units of measurements in the study of chemistry
1.3. Write chemical formula of common compounds
1.4. Describe types of chemical reactions with examples

2. UNDERSTAND THE STRUCTURE OF ATOMS AND ARRANGEMENT OF SUB ATOMIC PARTICLES IN THE ARCHITECTURE OF ATOMS

2.1. Define atom
2.2. State the periodic law of elements
2.3. Describe the fundamentals sub atomic particles
2.4. Distinguish between atomic no. And mass no. Isotopes and isobars
2.5. Explain the arrangements of electrons in different shells and sub energy levels
2.6. Explain the grouping and placing of elements in the periodic table

3. UNDERSTAND THE NATURE OF CHEMICAL BOND

3.1. Define chemical bond
3.2. Describe the nature of chemical bond
3.3. Differentiate between electrovalent and covalent bonding
3.4. Explain the formation of polar and non polar, sigma and pi-bond with examples
3.5. Describe the nature of coordinate bond with examples

4. UNDERSTAND THE CHEMICAL NATURE OF WATER

4.1. Describe the chemical nature of water with its formula
4.2. Describe the general impurities present in water
4.3. Explain the causes and methods to removing hardness of water
4.4. Express hardness in different units like mg / liter, p.p.m, degrees clark and degrees French
4.5. Describe the formation and nature of scales in boiler feed water
4.6. Explain the method for the treatment of scales
4.7. Explain the sewage treatment and desalination of sea water

5. UNDERSTAND THE NATURE OF ACIDS, BASES AND SALTS

5.1. Define acids, bases and salts with examples
5.2. State general properties of acids and bases
5.3. Differentiate between acidity and basicity and use the related terms
5.4. Define salts, state their classification with examples
5.5. Explain p-h value of solution and pH-scale

6. UNDERSTAND THE PROGRESS OF OXIDATION AND REDUCTION

6.1. Define oxidation
6.2. Explain the oxidation process with examples
6.3. Define reduction
6.4. Explain the reduction process with examples
6.5. Define oxidizing and reducing agents and give at least six examples of each
6.6. Define oxides
6.7. Classify the oxides and give examples

7. UNDERSTAND THE FUNDAMENTALS OF NUCLEAR CHEMISTRY

7.1. Define nuclear chemistry and radioactivity
7.2. Differentiate between alpha, beta and gama particles

7.3. Explain half life process
7.4. Explain at least six nuclear reactions resulting in the transformation of some elements
7.5. State important uses of isotopes

8. UNDERSTAND THE MANUFACTURE, SETTING AND HARDENING OF CEMENT

8.1. Define Portland cement and give its composition
8.2. Describe the method of manufacture
8.3. Describe the chemistry of setting and hardening of cement
8.4. Distinguish between ordinary and special purpose cement

9. UNDERSTAND THE PROCESS OF MANUFACTURE OF GLASS

9.1. Define glass
9.2. Describe its composition and raw materials
9.3. Describe the manufacture of glass
9.4. Explain its varieties and uses

10. UNDERSTAND THE NATURE AND IMPORTANCE OF PLASTIC AND POLYMERS

10.1. Define plastics and polymers
10.2. Explain the mechanism of polymerization
10.3. Describe the preparation and uses of some plastic / polymers

11. KNOW THE CHEMISTRY OF PAINTS, VARNISHES AND DISTEMPERS

11.1. Define paints, varnishes and distemper
11.2. State composition of each
11.3. State methods of preparation of each and their uses

12. UNDERSTAND THE PROCESS OF CORROSION WITH ITS CAUSES AND TYPES

12.1. Define corrosion
12.2. Describe different types of corrosion. State the causes of corrosion
12.3. Explain the process of rusting of iron
12.4. Describe methods to prevent/ control corrosion

13. UNDERSTAND THE NATURE OF REFRACTORY MATERIALS ABRASIVE

13.1. Define refractory materials
13.2. Classify refractory materials
13.3. Describe properties and uses of refractory
13.4. Define abrasive
13.5. Classify natural and artificial abrasives
13.6. Describe uses of abrasives `

14. UNDERSTAND THE NATURE AND IMPORTANCE OF ALLOYS

14.1. Define alloy
14.2. Describe different methods for the preparation of alloys
14.3. Describe important properties of alloys
14.4. Enlist some important alloys with their composition, properties and uses

15. UNDERSTAND THE NATURE OF FUELS AND THEIR COMBUSTION

15.1. Define fuels
15.2. Classify fuels and make distinction of solid, liquid and gaseous fuels
15.3. Describe important fuels
15.4. Explain combustion
15.5. Calculate air quantities in combustion gases

16. UNDERSTAND THE NATURE OF LUBRICANTS

16.1. Define a lubricant
16.2. Explain the uses of lubricants
16.3. Classify lubricants and site examples

16.4. State important properties of oils, greases and solid lubricants
16.5. State the criteria for the selection of lubricant for particular purpose / job

17. UNDERSTAND THE NATURE OF POLLUTION

17.1. Define pollution (air, water, food)
17.2. Describe the causes of environmental pollution
17.3. Enlist some common pollutants
17.4. Explain methods to prevent pollution

CH-112: APPLIED CHEMISTRY

LIST OF PRACTICALS

96 Hrs

On completion of this course, the trainees will be able to;

1. To introduce the common apparatus, glassware and chemical reagents used in the chemistry lab.
2. To purify a chemical substance by crystallization.
3. To separate a mixture of sand and salt.
4. To find the melting point of substance.
5. To find the pH of a solution with pH paper.
6. To separate a mixture of inks by chromatography.
7. To determine the co-efficient of viscosity of benzene with the help of Ostwald's vasomotor.
8. To find the surface tension of a liquid with a stalagmometer.
9. To perform electrolysis of water to produce Hydrogen and Oxygen.
10. To determine the chemical equivalent of copper by electrolysis of Cu SO_4.
11. Determination of Heat of Neutralization of NaOH and HCl.
12. Determination of Heat of Solution of C_2H_5OH and H_2O.
13. Determination of %age of O_2 in air.
14. Determination of %age of N_2 in air.
15. Determination of %age of CO_2 in air.
16. To get introduction with the methods/apparatus of conducting volumetric estimation.
17. To prepare standard solution of a substance.
18. To find the strength of a given alkali solution.
19. To estimate HCO_3^{-1} contents in water.
20. To estimate Cl^{-1} contents in water.
21. To estimate SO_4^{-2} contents in water.
22. To estimate total solids in water.
23. To find out the %age composition of a mixture solution of KNO_3 and KOH volumetrically.
24. To find out the amount of Na_2SO_4 and NaOH in their mixture with titration method.
25. To find the boiling point of Freon-12, or R-134a and Freon-22.
26. To find the density of Freon-12, or R 134a and Freon-22 with the help of sp. gravity bottle.
27. To prepare Ammonia gas in Laboratory and perform its tests.
28. To get introduction with the scheme of analysis of salts for basic radicals.
29. To analyse Ist group radials (Ag^{+1}, Pb^{+2}, Hg^{+1}).
30. To exercise Practice for detection of Ist group radicals.
31. To detect and confirm II-A group radicals (Hg^{+2}, Pb^{+4}, Cu^{+2}, Bi^{+3}, Cd^{+2})
32. To detect and confirm II-B group radicals (AS^{+3}, Sb^{+3}, $Sn^{+2, +4}$)

Phy-122 APPLIED PHYSICS

Total Contact Hours 128 Hrs

			T	P	C
Theory	**:**	**32 Hrs**			
Practicals	**:**	**96 Hrs**	**1**	**3**	**2**

LEARNING OUTCOMES: The students will be able to understand the fundamental principles and concept of physics, use these to solve problems in practical situations/technological courses and understand concepts to learn advance physics/technical courses.

COURSE CONTENTS

1.	**MEASUREMENTS.**	**2 Hrs**
1.1.	Fundamental units and derived units	
1.2.	Systems of measurement and S.I. units	
1.3.	Concept of dimensions, dimensional formula	
1.4.	Conversion from one system to another	
1.5.	Significant figures	
2.	**SCALARSAND VECTORS.**	**4 Hrs**
2.1.	Revision of head to tail rule	
2.2.	Laws of parallelogram, triangle and polygon of forces	
2.3.	Resolution of a vector	
2.4.	Addition of vectors by rectangular components	
2.5.	Multiplication of two vectors, dot product and cross product	
3.	**MOTION**	**4 Hrs**
3.1.	Review of laws and equations of motion	
3.2.	Law of conservation of momentum	
3.3.	Angular motion	
3.4.	Relation between linear and angular motion	
3.5.	Centripetal acceleration and force	
3.6.	Equations of angular motion	
4.	**TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA.**	**5 Hrs**
4.1.	Torque	
4.2.	Centre of gravity and centre of mass	
4.3.	Equilibrium and its conditions	
4.4.	Torque and angular acceleration	
4.5.	Rotational inertia	
5.	**WAVE MOTION.**	**4 Hrs**
5.1.	Review Hooke's law of elasticity	
5.2.	Motion under an elastic restoring force	
5.3.	Characteristics of simple harmonic motion	
5.4.	S.H.M. and circular motion	
5.5.	Simple pendulum	
5.6.	Wave form of S.H.M.	
5.7.	Resonance	
5.8.	Transverse vibration of a stretched string	

6.	**SOUND.**	**4 Hrs**
6.1.	Longitudinal waves	
6.2.	Intensity, loudness, pitch and quality of sound	
6.3.	Units of Intensity of level and frequency response of ear	
6.4.	Interference of sound waves silence zones, beats	
6.5.	Acoustics	
6.6.	Doppler effect.	
7.	**LIGHT.**	**4 Hrs**
7.1.	Review laws of reflection and refraction	
7.2.	Image formation by mirrors and lenses	
7.3.	Optical instruments	
7.4.	Wave theory of light	
7.5.	Interference, diffraction, polarization of light waves	
7.6.	Applications of polarization in sunglasses, optical activity and stress analysis	
8.	**OPTICAL FIBER.**	**2 Hrs**
8.1.	Optical communication and problems	
8.2.	Review total internal reflection and critical angle	
8.3.	Structure of optical fiber	
8.4.	Fiber material and manufacture	
8.5.	Optical fiber - uses.	
9.	**LASERS.**	**3 Hrs**
9.1.	Corpuscular theory of light	
9.2.	Emission and absorption of light	
9.3.	Stimulated absorption and emission of light	
9.4.	Laser principle	
9.5.	Structure and working of lasers	
9.6.	Types of lasers with brief description.	
9.7.	Applications (basic concepts)	
9.8.	Material processing	
9.9.	Laser welding	
9.10.	Laser assisted machining	
9.11.	Micro machining	
9.12.	Drilling, scribing and marking	
9.13.	Printing	
9.14.	Lasers in medicine	

RECOMMENDED BOOKS

Text Book of Phy-122, Vol-I, developed by Curriculum Section, Academics wing TEVTA and published by National Book Foundation (NBF)

Phy-122 APPLIED PHYSICS

INSTRUCTIONAL OBJECTIVES

1. USE CONCEPTS OF MEASUREMENT TO PRACTICAL SITUATIONS AND TECHNOLOGICAL PROBLEMS.

1.1. Write dimensional formulae for physical quantities
1.2. Derive units using dimensional equations
1.3. Convert a measurement from one system to another
1.4. Use concepts of measurement and Significant figures in problem solving.

2. USE CONCEPTS OF SCALARS AND VECTORS IN SOLVING PROBLEMS INVOLVING THESE CONCEPTS.

2.1. Explain laws of parallelogram, triangle and polygon of forces
2.2. Describe method of resolution of a vector into components
2.3. Describe method of addition of vectors by rectangular components
2.4. Differentiate between dot product and cross product of vectors
2.5. Use the concepts in solving problems involving addition resolution and multiplication of vectors.

3. USE THE LAW OF CONSERVATION OF MOMENTUM AND CONCEPTS OF ANGULAR MOTION TO PRACTICAL SITUATIONS.

3.1. Use law of conservation of momentum to practical/technological problems.
3.2. Explain relation between linear and angular motion
3.3. Use concepts and equations of angular motion to solve relevant technological problems.

4. USE CONCEPTS OF TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA TO PRACTICAL SITUATION/PROBLEMS.

4.1. Explain Torque
4.2. Distinguish between Centre of gravity and centre of mass
4.3. Explain rotational Equilibrium and its conditions
4.4. Explain Rotational Inertia giving examples
4.5. Use the above concepts in solving technological problems.

5. USE CONCEPTS OF WAVE MOTION IN SOLVING RELEVANT PROBLEMS.

5.1. Explain Hooke's Law of Elasticity
5.2. Derive formula for Motion under an elastic restoring force
5.3. Derive formulae for simple harmonic motion and simple pendulum
5.4. Explain wave form with reference to S.H.M. and circular motion
5.5. Explain Resonance
5.6. Explain Transverse vibration of a stretched string
5.7. Use the above concepts and formulae of S.H.M. to solve relevant problems.

6. UNDERSTAND CONCEPTS OF SOUND.

6.1. Describe longitudinal wave and its propagation
6.2. Explain the concepts: Intensity, loudness, pitch and quality of sound
6.3. Explain units of Intensity of level and frequency response of ear
6.4. Explain phenomena of silence zones, beats
6.5. Explain Acoustics of buildings
6.6. Explain Doppler effect giving mathematical expressions.

7. USE THE CONCEPTS OF GEOMETRICAL OPTICS TO MIRRORS and LENSES.

7.1. Explain laws of reflection and refraction
7.2. Use mirror formula to solve problems

7.3. Use the concepts of image formation by mirrors and lenses to describe ing of optical instruments, e.g. microscopes, telescopes, camera and sextant.

8. UNDERSTAND WAVE THEORY OF LIGHT

8.1. Explain wave theory of light

8.2. Explain phenomena of interference, diffraction, polarization of light waves

8.3. Describe uses of polarization given in the course contents.

9. UNDERSTAND THE STRUCTURE, WORKING AND USES OF OPTICAL FIBER.

9.1. Explain the structure of the Optical Fiber

9.2. Explain its principle of working

9.3. Describe use of optical fiber in industry and medicine.

Phy-122 APPLIED PHYSICS

LIST OF PRACTICALS.

96 Hrs

1. Draw graphs representing the functions:
1.1. y=mx for m=0, 0.5, 1, 2
1.2. y=x2
1.3. y=1/x
2. Find the volume of a given solid cylinder using Vernier callipers.
3. Find the area of cross-section of the given wire using micrometer screw gauge.
4. Prove that force is directly proportional to (a) mass, (b) acceleration, using fletchers' trolley.
5. Verify law of parallelogram of forces using Grave-sands apparatus.
6. Verify law of triangle of forces and Lami's theorem
7. Determine the weight of a given body using
7.1. Law of parallelogram of forces
7.2. Law of triangle of forces
7.3. Lami's theorem
8. Verify law of polygon of forces using Grave-sands apparatus.
9. Locate the position and magnitude of resultant of like parallel forces.
10. Determine the resultant of two unlike parallel forces.
11. Find the weight of a given body using principle of moments.
12. Locate the center of gravity of regular and irregular shaped bodies.
13. Find Young's Modules of Elasticity of a metallic wire.
14. Verify Hooke's Law using helical spring.
15. Study of frequency of stretched string with length.
1 Study of variation of frequency of stretched string with tension.
2 Study resonance of air column in resonance tube and find velocity of sound.
3 Find the frequency of the given tuning fork using resonance tube.
4 Find velocity of sound in rod by Kundt's tube.
5 Verify rectilinear propagation of light and study shadow formation.
6 Study effect of rotation of plane mirror on reflection.
7 Compare the refractive indices of given glass slabs.
8 Find focal length of concave mirror by locating centre of curvature.
9 Find focal length of concave mirror by object and image method
10 Find focal length of concave mirror with converging lens.
11 Find refractive index of glass by apparent depth.
12 Find refractive index of glass by spectrometer.
13 Find focal length of converging lens by plane mirror.
14 Find focal length of converging lens by displacement method.
15 Find focal length of diverging lense using converging lens.
16 Find focal length of diverging lens using concave mirror.
17 Find angular magnification of an astronomical telescope.
18 Find angular magnification of a simple microscope (magnifying glass)
19 Find angular magnification of a compound microscope.
20 Study working and structure of camera.
21 Study working and structure of sextant.
22 Compare the different scales of temperature and verify the conversion formula.
23 Determine the specific heat of lead shots.

24 Find the coefficient of linear expansion of a metallic rod.
25 Find the heat of fusion of ice.
26 Find the heat of vaporization.
27 Determine relative humidity using hygrometer.

Mech-173 ENGINEERING DRAWING & GRAPHICS

Total Contact Hours		**224 Hrs**			
Theory	**:**	**32 Hrs**	**T**	**P**	**C**
Practical	**:**	**192 Hrs**	**1**	**6**	**3**

LEARNING OUTCOMES: At the end of this course the students will be able to:

Understand the Fundamentals of Engineering Drawing used in the various fields of industry especially in Mechanical Technology. The students will be familiar with the use of conventional drawing equipment as well as the modern techniques used for this subject.

COURSE CONTENTS

(PART-A) BASIC ENGINEERING DRAWING (50%)

1.	**INTRODUCTION OF TECHNICAL DRAWING/DRAFTING**	**1Hrs**
1.1	Importance of Technical Drawing	
1.2	Uses/Applications of Technical Drawing	
1.3	Type of Drawing used in Engineering	
2.	**DRAFTING INSTRUMENTS AND ACCESSORIES**	**2Hrs**
2.1.	Introduction and importance of drafting instruments	
2.2.	List of drawing Instruments	
2.3.	Construction, uses and care of all instruments and accessories	
3.	**LINES AND SYMBOLS**	**2Hrs**
3.1.	Basic lines	
3.2.	Importance of lines and Symbols	
3.3.	Common Types (Alphabets) of lines	
3.4.	Common Symbols used in Industry	
4.	**LETTERING**	**1Hrs**
4.1.	Importance of good lettering	
4.2.	General Proportion/ Composition of letters	
4.3.	Uses of Guide lines in Lettering	
4.4.	Classification of lettering	
5.	**DRAFTING GEOMETRY AND CURVES**	**4Hrs**
5.1.	Introduction to geometry, plane and solid type	
5.2.	Definition of terms	
5.3.	Basic geometric constructions	
5.4.	Introduction to engineering curve	
5.5.	Application of engineering curves	
5.6.	Cone and conic section	
5.7.	Geometrical Solid and its types	
5.8.	Geometrical Surfaces and its types	
6.	**FREEHAND SKETCHING**	**1Hr**
6.1.	Introduction to sketching techniques	
6.2.	Sketching of basic lines and shapes	

6.3. Sketching of pictorial drawings

7. THEORY OF PROJECTIONS 4Hrs

7.1. Introduction to the plane and its types
7.2. Dihedral and Trihedral angles
7.3. Projection of point, lines, plane and solids
7.4. Perceptual views of plan of projections
7.5. Orthographic projections
7.6. 1st angle and 3rd angle projection
7.7. Principal views and its arrangements
7.8. Multi-view drawings and missing lines

8. DIMENSIONING 1Hr

8.1. Dimensioning and its types
8.2. Principles of Dimensioning
8.3. Methods of indicating Dimensions

(PART-B) ADVANCED ENGINEERING DRAWING (50%)

1. INTRODUCTION TO PICTORIAL DRAWING 3Hrs

1.1. Uses of pictorial /3D Views
1.2. Classification of pictorial views
1.3. Isometric drawing and its types
1.4. Oblique drawing and its types
1.5. Perspective drawing and its types

2. DEVELOPMENT AND INTERSECTION 3Hrs

2.1. Introduction and importance of development
2.2. Applications of development in industry
2.3. Methods to develop the surfaces
2.4. Frustum and truncation of solids
2.5. Introduction and importance of intersection
2.6. Applications of intersection in industry
2.7. Methods to develop the intersection

3. SECTIONING 1Hr

3.1. Sectioning and its purposes
3.2. Cutting Plane, Section Lines
3.3. Type of sectional views
3.4. Parts not sectioned
3.5. Conventional Breaks

4. FASTENERS AND ITS TYPES 6Hrs

4.1. Fasteners and their types
4.2. Threads nomenclature
4.3. Screw Threads, their types
4.4. Rivet, Rivet heads
4.5. Riveted joints
4.6. Caulking and fullering in riveting
4.7. Key and its types
4.8. Cotters and its types

4.9. Bearing and its types
4.10. Shaft Coupling
4.11. Types of coupling

5. WORKING / PRODUCTION DRAWINGS 2Hrs

5.1. Working / production drawing
5.2. Types of production drawings
5.3. Importance of detail and assembly drawings
5.4. Title blocks
5.5. Essentials Requirements for making detail and assembly drawings

6. STUDY OF DRAWINGS STANDARDS (WITH RELATED SHEET EXAMPLE) 1Hr

6.1. Japanese
6.2. Chinese
6.3. European
6.4. American
6.5. British
6.6. Common Standards

RECOMMENDED TEXTBOOKS:

1. Engineering Drawing By N.D Bhatt, 53rd Edition (2014)
2. A First Year Engineering Drawing By A.C Parkinson; Pitman Publisher, Latest Edition
3. Mechanical Drawing (12th Addition) by French. Svensen, Helsel and Urbanick
4. Drafting Fundamentals by scot. Foy, Schwendan
5. Text Book of Machine Drawing by R.K. Dhawan
6. Engineer Drawing by M.B. Shah (B.C.Rana)

Mech-173 ENGINEERING DRAWING & GRAPHICS

INSTRUCTIONAL OBJECTIVES

(PART-A) BASIC ENGINEERING DRAWING (50%)

1. INTRODUCTION OF TECHNICAL DRAWING/DRAFTING

1.1 Describe the Importance of Technical Drawing
1.2 Explain the Uses/Applications of Technical Drawing
1.3 Describe the type of Drawing used in Engineering

2. DRAFTING INSTRUMENTS AND ACCESSORIES

2.1. State the Introduction and importance of drafting instruments
2.2. State a List of drawing Instruments
2.3. Explain construction, uses and care of all instruments and accessories

3. LINES AND SYMBOLS

3.1. Describe Basic lines
3.2. Explain the Importance of lines and Symbols
3.3. Describe Common Types (Alphabets) of lines
3.4. Explain Common Symbols used in Industry

4. LETTERING

4.1. Describe the Importance of good lettering
4.2. Explain General Proportion/ Composition of letters
4.3. Explain Uses of Guide lines in Lettering
4.4. Describe Classification of lettering

5. DRAFTING GEOMETRY AND CURVES

5.1. Describe the Introduction to geometry, plane and solid type
5.2. State the Definition of terms
5.3. State Basic geometric constructions
5.4. Describe Introduction to engineering curve
5.5. Describe Application of engineering curves
5.6. Define Cone and explain conic section
5.7. Describe Geometrical Solid and its types
5.8. Explain Geometrical Surfaces and its types

6. FREEHAND SKETCHING

6.1. Describe Introduction to sketching techniques
6.2. Explain Sketching of basic lines and shapes
6.3. Explain Sketching of pictorial drawings

7. THEORY OF PROJECTIONS

7.1. Describe Introduction to the plane and state its types
7.2. Explain Dihedral and Trihedral angles
7.3. Explain Projection of point, lines, plane and solids
7.4. Explain Perceptual views of plan of projections
7.5. Explain Orthographic projections
7.6. Compare 1st angle and 3rd angle projection
7.7. State Principal views and its arrangements
7.8. Explain Multi-view drawings and missing lines

8. DIMENSIONING

8.1 Define Dimensioning and describe its types

8.2 Explain Principles of Dimensioning

8.3 Explained Methods of Indicating Dimensions,

(PART-B) ADVANCED ENGINEERING DRAWING (50%)

1. INTRODUCTION TO PICTORIAL DRAWING

1.1 Explain Uses of pictorial /3D Views

1.2 Explain the Classification of pictorial views

1.3 Describe Isometric drawing and its types

1.4 Describe Oblique drawing and its types

1.5 Describe Perspective drawing and its types

2. DEVELOPMENT AND INTERSECTION

2.1 Describe Introduction and importance of development

2.2 Explain Applications of development in industry

2.3 Explain Methods to develop the surfaces

2.4 Distinguish Frustum and truncation of solids

2.5 Explain the Introduction and importance of intersection

2.6 Explain Applications of intersection in industry

2.7 Describe the Methods to develop the intersection

3. SECTIONING

3.1 Define Sectioning and describe its purposes

3.2 State Cutting Plane, Section Lines

3.3 Explain type of sectional views

3.4 State Parts not sectioned

3.5 Describe Conventional Breaks

4. FASTENERS AND ITS TYPES

4.1 Describe Fasteners and their types

4.2 State Threads nomenclature

4.3 Describe Screw Threads, their types

4.4 Define Rivet, state Rivet heads

4.5 Explain Riveted joints

4.6 State Caulking and fullering process in riveting

4.7 Define Key and state its types

4.8 State Cotters and its types

4.9 Describe Bearing and its types

4.10 Describe Shaft Coupling

4.11 Explain Types of coupling

5. WORKING / PRODUCTION DRAWINGS

5.1 Explain Working / production drawing

5.2 Describe Types of production drawings

5.3 Explain Importance of detail and assembly drawings

5.4 State Title blocks

5.5 Explain Essentials Requirements for making detail and assembly drawings

6. STUDY OF DRAWINGS STANDARDS

6.1 Explain Japanese drawing standards.

6.2 Explain Chinese drawing standards.

6.3 Explain European drawing standards.

6.4 Explain American drawing standards.

6.5 Explain common Standards.

Mech-173 ENGINEERING DRAWING & GRAPHICS

LIST OF PRACTICAL

192 Hrs

(PART-A) BASIC ENGINEERING DRAWING

1. Practice of single stroke capital vertical lettering on graph and drawing sheet
2. Practice of single stroke capital Inclined lettering on graph and drawing sheet
3. Practice of single stroke capital Vertical & Inclined lettering on drawing sheet (Home Assignment)
4. Double stroke lettering on self-developed graph.
5. Practice to draw horizontal, vertical and inclined lines (use of tee square and set squares)
6. Drawing of lines, centers, curves, and crossing of lines
7. Construction of angles and triangles
8. Construction of quadrilaterals and circles elements
9. Construction of parallel-lines, perpendiculars, bisects line, angles and equal division of lines
10. Different types of drawing lines
11. Plumbing and Piping Symbols.
12. Welding Symbols & Threads Symbols
13. Material Symbols and Conventional Breaks.
14. Construction of inscribe and circumscribe figures (square, triangle and hexagon)
15. Construction of Pentagon, Hexagon & Octagon, by general and different methods
16. Construction of Tangents of circles (Inside & Outside)
17. Construction of Ellipse by four different methods
18. Construction of Parabola and Hyperbola curves.
19. Construction of Archimedean spiral, cycloid & involute curve of square, circle.
20. Orthographic projection 1 and 3rd angle wooden block-1
21. Orthographic projection 1 and 3rd angle wooden block-2
22. Orthographic projection 1 and 3rd angle wooden block-3

(PART-B) ADVANCED ENGINEERING DRAWING

1. Orthographic projection and Isometric Drawing-I
2. Orthographic projection and Isometric Drawing-II
3. Orthographic projection and Oblique Drawing
4. Construction of perspective drawing. (One Point and Two Point)
5. Development of Right and Truncated Prisms (Square, Hexagon)
6. Development of Right Pyramids and Frustum & Truncated Pyramid (Square, Hexagon)
7. Development of right and oblique Cones (Frustum & Truncated)
8. Development of right and oblique Cylinders (Truncated)
9. Line of Intersection of Plane Surfaces (Two square prism)
10. Line of Intersection of curved surfaces (Two Cylinders Having unequal dia)
11. Nut & Bolt (Hex. & Square Type)
12. Threads forms and multiple threads, (Locking devices Home Assignment)
13. Lap Joints (Single & Double Riveted) Chain and Zigzag type
14. Butt Joints (Single & Double Riveted) Chain and Zigzag type Rivets head Home Assignment)
15. Sketching of Keys and Cotters
16. Bushed Bearing (Half Section)
17. Multi view drawing of Gland
18. Split Muff Coupling and Oldham coupling
19. Flanged Coupling and Hook's Coupling
20. Plummer Block (Details and Assembly)
21. Screw Jack (Details and Assembly)
22. Tail stock (Detail)-I & II
23. Tail Stock (Assembly)-I & ll

TTW-112 TEXTILE RAW MATERIALS

Total Contact Hours :	**64 Hrs**				
Theory	**:**	**64 Hrs**	**T**	**P**	**C**
Practicals	**:**	**0 Hrs**	**2**	**0**	**2**

LEARNING OUTCOMES: Upon completing this course, students will have developed an understanding of textile raw materials, their cultivation and production methods, properties, and applications.

COURSE CONTENTS

1.	**CLASSIFICATION OF FIBERS**	**6 Hrs**
1.1	Introduction to Textile Fibers	
1.2	Classification of Natural and Man-Made Fibers	
1.3	Essential and desirable properties of textile fibers	
2.	**COTTON FIBER**	**6 Hrs**
2.1	History of cotton	
2.2	Types of picking	
2.3	Varieties of cotton	
2.4	Properties of cotton and uses	
3.	**GINNING**	**6 Hrs**
3.1	Introduction	
3.2	Types of ginning	
4.	**JUTE FIBER**	**4 Hrs**
4.1	Introduction to Jute fibers	
4.2	Properties of Jute fibers and applications	
5.	**WOOL FIBER**	**6 Hrs**
5.1	Introduction to wool fibers	
5.2	Properties of wool and end uses	
6.	**SILK FIBER**	**4 Hrs**
6.1	Introduction and Silk Sericulture	
6.2	Properties of silk and applications	
7.	**POLYESTER & POLYAMIDE FIBERS**	**6 Hrs**
7.1	Introduction to polyester and polyamides	
7.2	Properties of polyester and polyamides and end uses	
8.	**ACRYLIC FIBER**	**6 Hrs**
8.1.	Introduction of acrylic fibers	
8.2.	Properties of Acrylic and Applications	
9.	**VISCOSE RAYON FIBER**	**6Hrs**
9.1.	Introduction to Viscose Rayon	
9.2.	Properties of Viscose Rayon and Applications	
10.	**TENCEL FIBER**	**2 Hrs**
10.1.	Introduction to Tencel Fiber	
10.2.	Properties of Tencel and End Uses	
11.	**MODAL FIBER**	**2 Hrs**

11.1. Introduction of Modal Fiber
11.2. Properties of Modal and End Uses

12. HIGH PERFORMANCE FIBERS 4 Hrs

12.1 Aramid fibers, glass fibers,
12.2 HPPE, Carbon, conductive fibers

13. RECYCLED FIBERS 6 Hrs

13.1. Introduction to the recycling of textiles
13.2. Properties and uses of recycled fibers

RECOMENDED TEXTBOOKS:

1. A Text Book of Fiber Science and Technology, S. P. Mishra, New Age International, 2000
2. Man-made Fiber, R.W. Moncrieff
3. Textile Raw Materials, Ajay Jindal, Rakesh Jindal
4. Textile Raw Materials and Their Conversion Into Yarns, Julius Zipser and Charles Salter

TTW-112 TEXTILE RAW MATERIALS

INSTRUCTIONAL OBJECTIVES:

1. CLASSIFICATION OF FIBERS

1.1 Narrate textile fibers and their properties
1.2 Classify the natural and manmade fibers
1.3 Narrate essential and desirable properties of textile fibers

2. COTTON FIBER

2.1 Explain the history of cotton
2.2 Narrate types of picking
2.3 Illustrate the need for cotton fibers
2.4 Explain varieties of cotton
2.5 Properties of cotton and uses

3. GINNING

3.1 Introducing the ginning process
3.2 Narrate the types of ginning
3.3 Explain the roller ginning
3.4 Explain the saw ginning
3.5 Understand the difference and Pros and Cons of both ginning methods

4. JUTE FIBER

4.1 Understand the properties of Jute fibers
4.2 Explain the softening of jute for textiles
4.3 Discuss the uses and applications of jute fibers

5. WOOL FIBER

5.1 State the importance of wool
5.2 Differentiate the types of wool
5.3 Understand the ways to shear and sort the wool fibers
5.4 Elaborate on the woolen and worsted fibers
5.5 Explain the properties of wool and the uses/applications of wool fibers

6. SILK FIBERS

6.1 Narrate the importance of silk and the Sericulture of silk
6.2 Elaborate on the culture and production of silk fibers
6.3 Explain the properties of silk and the uses/applications of silk

7. POLYESTER & POLYAMIDES FIBERS

7.1 State the importance of Polyester and Polyamides
7.2 Explain methods to manufacture both types of fibers
7.3 Describe Properties of polyester & polyamides and uses/applications

8. ACRYLIC FIBER

8.1. State the importance of acrylic fibers
8.2. Explain the manufacturing method of acrylic fibers
8.3. Narrate properties of acrylic fibers and uses/applications

9. VISCOSE RAYON FIBER

9.1. Introducing the importance of Viscose Rayon
9.2. Explain the manufacturing method of viscose rayon
9.3. Differentiate the regenerated fibers and natural fibers
9.4. Explain the properties of Viscose Rayon fibers and uses/applications

10. TENCEL FIBER

10.1. Introducing the importance of Tencel fiber
10.2. Explain the manufacturing of Tencel fibers
10.3. Differentiate the Viscose Rayon and Tencel fibers
10.4. Explain the properties of Tencel fibers and uses/applications

11. MODAL FIBER

11.1. State the importance of Modal fibers
11.2. Explain the manufacturing of Modal fibers
11.3. Differentiate the Modal, Tencel, and Viscose Rayon fibers
11.4. Narrate properties of Modal fibers and applications

12. HIGH PERFORMANCE FIBERS

12.1 State the importance of high-performance fibers (HPF)
12.2 Categories of HPF
12.3 Explain the properties and applications of Aramid fibers
12.4 Explain the properties and applications of glass fibers
12.5 Illustrate the properties and applications of HPPE
12.6 State the properties and applications of Carbon and conductive fibers

13. RECYCLED FIBERS

13.1. State the importance of recycling textiles
13.2. Narrate ways to recycle the textiles
13.3. Elaborate on the negative points of recycled textiles
13.4. Explain the properties of recycled fibers
13.5. Elaborate on the application of recycled fibers

TTW-123 INTRODUCTION TO TEXTILE TECHNOLOGY

Total contact hours:	**96 Hrs**	**T**	**P**	**C**
Theory:	**64 Hrs**	**2**	**3**	**3**
Practical	**96 Hrs**			

LEARNING OUTCOMES: At the end of this course, the students will be able to:

1. Explain introductory knowledge of the operations of the textile and wool industry.
2. Describe different textile terminologies and methodologies.

COURSE CONTENTS:

1.	**GENERAL TEXTILES**	**7 Hrs**
1.1	Introduction to general textiles	
1.2	Steps of textile processes	
1.3	Conversion of raw material to end products	
2.	**YARN MANUFACTURING**	**11 Hrs**
2.1	Flow chart of spinning	
2.2	Objectives of all departments of spinning	
3.	**YARN NUMBERING SYSTEM**	**5 Hrs**
3.1	Yarn numbering.	
3.2	Direct and Indirect system of numbering the yarn	
4.	**FABRIC MANUFACTURING**	**9 Hrs**
4.1	Flow chart of weaving	
4.2	Objectives of weaving sections	
4.3	Weaving types and processes	
4.4	Flow chart of knitting	
4.5	Knitting types and process	
5.	**WEAVE/KNIT DESIGN**	**5 Hrs**
5.1	Definition of Design	
5.2	Basic weaves/knit structures	
6.	**PRE-TREATMENT OF FABRIC**	**7 Hrs**
6.1	Flow chart of wet processing	
6.2	Objectives of each section	
7.	**DYEING**	**5 Hrs**
7.1	Introduction to dyeing	
7.2	Dyeing techniques, process, and flow chart	
8.	**PRINTING**	**5 Hrs**
8.1	Introduction to printing	
8.2	Printing techniques, process, and flow chart	
9.	**Garments Manufacturing**	**5 Hrs**
9.1	Introduction to garment manufacturing	
9.2	Introduction to cutting and pattern making	
9.3	Introduction to sewing and types	
10.	**TECHNICAL TEXTILE**	**5 Hrs**
10.1	Introduction of technical textiles' 12 main categories and their application	
10.2	Introduction to non-woven textiles and its application	
10.3	Introduction to textile composites and their application	

RECOMMENDED BOOKS

1. Introduction to Textiles, Yasir Nawab
2. Introduction to Textiles, Evelyn E. Stout
3. TEXTILE, Sara J. Kadolph
4. TEXTILES from Fiber to Fabric, Corbman

TTW-123 INTRODUCTION TO TEXTILE TECHNOLOGY

INSTRUCTIONAL OBJECTIVES:

1. GENERAL TEXTILES

1.1 Describe Textiles and its terms.
1.2 Draw the Flow chart of Natural and Man-Made fiber processing
1.3 Describe the objectives of textile processes

2. YARN MANUFACTURING

2.1 Pretreatment of wool fibers before the blow room
2.2 Working of each process of pretreatment
2.3 Draw the flow chart of the blow room
2.4 State the working of the blow room
2.5 Define the objectives of the blow room
2.6 Explain the lap formation in the blow room
2.7 Sketch diagram of the blow room line
2.8 State the objectives of the carding machine
2.9 Sketch the diagram of a carding engine
2.10 Explain the objectives of the drawing frame
2.11 Draw a diagram of the drawing frame
2.12 State objectives of the lap former
2.13 Describe the working of lap former
2.14 State objectives of the comber/gilling frame
2.15 Describe the working of comber/gilling
2.16 State objectives of the roving frame
2.17 Describe the working of the roving frame
2.18 Sketch a diagram of the roving frame
2.19 Explain modifications of the roving frame
2.20 Define the objectives of the ring frame
2.21 Explain the objectives of winding

3. YARN NUMBERING SYSTEMS

3.1 Explain the yarn numbering system
3.2 Define and explain direct and indirect yarn numbering systems in detail
3.3 Differentiate the two counting systems

4. FABRIC MANUFACTURING

4.1 Draw the flow chart of weaving
4.2 Explain warping
4.3 Explain sizing
4.4 Explain drawing-in
4.5 Explain looming
4.6 Define drafting and lifting
4.7 Draw a flow chart of knitting
4.8 Explain different types of knitting mechanisms

5. WOVEN/KNIT DESIGN STRUCTURE

5.1 Define the graph paper used in woven/knit design structure
5.2 Explain the design structure and its patterns

6. PRE-TREATMENT PROCESS

6.1 Draw the flow chart of wet processing
6.2 Define inspection of fabric
6.3 Explain the shearing process
6.4 Define the de-sizing process
6.5 Explain the scouring of cotton fabric
6.6 Explain types of bleaching.
6.7 Discuss the objectives of bleaching

6.8 Define mercerizing

7. DYEING PROCESS

7.1 Explain the dyeing process
7.2 Enlist dyeing types
7.3 Explain dyeing techniques, printing process, and flow chart

8. PRINTING PROCESSES

8.1 Explain the printing process
8.2 Enlist printing types
8.3 Draw a flow chart of the composite textile mill

9. GARMENTS MANUFACTURING

9.1. Explain the process of garment manufacturing
9.2. Explain the cutting and pattern making
9.3. Understand the saving of fabric during cutting
9.4. Explain sewing and its types
9.5. Explain the packing and tagging of garments

10. TECHNICAL TEXTILE

10.1. Define and explain in detail the 12 main categories and their application
10.2. Define and explain non-woven textiles and their application
10.3. Define and explain textile composites and their application

TTW-123 INTRODUCTION TO TEXTILE TECHNOLOGY

LIST OF PRACTICALS:

96 Hrs

1. Sketch the blow room processes and observe the process of cotton lap formation
2. Sketch the pretreatment processes for wool fibers
3. Calculate the weight per unit length of lap
4. Study the cotton and worsted card machines and draw on the paper illustrating all the parts, systems, and material flow
5. Study the drawing frame and draw on the paper illustrating all the parts, systems, and material flow for wool and other fibers
6. Study the roving frame and draw on the paper illustrating all the parts, systems, and material flow
7. Study the ring frame and draw on the paper illustrating all the parts, systems, and material flow for wool and other fibers
8. Study the rotor spinning and draw on the paper illustrating all the parts, systems, and material flow
9. Sketch the direct warping machine and creels, and observe the formation of the warper's beam
10. Sketch the sectional warping machine and observe the formation of the warp beam
11. Sketch the sizing machine, illustrating all the parts, systems, and material flow
12. Prepare the sizing recipe using starch
13. Apply the size on yarn using a sizing machine and observe the properties of the yarn
14. Study of the Drawing-in process
15. Make the weaver’s knots
16. Observe the loom operations
17. Study of Counting of Healds, droppers, and reed dents and their types
18. Study of fabric construction on the loom
19. Perform the desizing of greige fabric using enzymes
20. Scour the desized fabric using sodium hydroxide
21. Bleach the scoured fabric using hydrogen peroxide
22. Perform scouring/bleaching of cotton and woolen fabrics
23. Perform dyeing of cotton fabric using reactive dyes
24. Perform dyeing wool fabric using acid dyes
25. Observe printing of cotton fabric using pigments
26. Observe printing of wool fabrics using pigments
27. Observe finishing of cotton and wool fabric
28. Study the different steps in the construction of garments
29. Study the patterning of fabrics for final garments
30. Study the sewing and its types for different garments
31. Study the packing and tagging of garments

TT-123 (Rev.) WORKSHOP PRACTICE (METAL, WELDING, WOOD)

Total contact hours 192 Hrs

		T	P	C
Theory	**0 Hrs**			
Practical	**192 Hrs**	**0**	**6**	**2**

LIST OF PRACTICALS: 192 Hrs

(A) METAL SHOP

1. Preparation of name plate
2. Sawing exercise
3. Preparation of inside caliper
4. Preparation of Bottle opener
5. Preparation of dove-tail joint
6. Preparation of small size Try-square
7. Preparation of Coat hook
8. Preparation of funnel (sheet)
9. Preparation of Pin tray (sheet)
10. Preparation of Drawer handle
11. Preparation of bevel square
12. Preparation of Spanner (small size)

(B) WELDING SHOP

1. Describe Welding and its process

1.1 Gas Welding

1.2 Arc Welding

1.3 Spot Welding

1.4 Tig and Mig Welding

2. Flame making practice
3. Pool making
4. Bed making
5. Welding Joint

5.1 Butt joint

5.2 Lap joint

5.3 T. joint

5.4 Edge joint

6. Corner Joint without filler Rod
7. Corner Joint with filler Rod
8. Brazing practice
9. Arc Welding

9.1 Arc making/current setting/polarity selection

9.2 Bed making

9.3 Butt joint

9.4 V. Butt joint

9.5 Lap joint

9.6 Corner joint

9.7 T. joint
9.8 Square corner joint
9.9 Bevel butt joint
10. Forging
10.1 Forging and its processes
10.2 Describe forging and its operations
10.3 Materials costing
    10.3.1. Aluminum, Ferrous, Brass, and Steel Alloys
    10.3.2. Pattern making
10.4 Cutting chisel hot and cold
10.5 Upsetting
10.6 Twisting
10.7 Heading
10.8 Drawing by forging

(C) WOOD WORKING SHOP

1. Safety precautions in wood working shop.
2. Using of various wood working tools
3. Planning and squaring to dimensions. (Job-1)
4. Introducing different wood working, layout and measuring tools.
5. Sawing exercise (job-2).
6. Identifying different types of handsaws and making sketches of all saws.
7. Wood chiseling.
8. Making middle half cross-lap joint. (job-3).
9. Making Mortise and Tenon joint. (job-4).
10. Making dado-joint (job-5).
11. Observing wood structure.
12. Identifying and comparing soft and hard wood.
13. Boring process, making holes of different diameters in wood. (job-6)
14. Nailing and wood screwing process. (job-7+8)
15. Making dove-tail joint. (job-9)
16. Wood working projects.
17. Spirit polishing (preparing wood surface for polishing, staining and lacquering).

TTW-132 COMPUTER APPLICATIONS IN TEXTILE

Total Contact Hours		**192 Hrs**			
Theory	**:**	**0 Hrs**	**T**	**P**	**C**
Practicals	**:**	**192 Hrs**	**0**	**6**	**2**

LEARNING OUTCOMES: This subject will enable students to become familiar with the fundamental concepts of Computer Science. They will also learn MS-Windows, MS-Office, Adobe Illustrator, Internet, and textile software to an elementary level.

LIST OF PRACTICALS:

192 Hrs

1. IDENTIFY KEY BOARD, MOUSE, CPU, DISK DRIVES, DISKS, MONITOR, AND PRINTER

2. MS WINDOWS

2.1. Practice of loading and shutdown of the operating system
2.2. How to install Drivers in Windows
2.3. Creating items (icons, shortcut, folders etc) and modifying taskbar
2.4. Changing of wallpaper, screensaver, and resolution
2.5. Practice of control panel items (add/remove, time and date, mouse, and create user account)

3. TYPING

3.1. Introduction
3.2. How to do typing
3.3. How to type accurately
3.4. How to maintain accuracy
3.5. How to do fast type
3.6. Paragraph writing

4. UNDERSTAND CHARTS

4.1. Explain in detail the types of charts e.g, pie chart, bar chart

5. MS OFFICE (MS-WORD)

5.1. Identifying the MS Word Screen and its menu
5.2. Practice of creating a new document, saving and re-opening it from the location and spell check & grammar
5.3. Practice of Page Formatting (Borders, Character Spacing, Paragraph, Bullets & Numberings and Fonts)
5.4. Practice of different tool bars like standard, format& drawing tool bars
5.5. Practice of Insert pictures, clipart, and shapes
5.6. Practice of header and footer
5.7. Practice of insert table and also format of table
5.8. Practice of page setup, set the page margins, and printing documents

6. MS OFFICE (MS-EXCEL)

6.1. Identifying the MS EXCEL Screen and its menu
6.2. Practice of create a new sheet, saving and re-opening it from the location and spell check
6.3. Practice of insert and delete of row and columns (format of cell)
6.4. Practice of entering data and formulas in worksheet (Add, Subtract, Multiplying, and Divide & Average)
6.5. Practice of insert chart and its types

6.6. Practice of page setup, setting the page margins, and printing

7. MS OFFICE (MS-POWER POINT)

7.1. Identifying the MS Power Point screen and its menu

7.2. Practice creating a new presentation and saving

7.3. Practice of open saves presentations

7.4. Practice of inserting pictures and videos

8. INTERNET & E-MAIL

8.1. Identifying Internet Explorer

8.2. Practice of searching data from any search engine

8.3. Practice of creating an email account and how to send and receive emails, download attachments

8.4. File attachment

8.5. Uploading and downloading file(s) and software(s)

9. INPAGE

9.1. Introduction

9.2. Handwritten Urdu typing assignments to InPage

9.3. Books, applications & articles in Urdu typing

9.4. Notes in Urdu

10. ADOBE ILUSTRATOR

10.1. Introduction

10.2. tools

10.3. Pen tool

10.4. selection/direct selection

10.5. Tracing

10.6. Victories

10.7. Create/recreate

10.8. Text to outlines

10.9. Creation of an image or logo to vector

11. Applications in Textiles

11.1 Gerber software

11.2 Weave/Knit design software

2nd Year

اسلامیات/مطالعہ پاکستان

نصاب سال دوئم

حصہ اول اسلامیات

حصہ دوئم مطالعہ پاکستان

ٹی	پی	سی
1	0	1

کل وقت 20 گھنٹے:

موضوعات:

1۔ سورۃ المومنون ایک تا گیارہ آیات کا ترجمہ مع تشریح

2۔ دس منتخب احادیث مع ترجمہ وتشریح

() خیر کم من تعلم القرآن و علمه

() لا ایمان لمن لا امانته له ولا دین لا من لا اعهد له

() و یاکم والظن ان الظن اکرب الحدیث

() من احدث فی امرنا هذا ما لیس منه فهورد

() من حمل علینا السلاح فلیس منا

() انا و کافل الیتیم فی الجنه

() لا ضرور ولا ضرار فی السلام

() کلکم راع و کلکم راع و کلکم مسول عن رعیته

3۔ سیرۃ طیبہ

() مکی زندگی۔ولادت۔بعثت۔ہجرت

() مدنی زندگی۔مواخات۔میثاق مدینہ۔فتح مکہ(اسباب ونتائج)

4۔ حضورﷺ بحیثیت

() خطبہ حجۃ الوداع۔انسانی حقوق کا اعلامیہ/حقوق انسانی پالیسی 2018

() معلم کامل۔سربراہ خاندان

5۔ اسلامی معاشرہ

نظام تعلیم اوراس کے مقاصد۔عدل وانصاف۔امر بالمعروف۔نہی عن المنکر۔انسانی حقوق کا معاشرتی اور معاشی ترقی میں کردار

جہاد۔کسب حلال۔مسجد(اہمیت وفضیلت)

6۔ اسلامی ریاست کی تعریف۔اسلامی ریاست کی خصوصیات۔اسلامی حکومت کے فرائض۔اسلامی طرز حکومت۔

حقوق آگاہی رمعلومات تک رسائی

۔ ملازم پیشہ خواتین کا تحفظ

اسلامیات

تدریس مقاصد:

عمومی مقاصد: طالب علم یہ جان سکے کہ آیات قرآنی کی روشنی میں مومن کے اوصاف کیا ہیں

() قرآن مجید () منتخب آیات قرآنی

خصوصی مقاصد:

() قرآنی آیات کا ترجمہ

() قرآنی آیات کی تشریح

() قرآنی آیات کی روشنی میں ایک مومن کے اوصاف بیان کر سکے

() قرآنی آیات میں بیان کردہ مومن کے اوصاف اپنے اندر پیدا کر سکے

احادیث نبوی:

عمومی مقاصد:

() احادیث کی روشنی میں اسلامی اخلاقی اقدار (انفرادی واجتماعی) سے آگاہ ہو سکے

خصوصی مقاصد:

() احادیث کا ترجمہ بیان کر سکے

() احادیث کی تشریح کر سکے

() احادیث کی روشنی میں اسلام کی اخلاقی اقدار کی وضاحت کر سکے

() احادیث کی دی گئی تعلیمات کے مطابق اپنی زندگی گزار سکے

سیرت طیبہ:

() عمومی مقاصد: حضور ﷺ کی سیرت طیبہ کے بارے میں جان سکے

خصوصی مقاصد:

() حضور ﷺ کی ابتدائی زندگی اختصار کے ساتھ بیان کر سکے

() حضور ﷺ کی ہجرت کا واقع بیان کر سکے

() حضور ﷺ کی مدنی زندگی اختصار سے بیان کر سکے

() حضور ﷺ کی بطور معلم خصوصیات بیان کر سکے

( ) حضورﷺ کی بطور سربراہ بیان کر سکے

حضورﷺ بحیثیت

( ) خطبہ حجۃ الوداع ۔ انسانی حقوق کا اعلامیہ رحقوق انسانی پالیسی 2018 کے بارے جان سکے

اسلامی معاشرہ:

عمومی مقاصد: اسلامی معاشرہ کی خصوصیات سے آگاہی حاصل کر سکے

خصوصی مقاصد:

( ) اسلامی معاشرہ کا معنی ومفہوم کر سکے

( ) اسلامی معاشرہ کی امتیازی خصوصیات بیان کر سکے

( ) اسلامی معاشرہ میں عدل واحسان کی اہمیت بیان کر سکے

( ) تبلیغ کے لغوی معنی بیان کر سکے

( ) تبلیغ کی اہمیت اور ضرورت بیان کر سکے

( ) جہاد کے لفظی واصطلاحی معنی بیان کر سکے

( ) جہاد کی اہمیت بیان کر سکے

( ) جہاد اور قتل میں فرق بیان کر سکے

( ) جہاد کی مختلف اقسام بیان کر سکے

( ) لفظ مسجد کی تعریف بیان کر سکے

( ) مسجد کی سابقہ حیثیت کو بحال کرنے کے بارے میں اقدامات کو مان سکے

( ) انسانی حقوق کی معاشی اور معاشرتی ترقی میں اہمیت اور کردار بیان کر سکے

اسلامی ریاست:

عمومی مقاصد:

( ) اسلامی ریاست کی خصوصیات بیان کر سکے

خصوصی مقاصد:

( ) ریاست کی تعریف بیان کر سکے

( ) اسلامی ریاست میں طرز حکومت سے آگاہی حاصل کر سکے

( ) اسلامی ریاست کی خصوصیات بیان کر سکے

- () اسلامی ریاست کے اغراض ومقاصد بیان کر سکے
- () اسلامی ریاست کے قیام کی لیے جدوجہد کر سکے
- () حقوق آگاہی رمعلومات تک رسائی کا قانون جان سکے
- () ملازمت پیشہ خواتین کے حقوق کا تحفظ جان سکے اور
- () معاشرے میں خواتین کے حقوق کا تحفظ یقینی بنائے

نصاب مطالعہ پاکستان

سال دوئم	ٹی	پی	سی
حصہ دوم	1	0	1
کل وقت 12 گھنٹے			

موضوعات:

- () دوقومی نظریہ
- () تحریک پاکستان
- () انڈین کانگریس
- () مسلم لیگ
- () تقسیم بنگال
- () میثاق لکھنو
- () تحریک خلافت
- () سندھو تحریک
- () تجاویز دہلی
- () نہرو رپورٹ
- () قائداعظم کے چودہ نکات
- () خطبہ آلہ آباد
- () انتخابات 1938 اور انتقال اقتدار
- () قرارداد پاکستان

حصہ دوم

مطالعہ پاکستان

تدریس مقاصد:

تحریک پاکستان:

عمومی مقاصد:

() قیام پاکستان کے اسباب وتحریک کو بیان کر سکے

خصوصی مقاصد:

() قومیت کے مفہوم کو بیان کر سکے

() دو قومی نظریہ کی تعریف وتوضیح کر سکے

() دوقومی نظریہ کی اہمیت بیان کر سکے

() ہندوستانی مسلمانوں کی محرومیوں کو بیان کر سکے

() قومی تشخص کو بحال رکھنے کے لیے مسلمانان ہند کی مساعی بیان کر سکے

() آزادی ہند اور قیام پاکستان علامہ اقبال اور قائداعظم کی مساعی بیان کریں

() قیام پاکستان سے مستقبل اسلامی مملکت کے قیام کے لیے مسلم عوام کی کوششوں کو بیان کر سکے

() مسلم لیگ کے قیام پاکستان کے لیے جدو جہد بیان کر سکے

(غیر مسلم طلباء کے لیے)

نصاب اخلاقیات

ٹی	پی	سی
1	0	1

سال دوم

کل وقت 20 گھنٹے

موضوعات:

معاشرتی اقدار بلحاظ ہمسایہ۔قوم۔قومی سطح۔شہری سطح۔صنعتی اداروں کی سطح۔ضروریات۔ورثہ

() حقوق وفرائض

() قوت برداشت

() قوت ارادی

() لگن وجذبہ

() وسیع النظری

() بے غرضی

() انسانی دوستی

() حفاظتی شعور

() پاس آزادی

() کامل آگاہی

() تغیرات کو قبول کرنا

() خودشناسی

() انسانی حقوق کا اعلامیہ/حقوق انسانی پالیسی 2018

() انسانی حقوق کا معاشرتی اور معاشی ترقی میں کردار

() حقوق آگاہی/معلومات تک رسائی۔ملازم پیشہ خواتین کا تحفظ

نصاب اخلاقیات

سال دوم

تدریس مقاصد:

طالب علم اخلاقیات کی اہمیت وضرورت سے آگاہ ہو سکے اور بیان کر سکے

خصوصی مقاصد: طالب علم اس قابل ہو کہ

() موضوعات کا مطلب بیان کر سکے

() عملی زندگی سے مثالوں کی نشاندہی کر سکے

() اپنی شخصیت اور معاشرے پر موضوعات کے مطابق اثرات پیدا کرنے کے طریقے بیان کر سکے

() اعلیٰ اخلاقی اقدار میں سے قوت برداشت۔قوت ارادی۔لگن وجذبہ۔وسیع النظری۔بے غرض۔انسانی دوستی شعور۔پاس آزادی۔کامل آگاہی اور خود شناسی کی اہمیت

() اخلاقیات سے متصف ہو کر قومی خدمت بہتر طور پر انجام دے سکے

() انسانی حقوق کا اعلامیہ/حقوق انسانی کی پالیسی 2018 کے بارے میں جان سکے

() انسانی حقوق کا معاشرتی اور معاشی ترقی میں اہمیت اور کردار بیان کر سکے

() حقوق اگاہی/معلومات تک رسائی کے قانون کو جان سکے

() ملازم پیشہ خواتین کا تحفظ کو اخلاقیات کا حصہ تصور کرے

TTQ-211 / Civic-211;

Tarjumat-ul-Quran / Civics

T	P	C
1	0	1

Total Contact Hours:

Theory: 32

Practical: 0

Note: Syllabi for these subject would be as per BISEs / General education, developed by Punjab Curriculum TextBook Board (PCTB)

MATH-223 APPLIED MATHEMATICS -II

Total contact hours	**96 Hrs**			
Theory	**96 Hrs**	**T**	**P**	**C**
Practical	**0 Hrs**	**3**	**0**	**3**

LEARNING OUTCOMES: The students will be able to:

1. Solve problems of Calculus and Analytic Geometry.
2. Develop mathematical skill, attitudes and logical perception in the use of mathematical instruments.
3. Apply principles of differential calculus to work out rate measures, velocity, acceleration, maxima and minima values.
4. Use principles of Integral Calculus to compute areas and volumes.
5. Acquire proficiency in solving technological problems with mathematical clarity and insight.

COURSE CONTENTS

PART-A 48 Hrs

1. FUNCTIONS AND LIMITS **6 Hrs**

1.1. Constant and variable quantities.
1.2. Functions and their classification.
1.3. The concept of limit.
1.4. Limit of a function.
1.5. Fundamental theorems on limit.
1.6. Some important limits.
1.7. Problems.

2. DIFFERENTIATION **6 Hrs**

2.1. Increments.
2.2. differential coefficient or derivative.
2.3. Differentiation ab-initio or by first principle.
2.4. Geometrical interpretation of differential coefficient.
2.5. Differential coefficient of Xn, (ax+b)n.
2.6. Three important rules.
2.7. Problems.

3. DIFFERENTIATION OF ALGEBRAIC FUNCTIONS **9 Hrs**

3.1. Explicit functions.
3.2. Implicit functions.
3.3. Parametric forms.
3.4. Problems.

4. DIFFERENTIATION OF TRIGONOMETRIC FUNCTIONS **6 Hrs**

4.1. Differential coefficient of Sin x, Cos X, Tan x from first principle.
4.2. Differential coefficient of Cosec x, Sec x, Cot x.
4.3. Differentiation of inverse Trigonometric functions.
4.4. Problems.

5. DIFFERENTIATIONS OF LOGARITHMIC AND EXPONENTIAL FUNCTIONS **6 Hrs**

5.1. Differentiation of In x.
5.2. Differentiation of Log ax.
5.3. Differentiation ax.
5.4. Differentiation ex.
5.5. Problems.

6. RATE OF CHANGE OF VARIABLES **6 Hrs**

6.1. Increasing and decreasing functions.
6.2. Maxima and Minima values.
6.3. Criteria for maximum and minimum values.
6.4. Methods of finding maxima and minima.
6.5. Problems.

7. INTEGRATION **9 Hrs**

7.1. Concept.
7.2. Fundamental formulas.
7.3. Important rules.
7.4. Problems.

PART-B 48 Hrs

8. METHODS OF INTEGRATION **9 Hrs**

8.1. Integration by substitution.
8.2. Integration by parts.
8.3. Problems.

9. DEFINITE INTEGRALS **6 Hrs**

9.1. Properties.
9.2. Application to area.
9.3. Problems.

10. DIFFERENTIAL EQUATIONS **6 Hrs**

10.1. Introduction.
10.2. Degree and Order.
10.3. First order differential equation.
10.4. Solution.
10.5. Problems.

11. PLANE ANALYTIC GEOMETRY AND STRAIGHT LINE **6 HRS**

11.1. Coordinate system.
11.2. Distance formula.
11.3. The ratio formula.
11.4. Inclination and slope of a line.
11.5. The slope formula.
11.6. Problems.

12. EQUATIONS OF STRAIGHT LINE **6 Hrs**

12.1. Some important forms.
12.2. General form.
12.3. Angle formula.
12.4. Parallelism and perpendicularity.
12.5. Problems.

13. EQUATIONS OF CIRCLE **6 Hrs**

13.1. Standard form of equation.
13.2. Central form of equation.
13.3. General form of equation.
13.4. Radius and coordinates of the centre.
13.5. Problems.

14. STATISTICS 9 Hrs

14.1. Concept of mean, median and mode.
14.2. Standard deviation.
14.3. Laws of probability.
14.4. Problems.

R ECOMMENDED BOOKS:

Text Book of Math-223, Vol-I, developed by Curriculum Section, Academics wing TEVTA and published by National Book Foundation (NBF)

MATH-223 APPLIED MATHEMATICS –II

INSTRUCTIONAL OBJECTIVES

PART-A

1. USE THE CONCEPT OF FUNCTIONS AND THEIR LIMITS IN SOLVING SIMPLE PROBLEMS

1.1. Define a function.
1.2. List all type of functions.
1.3. Explain the concept of limit and limit of a function.
1.4. Explain fundamental theorems on limits.
1.5. Derive some important limits.
1.6. Solve problems on limits.

2. UNDERSTAND THE CONCEPT OF DIFFERENTIAL COEFFICIENT

2.1. Derive mathematical expression for a differential coefficient.
2.2. Explain geometrical interpretation of differential coefficient.
2.3. Differentiate a constant, a constant associated with a variable and the sum of finite number of functions.
2.4. Solve related problems.

3. USE RULES OF DIFFERENTIATION TO SOLVE PROBLEMS OF ALGEBRAIC FUNCTIONS

3.1. Differentiate ab-initio xn and (ax+b)n.
3.2. Derive product quotient and chain rules.
3.3. Find derivatives of implicit functions and explicit functions.
3.4. Differentiate parametric forms, functions w.r.t. another function and by rationalization.
3.5. Solve problems using these formulas.

4. USE RULES OF DIFFERENTIATION TO SOLVE PROBLEMS INVOLVING TRIGONOMETRIC FUNCTIONS.

4.1. Differentiate from first principle sin x, cos x, tan x.
4.2. Derive formula derivatives of sec x, cosec x, cot x.
4.3. Find differential coefficients of inverse trigonometric functions.
4.4. Solve problems based on these formulas.

5. USE RULES OF DIFFERENTIATION TO LOGARITHMIC AND EXPONENTIAL FUNCTIONS.

5.1. Derive formulas for differential coefficient of logarithmic and exponential functions.
5.2. Solve problems using these formulas.

6. UNDERSTAND RATE OF CHANGE OF VARIABLE WITH RESPECT TO ANOTHER

6.1. Derive formula for velocity, acceleration and scope of a line.
6.2. Define an increasing and a decreasing function, maxima and minima values, point of inflexion.
6.3. Explain criteria for maxima and minima values of a function.
6.4. Solve problems involving rate of change of variables.
6.5. Solve problems using these formulas.

7. USE RULES OF INTEGRATION IN SOLVING RELEVANT PROBLEMS.

7.1. Explain the concept of integration.
7.2. State basic theorems of integration.
7.3. List some important rules of integration.
7.4. Derive fundamental formulas of integration.
7.5. Solve problems of integration based on these rules/formulas.

PART-B

8. UNDERSTAND DIFFERENT METHODS OF INTEGRATION

8.1. List standard formulas of integration.
8.2. Integrate a function by substitution method.
8.3. Find integrals by the method of integration by parts.
8.4. Solve problems using these methods.

9. UNDERSTAND METHODS OF SOLVING DEFINITE INTEGRALS

9.1. Define definite integral.
9.2. List properties of definite integrals.
9.3. Find areas under the curve using definite integrals.
9.4. Solve problems of definite integrals.

10. USE DIFFERENT METHODS OF INTEGRATION TO SOLVE DIFFERENTIAL EQUATIONS

10.1. Define a differential equation, its degree and order.
10.2. Explain method of separation of variables to solve differential equation of first order and first degree.
10.3. Solve differential equations of first order and first degree.

11. UNDERSTAND THE CONCEPT OF PLANE ANALYTIC GEOMETRY

11.1. Explain the rectangular coordinate system.
11.2. Locate points in different quadrants.
11.3. Derive distance formula.
11.4. Prove section formula.
11.5. Derive slope formula.
11.6. Solve problem using these formulas.

12. USE EQUATIONS OF STRAIGHT LINE IN SOLVING PROBLEMS

12.1. Define a straight line.
12.2. Write general form of equation of a straight line.
12.3. Derive slope intercept and intercept forms of equations of a straight line.
12.4. Derive expression for angle between two straight lines.
12.5. Derive conditions of perpendicularity and parallelism of two straight lines.
12.6. Solve problems involving these equations/formulas.

13. SOLVE TECHNOLOGICAL PROBLEMS USING EQUATIONS OF CIRCLE

13.1. Define a circle.
13.2. Describe standard, central and general forms of the equation of a circle.
13.3. Convert general form to the central form of equation of a circle.
13.4. Derive formula for the radius and the coordinates of the centre of a circle from the general form.
13.5. Derive equation of the circle passing through three given points.
13.6. Solve problems involving these equations.

14. UNDERSTAND THE BASIC CONCEPT OF STATISTICS

14.1. Define mean, median and mode.

14.2. Explain standard deviation.

14.3. State laws of probability.

14.4. Calculate the above-mentioned quantities using the proper formula.

Mgm-211 BUSINESS COMMUNICATION

Total Contact Hours		**32 Hrs**			
Theory	**:**	**32 Hrs**	**T**	**P**	**C**
Practical	**:**	**0 Hrs**	**1**	**0**	**1**

LEARNING OUTCOMES: The course has been designed to enable the students to.

1. Develop communication skills.
2. Understand basic principles of good and effective business writing in commercial andindustrial fields.
3. Develop knowledge and skill to write technical report with confidence and accuracy.

COURSE CONTENTS

1.	**COMMUNICATION PROCESS**	**6 Hrs**
1.1.	Purposes of communication.	
1.2.	Communication process.	
1.3.	Distortions in communication.	
1.4.	Consolidation of communiqué.	
1.5.	Communication flow.	
1.6.	Communication of self-development.	
2.	**COMMUNICATION SKILLS**	**6 Hrs**
2.1.	Significance of speaking.	
2.2.	Verbal and non-verbal messages.	
2.3.	Strategic steps of speaking.	
2.4.	Characteristics of effective oral messages.	
2.5.	Communication trafficking.	
2.6.	Oral presentation.	
3.	**QUESTIONING SKILLS**	**3 Hrs**
3.1.	Nature of question.	
3.2.	Types of questions.	
3.3.	Characteristics of a good question.	
3.4.	Questioning strategy.	
4.	**LISTENING SKILLS**	**5 Hrs**
4.1.	Principles of active listening.	
4.2.	Skills of active listening.	
4.3.	Barriers to listening.	
4.4.	Reasons of poor listening.	
4.5.	Giving feedback.	
5.	**INTERVIEWING SKILLS**	**3 Hrs**
5.1.	Significance of interviews.	
5.2.	Characteristics of interviews.	
5.3.	Activities in an interviewing situation.	
5.4.	Types of interviews.	
5.5.	Interviewing strategy.	
6.	**REPORT WRITING**	**3 Hrs**
6.1.	Goals of report writing.	

6.2. Report format.
6.3. Types of reports.
6.4. Report writing strategy.

7. READING COMPREHENSION **2 Hrs**

7.1. Reading problems.
7.2. Four reading skills.

8. GROUP COMMUNICATION **4 Hrs**

8.1. Purposes of conducting meetings.
8.2. Planning a meeting.
8.3. Types of meetings.
8.4. Selection of a group for meeting.
8.5. Group leadership skills.
8.6. Running a successful meeting.
8.7. Active participation techniques.

RECOMMENDED BOOKS:

1. Sh. Ata-ur-Rehman, Effective Business Communication and Report Writing.
2. Ulman J. N. Cloud JR. Technical Reporting.

Mgm-211 BUSINESS COMMUNICATION

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND THE COMMUNICATION PROCESS

1.1 State the benefits of two way of communication.
1.2 Describe a model of communication process.
1.3 Explain the major communication methods used in organizations.
1.4 Identify the barriers to communication and methods to overcoming these barriers.
1.5 Identify misconceptions about communication.

2. UNDERSTAND THE PROCESS OF ORAL

2.1 Identify speaking situations with other people.
2.2 Identify the strategic steps of speaking.
2.3 Identify the characteristics of effective oral messages.
2.4 State the principles of one-way communication.
2.5 State the principles of two-way communication.
2.6 Identify the elements of oral presentation skills.
2.7 Determine the impact of non-verbal communication on oral communication.

3. DETERMINE THE USES OF QUESTIONING SKILLS TO GATHER AND CLARIFY INFORMATION IN THE ORAL COMMUNICATION PROCESS

3.1 Identify different types of questions.
3.2 Determine the purpose of each type of question and its application.
3.3 Identify the hazards to be avoided when asking questions.
3.4 Demonstrate questioning skills.

4. DEMONSTRATE THE USE OF ACTIVE LISTENING SKILLS IN THE ORAL COMMUNICATION PROCESS

4.1 State the principles of active listening.
4.2 Identify skills of active listening.
4.3 Identify barriers to active listening.
4.4 State the benefits of active listening.
4.5 Demonstrate listening skills.
4.6 Explain the importance of giving and receiving feedback.

5. DETERMINE THE APPROPRIATE INTERVIEW TYPE FOR THE SPECIFIC WORK-RELATED SITUATION AND CONDUCT A WORK-RELATED INTERVIEW

5.1 State the significance of interviews.
5.2 State the characteristics of interviews.
5.3 Explain the activities in an interviewing situation.
5.4 Describe the types of interviews.
5.5 Explain the interviewing strategy.
5.6 Prepare instrument for a structured interview.

6. PREPARE A REPORT OUTLINE BASED ON SUBJECT MATTER AND AUDIENCE

6.1 Identify the different types of reports.
6.2 Determine when to use an informal or formal report presentation.
6.3 Identify the stages of planning a report.
6.4 Identify the parts of a report and chose the parts appropriate for each type of report.

6.5 Draft a report outline.

7. DEMONSTRATE READING COMPREHENSION

7.1 Identify major reading problems.

7.2 Identify basic reading skills.

7.3 State methods of previewing written material.

7.4 Identify methods of concentration when reading.

7.5 Demonstrate reading comprehension.

8. UNDERSTAND THE PRINCIPLES OF GROUP COMMUNICATION

8.1 State the purposes and characteristics of major types of meetings.

8.2 Explain responsibilities of a meeting/committee.

8.3 Identify problems likely to be faced at meeting and means to overcome these problems.

8.4 Distinguish between content and process at meetings.

8.5 Explain the key characteristics of a good group facilitator.

Mgm- 221 BUSINESS MANAGEMENT AND INDUSTRIAL ECONOMICS

Total Contact Hours	**32 Hrs**			
Theory	**32**	**T**	**P**	**C**
Practical	**0**	**1**	**0**	**1**

LEARNING OUTCOMES: The end of this course students will be able to:

Develop management skills, get acquainted the learner with the principles of management and economic relations and develop commercial/economic approach to solve the problems in the industrial set-up.

COURSE CONTENTS

1.	**ECONOMICS**	**2 Hrs**
1.1	Definition: Adam Smith, Alfred Marshall, Prof. Robins.	
1.2	Nature and scope	
1.3	Importance for technicians.	
2.	**BASIC CONCEPTS OF ECONOMICS**	**1 Hr**
2.1	Utility	
2.2	Income	
2.3	Wealth	
2.4	Saving	
2.5	Investment	
2.6	Value.	
3.	**DEMAND AND SUPPLY.**	**2 Hrs**
3.1	Definition of demand.	
3.2	Law of demand.	
3.3	Definition of supply.	
3.4	Law of supply.	
4.	**FACTORS OF PRODUCTION.**	**2 Hrs**
4.1	Land	
4.2	Labour	
4.3	Capital	
4.4	Organization.	
5.	**BUSINESS ORGANIZATION.**	**3 Hrs**
5.1	Sole proprietorship.	
5.2	Partnership	
5.3	Joint stock company.	
6.	**ENTERPRENEURIAL SKILLS**	**4 Hrs**
6.1	Preparing, planning, establishing, managing, operating and evaluating relevant resources in small business.	
6.2	Business opportunities, goal setting.	
6.3	Organizing, evaluating and analyzing opportunity and risk tasks.	
7.	**SCALE OF PRODUCTION.**	**2 Hrs**
7.1	Meaning and its determination.	
7.2	Large scale production.	
7.3	Small scale production.	
8.	**ECONOMIC SYSTEM**	**3 Hrs**

8.1 Free economic system.
8.2 Centrally planned economy.
8.3 Mixed economic system.

9. MONEY. 1 Hr

9.1 Barter system and its inconveniences.
9.2 Definition of money and its functions.

10. BANK. 1 Hr

10.1 Definition
10.2 Functions of a commercial bank.
10.3 Central bank and its functions.

11. CHEQUE 1 Hr

11.1 Definition
11.2 Characteristics and kinds of cheque.
11.3 Dishonour of cheque.

12. FINANCIAL INSTITUTIONS 2 Hrs

12.1 IMF
12.2 IDBP
12.3 PIDC

13. TRADE UNION 2 Hrs

13.1 Introduction and brief history.
13.2 Objectives, merits and demerits.
13.3 Problems of industrial labour.

14. INTERNATIONAL TRADE. 2 Hrs

14.1 Introduction
14.2 Advantages and disadvantages.

15. MANAGEMENT 1 Hr

15.1 Meaning
15.2 Functions

16. ADVERTISEMENT 2 Hrs

16.1 The concept, benefits and draw-backs.
16.2 Principal media used in business world.

17. ECONOMY OF PAKISTAN 1 Hr

17.1 Introduction
17.2 Economic problems and remedies

RECOMMENDED BOOKS

1. Nisar-ud-Din, Business Organization, Aziz Publisher, Lahore
2. M. Saeed Nasir,Introduction to Business, Ilmi Kitab Khana, Lahore.
3. S.M. Akhtar, An Introduction to Modern Economics, United Limited, Lahore

Mgm- 221 BUSINESS MANAGEMENT AND INDUSTRIAL ECONOMICS

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND THE IMPORTANCE OF ECONOMICS.

1.1 State definition of economics given by Adam Smith, Alfred Marshall and Professor Robins.

1.2 Explain nature and scope of economics.

1.3 Describe importance of study of economics for technicians.

2. UNDERSTAND BASIC TERMS USED IN ECONOMICS.

2.1 Define basic terms, utility, income, wealth, saving, investment and value.

2.2 Explain the basic terms with examples

3. UNDERSTAND LAW OF DEMAND AND LAW OF SUPPLY.

3.1 Define Demand.

3.2 Explain law of demand with the help of schedule and diagram.

3.3 State assumptions and limitation of law of demand.

3.4 Define Supply.

3.5 Explain law of Supply with the help of schedule and diagram.

3.6 State assumptions and limitation of law of supply.

4. UNDERSTAND THE FACTORS OF PRODUCTION

4.1 Define the four factors of production.

4.2 Explain labour and its features.

4.3 Describe capital and its peculiarities.

5. UNDERSTAND FORMS OF BUSINESS ORGANIZATION.

5.1 Describe sole proprietorship, its merits and demerits.

5.2 Explain partnership, its advantages and disadvantages.

5.3 Describe joint stock company, its merits and demerits.

5.4 Distinguish public limited company and private limited company.

6. UNDERSTAND ENTERPRENEURIAL SKILLS

6.1 Explain preparing, planning, establishing and managing small business set up

6.2 Explain evaluating all relevant resources

6.3 Describe organizing analyzing and innovation of risk of task

7. UNDERSTAND SCALE OF PRODUCTION.

7.1 Explain scale of production and its determination.

7.2 Describe large scale production and it merits.

7.3 Explain small scale of production and its advantages and disadvantages.

8. UNDERSTAND DIFFERENT ECONOMIC SYSTEMS.

8.1 Describe free economic system and its characteristics.

8.2 Explain centrally planned economic system, its merits and demerits.

8.3 State mixed economic system and its features.

9. UNDERSTAND WHAT IS MONEY

9.1 Define money

9.2 Explain barter system and its inconveniences.

9.3 Explain functions of money.

10. UNDERSTAND BANK AND ITS FUNCTIONS.

10.1 Define bank.

10.2 Describe commercial bank and its functions.

10.3 State central bank and its functions.

11. UNDERSTAND CHEQUE AND DISHONOR OF CHEQUE.

11.1 Define cheque.

11.2 Enlist the characteristics of cheque.
11.3 Identify the kinds of cheque.
11.4 Describe the causes of dishonor of a cheque.

12. UNDERSTAND FINANCIAL INSTITUTIONS.

12.1 Explain IMF and its objectives.
12.2 Explain organizational set up and objectives of IDBP.
12.3 Explain organizational set up and objectives of PIDC.

13. UNDERSTAND TRADE UNION, ITS BACKGROUND AND FUNCTIONS.

13.1 Describe brief history of trade union.
13.2 State functions of trade union.
13.3 Explain objectives, merits and demerits of trade unions.
13.4 Enlist problems of industrial labour.

14. UNDERSTAND INTERNATIONAL TRADE.

14.1 Explain international trade.
14.2 Enlist its merits and demerits.

15. UNDERSTAND MANAGEMENT

15.1 Explain meaning of management.
15.2 Describe functions of management.
15.3 Identify the problems of business management.

16. UNDERSTAND ADVERTISEMENT.

16.1 Explain the concept of advertisement.
16.2 Enlist benefits and drawbacks of advertisement.
16.3 Describe principal media of advertisement used in business world.

17. UNDERSTAND THE ECONOMIC PROBLEMS OF PAKISTAN.

17.1 Describe economy of Pakistan.
17.2 Explain economic problems of Pakistan
17.3 Explain remedial measures for economic problems of Pakistan measure.

PHY-242 APPLIED MECHANICS

Total contact hours	**128 Hrs**			
Theory	**32 Hrs**	**T**	**P**	**C**
Practical	**96 Hrs**	**1**	**3**	**2**

LEARNING OUTCOMES: At the end of this course students will be able to:

1. Apply the concepts of Applied Physics to understand Mechanics
2. Apply laws and principles of Mechanics in solving technological problems
3. Use the knowledge of App. Mechanics in learning advance technical courses.
4. Demonstrate efficient skill of practical work in Mechanics Lab.

COURSE CONTENTS

1.	**MEASUREMENTS**	**2 Hrs**
1.1.	Review: Dimensional formula of Equations of Motion	
1.2.	Review: Systems of measurement, S.I. Units, conversion	
1.3.	Significant Figures	
1.4.	Degree of accuracy	
2.	**EQUILIBRIUM OF CONCURRENT FORCES**	**3 Hrs**
2.1.	Concurrent forces	
2.2.	Addition and Resolution of Vectors	
2.3.	Toggle Joint, Hanging Chains	
2.4.	Roof Trusses, Cranes.	
2.5.	Framed structures	
3.	**MOMENTS AND COUPLES:**	**2 Hrs**
3.1.	Principle of Moments - Review	
3.2.	Levers	
3.3.	Safety valve	
3.4.	Steel yard	
3.5.	Parallel forces, couple	
3.6.	Torque	
4.	**EQUILIBRIUM OF NON-CONCURRENT FORCES:**	**3 Hrs**
4.1.	Non-concurrent forces	
4.2.	Free body diagram	
4.3.	Varignon's theorem	
4.4.	Conditions of total Equilibrium.	
4.5.	Ladders	
5.	**MOMENT OF INERTIA:**	**3 Hrs**
5.1.	Review: Rotational Inertia	
5.2.	Moment of Inertia, Theorems	
5.3.	Moment of Inertia of symmetrical bodies	
5.4.	M.I. of Fly wheel with applications	
5.5.	Energy stored by Fly wheel	
6.	**FRICTION:**	**2 Hrs**
6.1.	Review: Laws of friction	
6.2.	Motion of body along an inclined plane (up & down)	
6.3.	Rolling friction & Ball Bearings	
6.4.	Fluid Friction, Stokes' Law	
7.	**WORK, ENERGY AND POWER**	**3 Hrs**
7.1.	Work-Energy relationship	

7.2. Work done by variable force.
7.3. Power
7.4. I.H.P, B.H.P and Efficiency
7.5. Dynamometer.

8. TRANSMISSION OF POWER: 3 Hrs

8.1. Belts, Ropes.
8.2. Chains.
8.3. Gears.
8.4. Clutches, functions and types with application

9. MACHINES: 3 Hrs

9.1. Efficiency of machines
9.2. Inclined plane - Review
9.3. Reversibility of machines
9.4. Single purchase crab
9.5. Double purchase crab.
9.6. Worm and worm wheel.
9.7. Differential Screw Jack.
9.8. Differential Pulley, Wheel and Axle

10. VIBRATORY MOTION: 2 Hrs

10.1. S.H.M. - Review
10.2. Pendulums
10.3. Speed Governors.
10.4. Helical spring.
10.5. Cams
10.6. Quick return motion

11. ELASTICITY: 3 Hrs

11.1. Three Modulii of Elasticity
11.2. Loaded Beams, Types of Beam & Loads
11.3. Bending Stress
11.4. S.F & B.M diagram
11.5. Torsion and Torsional Stresses

12. SIMPLE MECHANISM: 1 Hr

12.1. Introduction
12.2. Kinematic link or Element
12.3. Kinematic pair and types.
12.4. Kinematic chains and types.

13. VELOCITY IN MECHANISM: 2 Hrs

13.1. Introduction.
13.2. Instantaneous centre.
13.3. Instantaneous velocity.
13.4. Velocity of a link by instantaneous centre method.
13.5. Relative velocity of two bodies in the straight line
13.6. Velocity of a link by relative velocity method.

RECOMMENDED BOOKS:

Text Book of Phy-242, Vol-I, developed by Curriculum Section, Academics wing TEVTA andpublished by National Book Foundation (NBF)

PHY-242 APPLIED MECHANICS

INSTRUCTIONAL OBJECTIVES

1. USE THE CONCEPTS OF MEASUREMENT IN PRACTICAL SITUATIONS/PROBLEMS

2. EXPLAIN DIAMENSIONAL FORMULA

3. EXPLAIN SYSTEM OF MEASUREMENT

4. USE CONCEPT PF SIGNIFICANT FIGURE AND DEGREE OF ACCURACY TO PROBLEMS

5. USE THE CONCEPT OF ADDITION AND RESOLUTION OF VECTORS TO PROBLEMS ON EQUILIBRIUM INVOLVING CONCURRENT FORCES

5.1 Describe concurrent forces

5.2 Explain resolution of vectors

5.3 Use the analytical method of addition of vectors for solving problems.

5.4 Use the graphical method of addition of vectors for solving problems.

5.5 Solve problems on forces with emphasis on roof trusses, cranes simple frames and framed structures.

6. USE THE PRINCIPLE OF MOMENTS AND CONCEPT OF COUPLE TO SOLVE PROBLEMS.

6.1. Describe the principle of moments.

6.2. Use the principle of moments to solve problems on compound levers, safety valve, steel-yard.

6.3. Describe couple and torque.

6.4. Use the concept to solve problems on torque.

7. USE THE LAWS OF TOTAL EQUILIBRIUM OF FORCES TO SOLVE PROBLEMS INVOLVING FORCES IN EQUILIBRIUM.

7.1. Distinguish between concurrent and non-concurrent forces.

7.2. Prepare a free body diagram of an object or a structure.

7.3. Explain Varignon's theorem.

7.4. Explain the second condition of equilibrium.

7.5. Use laws of total equilibrium to solve problems on forces involving framed structure andladders.

8. USE CONCEPTS OF MOMENT OF INERTIA TO PRACTICAL SITUATIONS AND PROBLEMS.

8.1. Explain moment of inertia.

8.2. Explain the theorems of Parallel and perpendicular Axis.

8.3. Describe the M.I. of regular bodies

8.4. Explain M.I. of Fly wheel

8.5. Explain Energy stored by Fly Wheel

8.6. Use these concepts to solve simple problems.

9. UNDERSTAND THE CONCEPTS AND LAWS OF SOLID AND FLUID FRICTION.

9.1. Define Coefficient of friction between a body placed on an inclined plane and the surface.

9.2. Explain motion of a body placed on an inclined plane

9.3. Calculate the force needed to move a body up and down an inclined plane.

9.4. Explain rolling friction and use of ball bearings.
9.5. Describe fluid friction and Stoke's law.

10. UNDERSTAND WORK, ENERGY AND POWER.

10.1. Derive work-energy relationship
10.2. Use formulae for work done by a variable force to solve problems.
10.3. Explain Power, I.H.P, B.H.P and efficiency.
10.4. Describe dynamometers.
10.5. Use the concepts to solve problems on power and work-energy

11. UNDERSTAND TRANSMISSION OF POWER THROUGH ROPES AND BELTS.

11.1. Describe the need for transmission of power.
11.2. Describe methods of transmission of power.
11.3. Describe transmission of power through ropes and belts.
11.4. Write formula for power transmitted through ropes and belts.
11.5. Describe transmission of power through friction gears and write formula.
11.6. Describe transmission of power through chains and toothed wheels/gears.
11.7. Use the formulae to solve/problems on transmission of power.
11.8. Describe types and function of clutches with applications

12. USE THE CONCEPTS OF MACHINES TO PRACTICAL SITUATIONS.

12.1. Explain theoretical, actual mechanical advantage and efficiency of simple machines.
12.2. Use the concept to calculate efficiency of an inclined plane.
12.3. Describe reversibility of machines.
12.4. Calculate the efficiency of:
12.5. Single purchase crab.
12.6. Double purchase crab.
12.7. Worm and worm wheel.
12.8. Differential screw jack, Diff. Pulley, Wheel and Axle.
12.9. Use the formulae to solve the problems involving efficiency, M.A of the above machines.

13. USE THE CONCEPTS OF VIBRATORY MOTION TO PRACTICAL SITUATIONS.

13.1. Define vibratory motion giving examples.
13.2. Describe circular motion and its projection on diameter of the circular path.
13.3. Relate rotatory motion to simple vibratory motion.
13.4. State examples of conversion of rotatory motion to vibratory motion and vice versa.
13.5. Describe speed governors, cams quick return motion.
13.6. Derive formulae for position, velocity and acceleration of a body executing S.H.M.
13.7. Use the concept of S.H.M to helical springs.
13.8. Use the concept S.H.M to solve problems on pendulum.

14. UNDERSTAND BENDING MOMENTS AND SHEARING FORCES.

14.1. Define three types of stresses and moduli of elasticity.
14.2. Describe types of beams and loads.
14.3. Explain shearing force and bending moment.
14.4. Use these concepts to calculate S.F and B.M in a given practical situation for point loads, uniformly distributed loads.
14.5. Prepare S.F and B.M diagram for loaded cantilever and simply supported beams.

14.6. Describe torsion and torsional stresses giving formula

15. UNDERSTAND SIMPLE MECHANISMS.

15.1. Define simple mechanisms.

15.2. Define kinematics.

15.3. Explain kinematic link or element.

15.4. Explain kinematic chains.

15.5. Distinguish between types of kinematic chains.

16. UNDERSTAND THE METHOD OF FINDING VELOCITY IN MECHANISMS.

16.1. Explains relative velocity.

16.2. Explain instantaneous center.

16.3. Explain instantaneous velocity.

16.4. Explain the method of finding velocity of a link by:

16.5. Relative velocity method.

16.6. Instantaneous center method.

PHY-242 APPLIED MECHANICS

LIST OF PRACTICALS

96 Hrs

1. Find the weight of the given body using Law of Polygon of forces.
2. Find unknown forces in a given set of concurrent forces in equilibrium using Grave-sandsapparatus
3. Set a jib crane and analyse forces in its members
4. Set a Derrick Crane and analyse forces in its members
5. Study forces shared by each member of a Toggle Joint
6. Set a Roof Truss and find forces in its members
7. Verify Principle of Moments in a compound lever
8. Calibrate a steelyard
9. Find the Reactions at the ends of a loaded beam
10. Use Reaction of Beams apparatus to study resultant of Parallel forces
11. Find the Moment of Inertia of a Flywheel
12. Find the angle of reaction for a wooden block placed on an inclined plane
13. Find the B.H.P. of a motor
14. Study the transmission of Power through friction gears
15. Study the transmission of power through belts
16. Study the transmission of Power through toothed wheels
17. Study the function of clutches
18. Find M.A. and efficiency of worm and worm wheel
19. Find M.A. and efficiency of differential wheel and axle
20. Find the efficiency of a screw
21. Find the efficiency of a differential pulley
22. Study conversion of rotatory motion to S.H.M. using S.H.M. Model/Apparatus
23. Study conversation of rotatory motion to vibratory motion of the piston in a cylinder
24. Study the reciprocating motion
25. Study the working of cams
26. Study the quick return motion
27. Compare the Elastic constants of the given wires
28. Verify Hooke's Law using Helical Spring
29. Find the coefficient of Rigidity of a wire using Maxewell's needle
30. Find the coefficient of Rigidity of a round bar using torsion apparatus
31. Find the coefficient of Rigidity of a rectangular bar using Deflection of Beam Apparatus
32. Determine S.F. and B.M. in a loaded cantilever (Point Loads)
33. Determine S.F. and B.M. in a simply supported Beam (Point Loads)
34. Determine S.F. and B.M. in a simply supported Beam (Point loads and uniformly distributed load)
35. Determine S.F. and B.M. in a simply supported Beam (Point loads and uniformly distributed)
36. Study working and function of link mechanism of different types

TTW-214 TEXTILE AND WOOLEN YARN MANUFACTURING

Total Contact Hours 192 Hrs	**T**	**P**	**C**
Theory: 96 Hrs	**3**	**3**	**4**
Practical: 96 Hrs			

LEARNING OUTCOMES: At the end of this course students will be able to:

1. Apply the elementary principles of yam manufacturing.
2. Handle and operate the machines used in different yarn formations.

COURSE CONTENTS

PART-A 48 Hrs

1	**INTRODUCTION**	**6 Hrs**
1.1	What is the yarn	
1.2	Different yarn types	
2	**COTTON YARN MANUFACTURING**	**6 Hrs**
2.1	Process flow chart for making carded and combed yarn	
2.2	Process flow chart for making rotor/vortex spun yarn	
3	**WOOLEN/WORSTED YARN MANUFACTURING**	**6 HRS**
3.1	Process flow chart	
3.2	Woolen and worsted yarns manufacturing	
4	**JUTE & FLEX YARN MANUFACTURING & MANUFACTURING OF OTHER YARNS**	**6 Hrs**
4.1	Process flow chart for jute yarn manufacturing	
4.2	Machines involved in manufacturing of flax, Ramie and flex yarns	
5	**YARN NUMBRING & DRAFTING**	**6 Hrs**
5.1	Yarn numbering (count measurement)	
5.2	Interconversion of the numbering system	
6	**BLOW ROOM**	**6 Hrs**
6.1	Objectives of blow room	
6.2	Flow of material through different machines in blow room	
7	**CARDING MACHINE**	**6 Hrs**
7.1	Objectives of carding	
7.2	Flow of material through carding machine by sketches	
8	**DRAWING FRAME**	**6 Hrs**
8.1	Doubling and drafting	
8.2	Objectives and working of the drawing frame	

PART-B 48 Hrs

9	**COMBER PREPARATION & COMBER**	**6 Hrs**
9.1	Objectives of the combing/gilling process for cotton and wool fibers	
9.2	Functions of different parts of lap former and comber machine	
10	**ROVING FRAME**	**6 Hrs**
10.1	Objectives of roving frame	
10.2	Working operation of machine	

11	**RING SPINNING FRAME**	**8 Hrs**
11.1	Objectives of ring spinning machine	
11.2	Working operation of machine	
11.3	Types of special yarns (core-spun, slub, compact, SIRO) prepared on ring frame	
12	**WINDING**	**6 Hrs**
12.1	Objectives of winding machine	
12.2	Working operation of machine	
13	**DOUBLING, TWISTING & GASSING**	**6 Hrs**
13.1	Objectives of doubling, twisting, and gassing machine	
13.2	Working operation of machines	
14	**OTHER SPINNING SYSTEMS**	**10 Hrs**
14.1	Rotor, Vortex, Air jet spinning	
14.2	Objectives of open end spinning system	
15	**YARN CONDITIONING & PACKING**	**6 Hrs**
15.1	Objectives and importance of yarn conditioning and packing	
15.2	Working operation of conditioning machines	

RECOMMENDED BOOKS:

1. W. Klein “Short Staple Spinning” (vol. I) (1998).
2. Wool Handbook (Werner Von Bergen)
3. Rieter Manual Vol, II, III
4. Wool and Worsted Handbook
5. Fiber and Yarn Quality in Jute Spinning

TTW-214 TEXTILE AND WOOLEN YARN MANUFACTURING

INSTRUCTIONAL OBJECTIVES

PART-A

1 INTRODUCTION

1.1 Understand the yarn and formation

1.2 Explain the different yarn types

1.3 Differentiate the staple spun yarn and filament yarn

1.4 Illustrate the types of staple fiber spinning systems

1.5 Explain the woolen and worsted yarns and types

2 COTTON YARN MANUFACTURING

2.1 Understand the process flow chart for making carded and combed yarn, showing input and output at each stage (ring spun yarn)

2.2 Understand the process flow chart for making carded and combed yarn, showing input and output at each stage (rotor/vortex spun yarn)

3 WOOLEN/WORSTED YARN MANUFACTURING

3.1 Understand the process flow chart of woolen and worsted yarns

3.2 Explain the raw material of the woolen/worsted industry

3.3 Understand the steps of manufacturing wool based yarns, like shearing, sorting, classifying, drying, blending, carding, worsted carding, back washing, carbonizing, gilling, combing, drawing, and spinning

4 JUTE & FLEX YARN MANUFACTURING

4.1 Understand the process flow chart for jute yarn manufacturing

4.2 Explain the various machines used in jute yarn manufacturing

4.3 Illustrate the process flow charts for stem based yarns manufacturing

4.4 Classify machines involved in the manufacturing of flax, Ramie, and spun silk yarns

5 YARN NUMBRING & DRAFTING

5.1 Explain the system of yarn numbering (count measurement)

5.2 Understand the interconversion of the numbering system

6 BLOW ROOM

6.1 Understand the objectives of blow room

6.2 Explain the flow of material through different machines in blow room.

6.3 Understand the principles of working of various blow room machines

6.4 Classify the blow room process for cotton, wool, and manmade staple fibers

7 CARDING MACHINE

7.1 Understand the objectives of carding

7.2 Explain the flow of material through the carding machine by sketches

7.3 Illustrate the working of the machine and its parts

7.4 Differentiate the carding process for cotton, wool, and manmade fibers

7.5 Understand the draft and its types

7.6 Explain the main methods of drafting

8 DRAWING FRAME

8.1 Understand the objectives of drawing

8.2 Explain the need for doubling and drafting

8.3 Illustrate the machine sketches showing different parts, their sizes, and speeds as well as the flow of material.

8.4 Understand the working of machines for wool, manmade, and cotton fibers

PART-B

9 COMBER PREPARATION & COMBER

9.1 Understand the combing/gilling process and its objectives
9.2 Explain the types of combers for different fibers, including wool
9.3 Understand the objectives of lap preparation
9.4 Specify the methods of lap preparation
9.5 Explain the passage of material through comber machine, including the combing cycle
9.6 Understand the functions of different parts of the combing/gilling machine
9.7 Understand the effect of Noil% on the yarn quality

10 ROVING FRAME

10.1 Understand the objectives of the roving frame
10.2 Illustrate the machine sketch showing different parts and the flow of material
10.3 Explain the working operation of the machine and its parts
10.4 Understand the basic calculations related to draft and twist

11 RING SPINNING FRAME

11.1 Understand the objectives of the ring spinning machine
11.2 Illustrate the sketches showing different parts and the flow of material
11.3 Explain the working operation of the machine
11.4 Understand the basic calculations related to draft and twist
11.5 Differentiate the ring settings for different fibers, including wool
11.6 Classify the types of special yarns (core-spun, slub, compact, SIRO) prepared on the ring frame

12 WINDING

12.1 Understand the objectives of the winding machine
12.2 Illustrate sketches showing different parts, as well as the flow of material
12.3 Explain the working operation of the machine and its parts
12.4 Understand yarn faults clearing on the winding machine
12.5 Differentiate the Splicing and its different methods

13 DOUBLING, TWISTING & GASSING

13.1 Understand the objectives of the doubling, twisting, and gassing machine
13.2 Illustrate sketches showing different parts, as well as the flow of material
13.3 Explain the working operation of the machine and its parts
13.4 Understand the final yarn specifications on each machine
13.5 Understand the splicing and joining of yarns on all machines

14 OTHER SPINNING SYSTEMS

14.1 Understand the following spinning systems
14.2 Rotor spinning
14.3 Vortex
14.4 Air jet
14.5 Understand the objectives of the open-end spinning system
14.6 Differentiate the yarn characteristics of each system

15 YARN CONDITIONING & PACKING

15.1 Understand objectives and importance of yarn conditioning and packing
15.2 Explain the working operation of conditioning machines
15.3 Understand the final yarn specifications for weaver, knitter etc.
15.4 Differentiate the room & steam conditioning

15.5 Illustrate the different packing methods and pros and cons of each

TTW-214 TEXTILE AND WOOLEN YARN MANUFACTURING
LIST OF PRACTICALS

96 Hrs

1. Sketch the process flow of carded ring and rotor spun yarns, with the input and output of each process
2. Sketch the process flow of combed ring and rotor spun yarns with input and output of each process
3. Sketch the process flow of woolen and worsted spun yarns with the input and output of each process
4. Study the waste extraction systems used in spinning mills. Inspection of waste extracted by various spinning department machines, and also input and output of each machine of the spinning process, and mounting of samples on the lab report.
5. Determine the chemicals and water quantity used in the pretreatment of wool fibers
6. Determine the lint percentage and trash percentage in the given sample of bale cotton. Additionally, determine the cleaning efficiency of the entire Blow Room and its individual machines.
7. Determine the cleaning efficiency and nep removal efficiency of the carding machine
8. Determine the count of lap and sliver, roving and ring yarn.
9. Observation and calculation of transmitted speeds by various driving methods, e.g., belts, gears, and ropes, including the calculation of slippage %age on carding machines
10. Investigation of various drafting methods on the Card. Calculate the different drafts of the carding machine.
11. Investigation of drafting method on the drawing frame machine and calculate the different drafts on the drawing frame machine (roller drafting).
12. Determine the twist and draft by the direct method on the roving frame.
13. Study the package formation mechanism on the roving frame.
14. Determine the twist and draft by the direct method on the ring frame.
15. Study the cop building mechanism on the ring frame.
16. Study of the change of roller setting on drawing, roving, and ring frames.
17. Practical observation of material flow on carding, drawing frame, lap former, and comber, identifying each part.
18. Practical observation of material flow on roving and ring frames, identifying each part.
19. Practical observation of material flow on the winding machine, identifying each part.
20. Practical observation of material flow on doubling, twisting & gassing machines, identifying each part.
21. Practical observation of material flow on rotor and air vortex spinning machines, identifying each part.
22. Determine the twist and draft on the rotor spinning machine.
23. Practical observation of the working principle of slub/multicount yarn attachments and operation, and identify the importance of each part.
24. Practical observation of the working principle of single-core and dual-core yarn attachments and operation and identify the importance of each part.
25. Practical observation of different types of yarn and yarn faults. Also, prepare a yarn fault blackboard.
26. Study the air conditioning systems used in spinning mills
27. Study compressed air generation and usage in different sections of spinning mills
28. Prepare high-performance yarns for conductive textiles
29. Prepare special yarns for cut-resistant gloves

TTW-223

TEXTILE AND WOOLEN FABRIC MANUFACTURING

Total contact hours:	**160 Hrs**	**T**	**P**	**C**
Theory:	**64 Hrs**	**2**	**3**	**3**
Practical	**96 Hrs**			

LEARNING OUTCOMES: At the end of this course, students will be able to:

1. Apply the elementary principles of textile and woolen fabric manufacturing.
2. Handle and operate the weaving and knitting Machines for fabric manufacturing.

COURSE CONTENTS:

1. INTRODUCTION TO WEAVING/KNITTING **2 Hrs**

1.1 History of woven and knitted structures

1.2 Weaving and knitting machinery sequence of operation (Cone to fabric inspection and folding

2. WARPING **6 Hrs**

2.1 Types of warping.

2.2 Study of creel and its types

2.3 Study of Head stock

3. SIZING **4 Hrs**

3.1 Purpose of sizing the yarn.

3.2 Components of sizing machine.

3.3 Tension zone on sizing machine.

3.4 Size recipe/ingredient.

4. DRAWING-IN **4 Hrs**

4.1 Objectives

4.2 Methods of drawing-in

5. LOOM MOTION **2 Hrs**

5.1 Primary Motion of loom.

5.2 Secondary Motion loom.

5.3 Supplementary Motion of loom.

6. WEAVING **10 Hrs**

6.1 Introduction of weaving

6.2 Types of loom

6.3 Shuttle loom.

6.4 Terry loom.

6.5 Shuttle less loom.

- 6.5.1 Air jet loom.
- 6.5.2 Water jet loom.
- 6.5.3 Rapier loom
- 6.5.4 Projectile loom.
- 6.5.5 Multiphase Loom

7. DOBBY MOTION & JACQUARD MOTION **12 Hrs**

7.1 Types of dobbies

7.2 Types of Jacquards

8. FOLDING AND INSPECTION **12 Hrs**

8.1 Inspection Methods
8.2 Grading System
8.3 Study of different fabric Faults

9. DENIM WEAVING **12 Hrs**

9.1 Process of Denim Weave
9.2 Features of Denim fabric

10. KNITTING

10.1 Principles of knitting
10.2 Types of knitting
10.3 Woolen fabric knitting
10.4 Knitting products and specifications

RECOMMENDED BOOKS:

1. Textile (Fiber to Fabric) by Bernard (McGraw-Hill).
2. Practical Weaving Course by P.R. Jarvis.
3. The principles of knitting, by June Hemmons Hiatt

TTW-223 TEXTILE AND WOOLEN FABRIC MANUFACTURING

INSTRUCTIONAL OBJECTIVE:

1. WEAVING

1.1 Elaborate History of Weaving

1.2 State Weaving process Sequence of operation (Warping to Inspection and folding)

2. WARPING

2.1 Define Types of warping

2.2 Explain the creel and its types

2.3 Define Headstock

3. SIZING

3.1 Narrate the purpose of sizing yarn.

3.2 Explain the construction of the sizing machine

3.3 Explain the working of the sizing machine

4. DRAWING-IN

4.1 Define the objectives of drawing-in process

4.2 Explain the design technique used in drawing-in process

4.3 State methods of drawing-in process.

5. LOOM MOTION

5.1 Define the primary motion of loom

5.2 Describe the secondary motion of loom

5.3 Explain the supplementary motion of loom

6. WEAVING

6.1 Define the weaving process

6.2 Explain types of loom

6.3 Explain working of the Shuttle loom

6.4 Explain the working of Terry loom

6.5 Explain the working of Shuttle less loom

- 6.5.1 Explain the working of Air jet loom
- 6.5.2 Explain the working of Water jet loom
- 6.5.3 Explain the working of Rapier loom
- 6.5.4 Explain the working of Projectile loom
- 6.5.5 Explain the working of Multiphase Loom

7. DOBBY MOTION & JACQUARD MOTION

7.1 State Types of dobbies

7.2 Explain different types of Jacquards

8. FOLDING AND INSPECTION

8.1 Elaborate Inspection Methods

8.2 Narrate Grading System

8.3 Reduction/removal/mending of different fabric Faults

9. DENIM WEAVING

9.1 Introduce the Denim Fabric

9.2 Explain the different stages of the denim fabric manufacturing

10. KNITTING

10.1 Explain the basics of knitting
10.2 Illustrate the principles of knitting
10.3 Differentiate the different knitting types
10.4 Elaborate on the woolen/worsted knitting products
10.5 Explain the knitting faults and their removal
10.6 Elaborate on the knitting products and their specifications

TTW-223 Textile and woolen Fabric manufacturing

LIST OF PRACTICAL

96 Hrs

1. General survey of weaving and knitting sections and machinery layout plan.
2. Study the different controlling parameters in the formation of wapers beam in direct warping.
3. Study the different controlling parameters in the formation of wapers beam in sectional warping.
4. Analyze the various faults in warping, sizing, and weaving.
5. Prepare the size recipe using different ingredients.
6. Study the effect of different additives on the characteristics of size
7. Observe the effect of various size material loading on yarn characteristics
8. Study the primary motions on looms and their diagrams.
9. Study the shedding motion and picking motion.
10. Prepare the heald frames, and reed and study its calculation.
11. Study tappets and perform their setting.
12. Perform the knotting on the loom.
13. Observe in detail the take-up, let-off, beat-up motion, perform their calculations, and sketch the diagrams.
14. Observe the weft insertion in shuttle, projectile, air-jet, rapier, and water-jet looms.
15. Observe the operation of dobby parts, sketch the diagram, and prepare a fabric sample.
16. Observe the warp and weft stop motions and prepare a sketch of them.
17. Observe and operate the Jacquard weaving machine, then sketch a diagram of the yarn path.
18. Observe and operate the warp knitting machine, then sketch a diagram.
19. Observe and operate the weft knitting machine and sketch the diagram.
20. Develop the fabric sample on the Jacquard knitting machine and sketch the machine diagram.
21. Study the mechanism of the glove knitting machine and sketch the diagram.
22. Observe the mechanism of the socks knitting machine and sketch the diagram.
23. Develop woolen knitting products.
24. Find root causes of different fabric faults produced during the weaving and knitting process.
25. Develop a technical fabric for heat-resistant applications.
26. Develop a technical fabric for cut-resistant applications.
27. Develop an anti-static technical fabric.

TTW-232 MILL ENGINEERING AND SERVICES

Total Contact Hours 128 Hrs

			T	P	C
Theory	**:**	**32 Hrs**			
Practicals	**:**	**96 Hrs**	**1**	**3**	**2**

LEARNING OUTCOMES: At the end of this course students will be able to:

To develop the knowledge within students and understanding of mill engineering, including information relating to construction operation and maintenance of a mill.

COURSE CONTENTS:

1.	**ELECTRICAL SUPPLY**	**2 Hrs**
1.1	Electrical transmission and distribution	
1.2	Electrical distribution in different departments of textile and woolen mills	
2.	**INDUCTION MOTOR**	**2 Hrs**
2.1	Operation of Induction motors.	
2.2	Parts of Induction motors.	
2.3	Induction motors used in textile industry	
3.	**A.C AND D.C**	**2 Hrs**
3.1	Conversion of A.C. to D.C and D.C to A.C.	
3.2	Rectifiers and diodes.	
4.	**ILLUMINATION IN TEXTILE MILLS**	**2 Hrs**
4.1	Mills illumination and importance for textile workers	
4.2	Fire control instruments used in textile industry	
5.	**ENGINES AND GENERATORS**	**2 Hrs**
5.1	Types of Engines.	
5.2	Petrol, CNG, and solar power.	
5.3	Power generators.	
6.	**LUBRICANTS**	**2 Hrs**
6.1	Oiling and greasing used in textile mills	
6.2	Different types of lubricants.	
7.	**MILL BUILDING**	**2 Hrs**
7.1	Layout plan of mills	
7.2	Characteristics of mill building layout.	
7.3	Textile mills Planning.	
8.	**HUMIDIFICATION**	**2 Hrs**
8.1	Types of humidifiers.	
8.2	Working of humidifiers.	
9.	**BOILERS**	**2 Hrs**
9.1	Introduction to boiler.	
9.2	Types of boilers.	
9.3	Thermal oil boiler.	
9.4	Boilers used in textile industry.	
10.	**STEAM**	**2 Hrs**
10.1	Objectives of steam.	

10.2 Properties and uses of steam in textile industry.

11. PUMPS 2 Hrs

11.1 Characteristics of pumps.

11.2 Types of pumps.

12. WATER SOFTENING PLANTS 2 Hrs

12.1 Types of softening plants.

12.2 Working method of a softening plant.

12.3 Water softening for textile industry.

13. WASTEWATER TREATMENT PLANTS 2 Hrs

13.1 Types of wastewater treatment plants.

13.2 Working method of a wastewater treatment plant.

13.3 Textile wastewater treatment methods.

14. AIR COMPRESSORS 2 Hrs

14.1 Types of air compressors.

14.2 Uses of air compressor.

15. BEARINGS 2 Hrs

15.1 Objects of bearings.

15.2 Different types of bearing, used in textile mills.

16. AIR CONDITIONING IN TEXTILE AND WOOLEN INDUSTRY 2 Hrs

16.1 Air conditioning systems in textile and woolen mills.

16.2 Air conditioners and chillers utilization in textiles.

Recommended Books:

1. Air-conditioning in Textile Mills by S. P. Patel, ATIRA silver jubilee monographs, 1974
2. Heat Transfer Design Methods by John J. McKetta Jr, 1991
   Textile Project Management by A. Ormerod, 1992

TTW-232 MILL ENGINEERING & SERVICES

INSTRUCTIONAL OBJECTIVES:

1. ELECTRICAL SUPPLY

1.1 State the electrical distribution
1.2 Explain the methods of supply of electricity
1.3 Describe the electrical distribution of different departments in a textile mill
1.4 Illusrate the efficient methods of electric supply and distribution

2. INDUCTION MOTOR

2.1 Define and explain working of induction motor
2.2 Explain the types of Induction motors.
2.3 State the different parts of Induction motors.
2.4 Describe the latest innovations in induction motors

3. A.C AND DC

3.1 Define and explain alternative current and direct current
3.2 Describe the conversion of A.C. to D.C
3.3 Explain the use of A.C and D.C in textile mills
3.4 Describe the rectifiers and diodes.

4. ILLUMINATION IN TEXTILE MILL AND SAFETY

4.1 Explain the mill illumination.
4.2 Describe the requirements for illumination in textile mills
4.3 Illustrate the safety measures regarding illumination
4.4 Define important safety measures for textile mills
4.5 Explain the fire control instrument

5. ENGINES AND GENERATORS

5.1 Define engines and generators
5.2 Explain the types of Engines and generators
5.3 Explain the diesel and gas engines
5.4 Explain the power generator
5.5 Calculate efficiency of engines and generators

6. LUBRICANTS

6.1 Describe importance of lubrication in mills
6.2 Explain the oiling and greasing of different machines
6.3 State the different types of lubricants
6.4 Illustrate the lubrication requirements

7. MILL BUILDING

7.1 Sketch the layout plan of mill
7.2 Specify the important sections of mill building
7.3 Explain the characteristics of mill building
7.4 Explain the planning of mill building
7.5 Illustrate the safety measures to be taken in mill buildings

8. HUMIDIFICATION

8.1 State the importance of humidification in mills
8.2 Explain the air conditioning systems used in textile mills
8.3 Understand the working of each part of air conditioning system

8.4 State the types of humidifiers
8.5 Explain the working of humidifier

9. BOILERS

9.1 State the importance of boiler in mills
9.2 Explain the different types of boilers
9.3 Explain the working differet boilers
9.4 Calculate the efficiency of boilers

10. STEAM

10.1 State the importance of steam in the mills
10.2 Explain the objectives of steam in the mills
10.3 Explain the properties and uses of steam
10.4 Illustrate the ways to generate the steam

11. PUMPS

11.1 State the objectives and importance of pumps
11.2 Explain the characteristics of pumps
11.3 State the types of pumps
11.4 Specify the energy saving pumps

12. WATER SOFTENING PLANTS

12.1 State the objectives of water softening in mills
12.2 Illustrate the types of water softening plants
12.3 Describe the importance of water softening plants
12.4 Explain the working method of a softening plant.

13. WASTE WATER TREATMENT PLANTS

13.1 State the objectives of wastewater treatment in mills
13.2 Illustrate the types of water treatment plants
13.3 Describe the importance of water treatment plants
13.4 Explain the working method of a waste water treatment plant

14. AIR COMPRESSORS

14.1 Explain the objectives of air compressors in mills
14.2 State the types of air compressors
14.3 Differentiate the different air compressors
14.4 Calculate the air production and its pricing
14.5 Explain the uses of air compressor

15. BEARINGS

15.1 Explain the objects of bearings
15.2 State the different types of bearings used in textile mills
15.3 Explain the lubrication of bearings
15.4 Illustrate the ways to increase bearing life

16. AIR CONDITIONING

16.1 State the objectives of air conditioning in textile mills
16.2 Explain the air conditioning systems
16.3 Explain the air conditioners and air chillers
16.4 Illusrate the working of each part of air conditioning system
16.5 Calculate the air changes and air circulations

TTW-232 MILL ENGINEERING & SERVICES

LIST OF PRACTICALS:

96 Hrs

1. To demonstrate the first aid and paramedical treatment
2. Study of power transmission by gear belt chain rope and pulley
3. To compare the AC and DC currents
4. Demonstration on illumination and its effects on Human beings.
5. Demonstration on working of different types of Engines
6. Demonstration on different types of lubricants
7. Demonstration on textile mill building planning
8. Study of atmospheric Humidification
9. Study of different types of boilers
10. Demonstration of steam and its utilization in textiles
11. Study of different types of Water Pumps
12. Study of different water softening plants
13. Study of waste water treatment system
14. Study of air compressors and their air calculations
15. Demonstration on bearings working
16. Demonstration on air conditioning and air chillers and calculations of air changes

TTW-243 TEXTILE AND WOOL CHEMICAL PROCESSING

Total Contact Hours 160 Hrs

			T	P	C
Theory	**:**	**64 Hrs**			
Practicals	**:**	**96 Hrs**	**2**	**3**	**3**

LEARNING OUTCOMES: At the end of this course, students will be able to:

1. Apply the elementary principles of wet processing for the treatment of various textile fibers such as wool, cotton, silk, and synthetic fibers.
2. Independently perform the bleaching, dyeing, printing, and finishing of various fibers.

COURSE CONTENTS:

1.	**INSPECTION OF FABRIC**	**04 Hrs**
1.1	Inspection systems.	
1.2	Faults in yarn and fabric	
2.	**SINGEING**	**04 Hrs**
2.1	Objectives of singeing	
2.2	Parameters of singeing	
3.	**DESIZING**	**04 Hrs**
3.1	Objectives of desizing	
3.2	Desizing techniques	
4.	**SCOURING (COTTON, WOOL, MAN MADE FIBER)**	**04 Hrs**
4.1	Objective of scouring	
4.2	Scouring process	
4.3	Scouring of wool and other fibers	
5.	**BLEACHING**	**06 Hrs**
5.1	Objectives of bleaching	
5.2	Methods of wool bleaching	
5.3	Machinery for wool bleaching	
6.	**MERCERIZING**	**04 Hrs**
6.1	Objectives of Mercerizing	
6.2	Mercerizing process	
6.3	Mercerizing machines and methods	
7.	**DYEING OF TEXTILES**	**12 Hrs**
7.1	Dyeing with different dyes	
7.2	Eco dyeing systems in textile dyeing	
8.	**DYEING MACHINES**	**06 Hrs**
8.1	Different dyeing machines	
8.2	Working of dyeing machines	
9.	**PRINTING OF TEXTILES**	**08 Hrs**
9.1	Different printing machines	
9.2	Printing of wool and other textile fibers	
10.	**FINISHING OF TEXTILES**	**06 Hrs**
10.1	Chemical and physical finishes	
10.2	Machinery for chemical and physical finishes	

11. FINISHING OF WOOLEN FABRICS 06 Hrs

11.1 Principles of wool fabric finishing

11.2 Methods of wool fabric finishing

11.3 Final Inspection

RECOMENDED BOOKS:

1. Chemical Technology in the pretreatment processes of Textiles. BY: S.R. KARMAKAR, 1999
2. Chemistry & Technology of Fabric Preparation & Finishing by Dr. Charles Tomasino, 1992
3. Textile Printing by WC Miles, 2003
4. Finishing reference book for textile technologies by ACIMIT, 2022

TTW-243 TEXTILE AND WOOL CHEMICAL PROCESSING

INSTRUCTIONAL OBJECTIVE:

1. INSPECTION OF FABRIC

1.1 State different systems for the inspection of fabrics
1.2 Perform grading of the cloth
1.3 Explain faults in the cloth

2. SINGEING

2.1 Explain singeing methods
2.2 Explain the working of singeing machines.
2.3 Perform evaluation of singed fabric

3. DESIZING

3.1 Explain different desizing techniques
3.2 Demonstrate enzyme desizing

4. SCOURING

4.1 Explain scouring process
4.2 Demonstrate the scouring of wool and other fiber based fabrics

5. BLEACHING

5.1 Discuss the bleaching with hydrogen peroxide
5.2 Explain bleaching with chlorine bleaching agents
5.3 Explain the bleaching plant
5.4 Explain the bleaching of wool and other textile fiber based structures

6. MERCERIZING

6.1 Explain the mercerizing process
6.2 Explain the mercerizing machines
6.3 Describe the evaluation of mercerized fabrics
6.4 Evaluate the different mercerization methods

7. DYEING OF TEXTILES

7.1 Understand the properties of direct, reactive, vat, sulphur, acid, and disperse dyes
7.2 Explain the role of auxiliaries used in direct, reactive, vat, sulphur, acid, and disperse dyeing of textiles
7.3 Explain the process of dyeing with direct, reactive, vat, sulphur, acid, and disperse dyes
7.4 Explain the eco dyeing processes

8. DYEING MACHINES

8.1 State different dyeing machines
8.2 Explain the processes carried out at different dyeing machines
8.3 Illustrate the difference between the different machines' working

9. PRINTING OF TEXTILES

9.1 Explain different printing machines
9.2 Explain the preparation of printing paste
9.3 Explain the role of auxiliaries used in print paste
9.4 Demonstrate pigment, reactive, vat, and disperse printing
9.5 Explain the printing of wool and other fiber based textile structures

10. FINISHING OF TEXTILES:

10.1 Explain the chemistry and properties of different chemical finishes
10.2 Explain the application of various chemical finishes on textiles

10.3 Explain the processes of physical finishes
10.4 Explain the machinery for chemical and physical finishes

11. FINISHING OF WOOLEN FABRICS

11.1 Explain the principle of wool fabric finishing
11.2 Explain the different wool fabric finishing processes
11.3 Explain the properties induced in wool by different finishing processes

TTW-243 TEXTILE AND WOOL CHEMICAL PROCESSING

LIST OF PRACTICALS:

96 Hrs

1. Perform the desizing of greige fabric using enzymes by exhaust method.
2. Perform the desizing of greige fabric using enzymes by cold pad batch method
3. Execute the scouring of desized cotton/wool fabric by exhaust and pad steam method
4. Perform the scouring of wool fabric using soda ash
5. Execute the bleaching of scoured cotton fabric using hydrogen peroxide and sodium hypochlorite by exhaust method
6. Perform the bleaching of scoured cotton fabric using sodium chlorite by exhaust method
7. Execute the bleaching of desized cotton fabric using hydrogen peroxide by the exhaust method
8. Execute the bleaching of wool fabric scoured using hydrogen peroxide by the exhaust method
9. Study the effect of different dyeing parameters on the shade depth of dyed cotton fabric using direct and reactive dyes.
10. Observe the effect of different dyeing parameters on the shade depth of dyed wool fabric using direct dyes.
11. Observe the effect of different dyeing parameters on the shade depth of dyed cotton fabric using vat and sulphur dyes.
12. Study the effect of different dyeing parameters on the shade depth of dyed nylon fabric using acid dyes.
13. Study the effect of different dyeing parameters on the shade depth of dyed acrylic fabric using basic dyes.
14. Study the effect of different dyeing parameters on the shade depth of dyed polyester fabric using disperse dyes.
15. Printing wool and cotton fabrics using pigments.
16. Printing wool and cotton fabrics using reactive dyes.
17. Printing of cotton fabric using vat dyes.
18. Application of different softeners on wool and other fibers and evaluation of fabric characteristics.
19. Application of a crease-resistant finish to cotton/wool fabric and evaluation of the fabric's characteristics.
20. Application of a water repellent finish on cotton/wool fabric and evaluation of fabric characteristics for technical applications.
21. Application of flame-retardant finish on cotton/wool fabric and evaluation of fabric characteristics for technical applications.
22. Perform the calendaring process on fabric and evaluate fabric characteristics.
23. Perform the sanforizing of fabric and evaluate fabric characteristics.
24. Perform raizing process on the given fabric and evaluate fabric characteristics.

TTW-254 TEXTILE AND WOOL GARMENTS AND MADE-UPS

		T	P	C
Total Contact Hours	**192 Hrs**			
Theory:	**96 Hrs**	**3**	**3**	**4**
Practical:	**96 Hrs**			

LEARNING OUTCOMES: At the end of this course, students will be able to:

1. Apply the elementary principles of garment manufacturing for various textile products, including casual wear, ethnic wear, and made-ups.
2. Handle garments manufacturing operations, including patterning, cutting, stitching, seams, finishing, and packing.

COURSE CONTENTS

PART-A 48 Hrs

1.	**OVERVIEW OF APPAREL INDUSTRY AND TYPES OF ARTICLES**	**03 Hrs**
1.1	Overview and Structure of the Apparel Manufacturing Industry in Pakistan and the World.	
1.2	Types of articles used in the Pakistani industry	
2.	**PRODUCT DEVELOPMENT PROCESS**	**03 Hrs**
2.1	Pre-adoption phase, line adoption phase	
2.2	Post-adoption phase	
2.3	Design development	
3.	**MERCHANDISING**	**06 Hrs**
3.1	Process flow in the merchandising	
3.2	Marketing vs merchandising	
4.	**SAMPLING PROCESS**	**06 Hrs**
4.1	Responsibilities of the sampling department	
4.2	Different types of samples	
5.	**PRODUCTION PLANNING AND CONTROL**	**06 Hrs**
5.1	Aims of production planning and control	
5.2	Characteristics of production planning and control	
5.3	Aspects of production control	
6.	**INDUSTRIAL ENGINEERING**	**06 Hrs**
6.1	Broad areas of industrial engineering	
6.2	Role of industrial engineering	
7.	**GARMENT PREPARATORY PROCESS (FABRIC INSPECTION)**	**03 Hrs**
7.1	Process flow in the garments preparatory process	
7.2	Importance and objective of each step	
8.	**GARMENT PREPARATORY PROCESS (MARKER MAKING)**	**06 Hrs**
8.1	Importance of the marker	
8.2	Dimensions of the marker	
8.3	Marker making techniques	
9.	**GARMENT PREPARATORY PROCESS (SPREADING)**	**03 Hrs**
9.1	Importance of spreading	
9.2	Modes of spreading	

9.3 Spreading set up
9.4 Spreading Equipment

10. GARMENT PREPARATORY PROCESS (CUTTING) 06 Hrs

10.1 Importance of cutting of fabric
10.2 Cutting Methods
10.3 Cutting Equipment and their types

PART-B 48 Hrs

11. GARMENT PRODUCTION PROCESS (SEAM AND STITCHES) 06 Hrs

11.1 Importance of stitches and their classes
11.2 Seam & types of seam

12. GARMENT PRODUCTION PROCESS (SEWING THREAD) 06 Hrs

12.1 Function of sewing thread
12.2 Types of sewing thread

13. GARMENT PRODUCTION PROCESS (SEWING MACHINES) 06 Hrs

13.1 Sewing machine fundamentals
13.2 Types of machines

14. GARMENT PRODUCTION PROCESS (MANUFACTURING SYSTEMS) 06 Hrs

14.1 Progressive bundle system
14.2 Unit production system
14.3 Modular system

15. GARMENT PRODUCTION PROCESS (WORK AIDS) 03 Hrs

15.1 Work aids and their types
15.2 Machine options as work aids

16. POST-PRODUCTION PROCESS (WASHING) 06 Hrs

16.1 Explain the Garment Wet Process
16.2 Operations in GWP & their application

17. POST-PRODUCTION PROCESS (PRESSING) 03 Hrs

17.1 Pressing, types, and Elements of pressing
17.2 Advancements in pressing equipment

18. POST-PRODUCTION PROCESS (FINISHING AND PACKING) 06 Hrs

18.1 Importance of the finishing section
18.2 Importance of the packing section
18.3 Garber Garment Technology (GGB) and its applications
18.4 Advancements in garment manufacturing

19. POST-PRODUCTION PROCESS (AUDITING AND SHIPMENT) 06 Hrs

19.1 Quality auditing ways
19.2 Acceptable quality level
19.3 Shipment and post shipment analysis

RECOMMENDED BOOKS:

1. Introduction to Clothing Manufacturing, Gerry Cooklin
2. Clothing Technology for Fashion Designers, Gerry Cooklin
3. Clothing, Jeanette Weber

TTW-254 TEXTILE AND WOOL GARMENTS AND MADE-UPS

INSTRUCTIONAL OBJECTIVE:

PART-A

1. OVERVIEW OF APPAREL INDUSTRY AND TYPES OF ARTICLES

1.1 Understand the structure of the apparel manufacturing industry in Pakistan/ world

1.2 Understand the concept of the supply chain of the apparel industry

2. PRODUCT DEVELOPMENT PROCESS

2.1 Understand the concept of product development

2.2 Understand the pre-adoption phase, line adoption phase, and the adoption phase

2.3 Understand design development, like concept board, using design elements and principles

3. MERCHANDISING

3.1 Understand the process flow in the merchandising department

3.2 Identify the key activities of the merchandising department

3.3 Differentiate between marketing and merchandising

4. SAMPLING PROCESS

4.1 Understand the sampling process and identify the responsibilities of the sampling department

4.2 Identify the different types of samples in the garment industry

4.3 Understand the steps in the sampling process

4.4 Sampling precautions for woolen fabrics and articles

5. PRODUCTION PLANNING AND CONTRO L

5.1 Understand the aims, objectives, and characteristics of production planning and control

5.2 Identify the areas of production control

5.3 Understand the elements of production planning

6. INDUSTRIAL ENGINEERING

6.1 Broad areas of industrial engineering can be defined

6.2 Define the role of industrial engineering

6.3 Define and calculate the measures of productivity

7. GARMENT PREPARATORY PROCESS (FABRIC INSPECTION)

7.1 Understand the process of receiving fabric at the store

7.2 Understand the internal quality check

7.3 Understand the cut order planning

7.4 Understand the fabric issuance for cutting

8. GARMENT PREPARATORY PROCESS (MARKER MAKING)

8.1 Understand the markers and dimensions of the marker

8.2 Understand the marker making (Manual vs Computerized)

8.3 Understand the lay planning and its procedure

8.4 Understand the quality of marker making

9. GARMENT PREPARATORY PROCESS (SPREADING)

9.1 Understand the process of spreading and its modes

9.2 Understand the spreading quality and setup for spreading

9.3 Understand the spreading of woolen and other fabrics

9.4 Understand the spreading equipment and spreading costs

10. GARMENT PREPARATORY PROCESS (CUTTING)

10.1 Understand the cutting process and cutting quality
10.2 Differentiate between the cutting methods (Manual vs automated)
10.3 Understand the cutting equipment and cutting costs
10.4 Understand the ticketing and bundling
10.5 Understand the cutting precautions for woolen products

PART-B

11. GARMENT PRODUCTION PROCESS (SEAM AND STITCHES)
11.1 Identify and understand stitch & stitch classes.
11.2 Identify and understand seam & types of seam
11.3 Understand the process of stitch formation
11.4 Understand the stitch control in woolen articles
11.5 Understand the stitch properties
12. GARMENT PRODUCTION PROCESS (SEWING THREAD)
12.1 Understand the function of sewing thread
12.2 Identify the types of sewing thread
12.3 Understand the quality of sewing thread
12.4 Identify the most suitable thread for wool articles
12.5 Identify the sewing thread alternative
13. GARMENT PRODUCTION PROCESS (SEWING MACHINES)
13.1 Understand the sewing machine fundamentals
13.2 Identify the types of machines
13.3 Understand the functions of machine casting and other machine parts.
13.4 Understand the process of sewing machine maintenance
14. GARMENT PRODUCTION PROCESS (MANUFACTURING SYSTEMS)
14.1 Understand the progressive bundle system.
14.2 Understand the unit production system
14.3 Understand the modular system
15. GARMENT PRODUCTION PROCESS (WORK AIDS)
15.1 Identify the work aids and their types
15.2 Separate devices as work aids
15.3 Identify the attachments
15.4 Identify the machine options as work aids
16. POST-PRODUCTION PROCESS (WASHING)
16.1 Explain the Garment Wet Process
16.2 Understand the operations in GWP & their applications
16.2.1. Desizing
16.2.2. Enzyme application
16.2.3. Bleaching
16.2.4. KMnO4 application
16.2.5. Tinting/Dye
16.2.6. Neutralization
16.2.7. Single/Double Stone Wash
16.2.8. Garment Wash
16.2.9. Fixer & Softeners

17. POST-PRODUCTION PROCESS (PRESSING)

17.1 Understand the pressing and elements of pressing

17.2 Understand the pressing equipment

17.3 Understand the types of pressing

17.4 Understand the pressing techniques

17.5 Understand the advancements in pressing equipment

17.6 Understand the pressing of wool articles

18. POST-PRODUCTION PROCESS (FINISHING AND PACKING)

18.1 Understand the responsibilities of the finishing section

18.2 Understand the responsibilities of the packing section

18.3 Identify packing types, packing material, and garment presentation

18.4 Identify the different care symbols, their application, and use

18.5 Garber Garment Technology (GGB) and its applications

18.6 Advancements in garment manufacturing

19. POST-PRODUCTION PROCESS (AUDITING AND SHIPMENT)

19.1 Define quality auditing

19.2 Understand the acceptable quality level

19.3 Understand the process of conducting a final audit

19.4 Understand the shipment and post-shipment analysis

TTW-254 TEXTILE AND WOOL GARMENTS AND MADE-UPS

LIST OF PRACTICALS: 96 Hrs

1. Development of basic bodice block pattern.
2. Development of trouser pattern.
3. Development of skirt pattern.
4. Study of parts and functioning of fabric cutting machine (Straight knife cutter).
5. Study of the parts and functioning of a lock stitch sewing machine.
6. Perform bobbin winding and needle threading of a lock stitch sewing machine.
7. Study of parts and the functioning of the overlock machine. Threading of 3-thread, overlock, and 4-thread overlock sewing machines. Draw a line diagram of the needle and the loopers' thread.
8. Observe the parts and the functioning of the chain stitch machine.
9. Prepare a Flow Process Chart and a Flow Diagram for the top garment for OPC.
10. Draw drive mechanisms of Thread Take-Up Lever and Needle Bar, hook, feed dogs, and lubrication system of a Lockstitch Machine.
11. Study the timing of needle bar & crank shaft of a Lockstitch Sewing machine.
12. Analyze the effect of using feed dogs Size-1, Size-2 on seam quality of light weight and heavy weight fabrics using different machines
13. Analyze the effect of different gauge settings (differential feed) on seam quality of knitted and woven fabrics in the overlock machine
14. Investigate the effect of Needle size 9, Needle size 11, and Needle size 14 on seam quality using stitch class 300 Family using grey fabric.
15. Investigate the effect of Needle size 9, Needle size 11, and Needle size 14 on seam quality using stitch class 400 Family using grey fabric.
16. Perform the XY Scale/ design changing in the button attach and bar-tack machine.
17. Investigate the effect of varying thread tension using the thread tension assembly on final seam performance.
18. Evaluate the effect of an increase in presser foot assembly pressure on seam performance.
19. Study the main frame, cover components, and operating principles of the Embroidery Machine.
20. Study the main frame, cover components, and operating principles of the heat transfer machine.
21. Study the main frame, cover components, and operating principles of the Auto pattern machine.
22. Assessment of manual activity by dexterity tests.
23. Analysis of a garment for stitches and seams
24. Perform stitching Exercises on paper using a lock stitch practice machine.
25. Perform stitching Exercise using fabric swatches.
26. Prepare Operation Process Chart (OPC) for top garment.

27. Prepare a Man-Machine Chart for the given situation.
28. Conduct a method study for the given situation and analyze how to improve productivity by using the motion economy
29. Calculate the coefficient of correlation for the time study person using the performance rating technique.
30. Calculate the standard time for the given job.
31. Design an optimal layout for the sewing floor by appropriate line balancing.
32. Anthropometric measurement of human body (young Pakistani males and females) and compare it with the international data bank

Elect-212 APPLIED ELECTRICITY AND ELECTRONICS

Total Contact Hours 128 Hrs

			T	P	C
Theory	**:**	**32 Hrs**			
Practicals	**:**	**96 Hrs**	**1**	**3**	**2**

Pre-requisites: Applied Physics (1st year}

AIMS: This course enables the students to understand the fundamentals of electricity, know the devices used for the control of industrial equipment, their properties, and uses. The course provide the knowledge of working principles and operation of A.C. and D.C. motors,

transformers and generators, interpret connection diagrams of various electrical devices. Students will be able to observe safety rules and provide electric shock treatment.

CorseContents:

1. FUNDAMENTALS OF ELECTRICITY 4 Hrs

1.1 **Current, (AC and DC Supply**) voltage and resistance, their units, single phase and three phase supply

1.2 Ohms law, simple calculations

1.3 Laws of resistance, simple calculations

1.4 Combination of resistances, simple calculations, capacitors and their combinations

1.5 Electrical and mechanical power, their conversion, units, horse power

1.6 Heating effect of current, joules law

1.7 Electrical energy, units, energy bill

1.8 Batteries and battery cells

2. PROTECTION DEVICES AND ELECTRICAL SAFETY 4 Hrs

2.1 Fuse and their types

2.2 Circuit breaker and their types

2.3 Relay and their types

2.4 Starter and their types

3. MOTORS, GENERATORS AND TRANSFORMERS 5 Hrs

3.1 Faraday's law

3.2 Construction and working of AC and DC generators

3.3 Construction and working of transformers, emf and current equation types

3.4 Welding transformers, ratings

3.5 Types & Working of Motors

3.5.1 AC Motors: Single Phase and 3-Phase Induction Motor
Dc Motors: Servo Motor, Stepper Motor

4. (A) MEASURING INSTRUMENTS 5Hrs

4.1 Basic Electrical measuring instruments

4.2 Ammeter, Voltmeter, Ohm meter, Multimeter, Watt meter Energy Meter and their connections

4.3 Use of multimeter

4.4 Use of megger

(B) DOMESTIC WIRING

4.5 Introduction to wiring and their types

5. FUNDAMENTALS OF ELECTRONICS 5 Hrs.

5.1 Semi-conductor theory, doping, P & N type materials

5.2 PN Junction diode, potential barrier, forward and reverse bias

5.3 Use of PN Diode as rectifier

5.4 Half-wave, full-wave and bridge rectifiers

5.5 Filtering, inverters and stabilizers

5.6 Power supply

6. TRANSISTORS/ AND SPECIAL DIODES 4 Hrs

6.1 PNP & NPN transistors, biasing, working

6.2 Use of transistors as amplifies, gains in CE, CB and CC amplifiers

6.3 Zener diode

6.4 Photo diode, photovoltaic cells, LED

7. PROGRAM LOGIC CONTROLLER (PLC) and Logic Gates 5 Hrs

7.1 PLC advantage and disadvantages and its types

7.2 Basic PLC programming

7.3 Gate and types, Relay logic

7.4 k. maps, binary system

7.5 Design a control circuit **5 Hrs**

Recommended Textbooks:

1. **Examples of Electrical Calculations, by Admiralty**
2. **Reed's Basic electro-technology for marine engineers, KRAAL**
3. **Electrical Technology, B.L. Theraja**
4. **AC & DC circuits B. Grob**
5. **Basic Electronics B. Grob**
6. **Digital Electronics by Moris Mayno**

Elect-212 **APPLIED ELECTRICITY AND ELECTRONICS**

Instructional Objectives:

1. UNDERSTAND BASIC CONCEPTS AND LAWS OF ELECTRICITY

1.1 Define units of current, voltage and resistance with respect to supply of single phase and three phase

1.2 Explain Ohm's Law with simple calculations

1.3 Solves simple problems o n laws of resistance

1.4 Substitute two of the three variables to find the third unknown in equation V=I x R

1.4.1 Calculate

1.4.2 the equivalent resistances for resistors joined in series, parallel and combination

1.4.3 Calculate the total capacitance in series and parallel

1.5 Calculate electrical and mechanical power and the inter relation between the two systems

1.6 Heating effect of current, Jowls Law

1.7 Calculate the electrical energy consumption in an installation and prepare the energy bill

1.8 Define the inductors and its uses

1.9 Define RLC circuit and its uses

1.10 Define the batteries and battery cell

1.10.1 Define primary and secondary battery

1.10.2 State the types of primary and secondary batteries

2. UNDERSTAND PROTECTION DEVICES AND ELECTRICAL SAFETY

2.1 Define Fuse and its current rating, fusing factor, Types of fuses, Re-wirable and HRC

2.2 Explain working of circuit breaker, Types of C.B, High power circuit breaker and their types, Domestic Circuit breakers

2.2.1 Difference between MCB and MCCB, Types of MCB w.r.t. poles

2.3 Define relay and explain its working

2.3.1 State types of relays w.r.t working

2.4 Describe starter and its types

2.4.1 Explain the working of following starter, 3Point, 4Point and star delta starter and soft starter)

2.4.2 Understand personal safety while working on electricity)

3. **UNDERSTAND WORKING OF ELECTRIC MOTORS, AND GENERATORS AND TRANSFORMERS**

3.1 Explain Faraday's law

3.2 State the construction of alternator and D.C. generator with its parts and working

3.3 Explain the working principal of transformers and emf equation

3.4 State various parts of a welding transformer and setting

3.5 Explain the working of single phase, three phase, and servo motors

3.6 Explain the working of stepper motors

4. INSTRUMENTS AND BASIC WIRING

4.1 Define instrument and their types, Use of instruments and their connections)

4.2 Define secondary analog digital and working effect

4.3 Explain types of meters, there uses and connection in a circuit , Ammeter, Voltmeter, Ohm meter, Multimeter, Watt meter and Energy Meter

4.4 Define electric wiring and enlist the accessories used in Domestic wiring

4.4.1 Describe batten wiring, conduit PVC, casing capping wiring, advantages and disadvantages of each

5. **UNDERSTAND THE FUNDAMENTALS OF ELECTRONICS**

5.1 State the Semiconductor theory

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5.1.1. State how P type and N type material is produced

5.2 State the action of potential barrier in a PN junction and the effect of forward and reverse bias on the junction

5.3 Describe the use of PN junction diode as rectifier

5.4 Draw and explain the circuit diagram for half wave and full wave rectifier

5.5 Draw and explain the Bridge Rectifier circuit with filter circuit, investors and stabilizer and its circuits

5.6 Explain Power supply

6. UNDERSTAND THE WORKING OF SPECIAL DIODES

6.1 State the biasing working of zener diodes

6.2 , State the construction working and uses of photo diodes, Photovoltaic cell and LED

7. PROGRAM LOGIC CONTROLER (PLC) AND GATES

7.1 Define PLC, working, advantages and disadvantage

7.2 Describe Basic PLC programming 7 .3 Explain Gate and Types

7.3.1 Define symbols truth able logic diagram (AND, OR, NOT, NANO, NOR, XOR, NXOR)

7.4 Define binary system decimal to binary, Hexa, octal system, K maps SOP,POS,

7.5 Explain pneumatic cylinder control, basic operation, charging control operation, connection 1/0 devices

Elect-212 APPLIED ELECTRICITY AND ELECTRONICS

List of Practical:

1. FUNDAMENTALS OF ELECTRICITY

1.1 Study of electrical measuring instruments, handling precautions, methods of connection and identification of AC & DC Meter
1.2 Verification of Ohm's law
1.3 Verification laws of combination; of resistance
1.4 Measurement of power by Volt-ammeter and wattmeter
1.5 Measurement of electrical energy
1.6 Use of primary and secondary batteries

2. PROTECTION DEVICES AND ELECTRICAL SAFETY

2.1 Application of various fuses in wiring
2.2 Study of connection circuit breaker 2 pole, 3 pole with time setting

3. MOTORS, GENERATORS AND TRANSFORMERS

3.1 Verification offaraday's laws of electro-magnetic induction
3.2 Connection of star delta starter and timer
3.3 Study of AC and DC generators
3.4 Study of welding transformers
3.5 Starting single-phase induction motors, reversal and forward
3.6 Starting 3-phase induction motors, reversal and forward
3.7 Connections of magnetic starters with motors

4. INSTRUMENTS AND WIRING

4.1 Current carrying capacity of cables
4.2 Wiring, PVC, casing Capping and Batten
4.3 Use of oscilloscope
4.4 Study of calibration of instruments using bridge circuits
4.5 Study of using AVO meter and meggar analog and digital

5. FUNDAMENTALS OF ELECTRONICS

5.1 Study and connections of PN diodes as rectifiers
5.2 Connecting PN Diode as half-wave and full-wave rectifier
5.3 Connecting PN Diode as bridge Rectifiers with filter
5.4 Study of Power Supply

6. TRANSISTORS AND SPECIAL DIODES

6.1 Connections and biasing of PNP and NPN transistors
6.2 Study and connections of zener diode as voltage regulator
6.3 Study and connections of Photodiode as light sensing device
6.4 Study and connections of DIAC's and TRIAC's as switch circuits

7. PROGRAM LOGIC CONTROLER (PLC) AND GATES

7.1 Study of PLC system
7.2 Study and connection of gate AND, OR, NOT, NANO, NOR, XOR, NXOR
7.3 Study how to execute PLC
7.3.1 Basic commands and how to design control circuit

TTW-261 WORKPLACE ETHICS & OHSE

Total contact hours:	**32 Hrs**	**T**	**P**	**C**
Theory:	**32 Hrs**	**1**	**0**	**1**
Practical	**0 Hrs**			

LEARNING OUTCOMES: At the end of this course students will be able to:

- Describe hazards at work place, knowledge of their assessment and control to prevent the acute incidents or injuries and chronic exposures to health affecting factors.

COURSE CONTENTS:

1.	**WORKPLACE ETHICS**	**2 Hrs**
1.1.	Loyalty, integrity, and respect on workplace	
1.2.	Citizenship, trustworthiness and caring attitude	
1.3.	Responsibility and accountability at workplace	
2.	**ETHICAL BEHAVIOR AT WORKPLACE**	**2 Hrs**
2.1.	The six pillars of character on job	
2.2.	Importance of each piller	
3.	**MAJOR PRINCIPLES FOR PROFESSIONAL LIFE**	**2 Hr**
3.1.	Fairness, caring, and citizenship attitudes in employees	
3.2.	Importance of these attitudes	
4.	**ACTING ETHICALLY**	**2 Hr**
4.1.	Integrity and transparency	
4.2.	Confidentiality and privacy	
4.3.	Social responsibility	
5.	**BENEFITS OF ETHICS IN THE WORKPLACE**	**3 Hrs**
5.1.	Asset Protection and Assurance	
5.2.	Public Image and Brand Value	
5.3.	Decision making and implementing	
5.4.	Trouble-free working environment	
6.	**EFFECTIVE WAYS TO TEACH WORKPLACE ETHICS**	**3 Hrs**
6.1.	Role-playing complex ethical situations	
6.2.	Discussions about workplace ethics	
7.	**OCCUPATIONAL SAFETY AND HEALTH MANAGEMENT SYSTEMS**	**2 Hrs**
7.1.	Occupational health and safety policy	
7.2.	Worker participation	
7.3.	Hazard identification, risk assessment and control	
7.4.	Management of risk	
8.	**HAZARDS AT WORKPLACE**	**2 Hrs**
8.1.	Chemical hazards	
8.2.	Physical hazards	
8.3.	Biological hazards	
8.4.	Fire hazards	
9.	**SAFETY REQUIREMENTS FOR TOOLS, MACHINES**	

	AND EQUIPMENT	**2 Hrs**
9.1.	Risk control strategies	
9.2.	Safe working systems and procedures	
9.3.	Control measures for different tools, machines and equipment	
10.	**PERSONEL PROTECTIVE EQUIPMENT**	**2 Hrs**
10.1.	OHSA PPE standards	
10.2.	Protective equipment for different body parts and systems	
11.	**WASTE AND EMISSION MANAGEMENT**	**2 Hrs**
11.1.	Emission of smoke and chemicals	
11.2.	Emission of solid waste and effluent	
11.3.	Risk assessment and control measures	
12.	**COMPETENCE AND TRAINING**	**2 Hrs**
12.1.	Training of managers, supervisors and workers	
12.2.	Methods of training	
13.	**INTRODUCTION TO WORKPLACE ETHICS**	**2 Hrs**
13.1.	Definition of ethics	
13.2.	Ethical and unethical behaviors	
14.	**ATTRIBUTES OF WORKPLACE ETHICS**	**2 Hrs**
14.1.	Loyalty, comradery, citizenship, trust worthiness, reliability, integrity, respect, caring, fairness, responsibility, accountability, compliance	
14.2.	Six pillars of character	
15.	**IMPORTANCE OF ETHICS IN WORKPLACE**	**2 Hrs**
15.1.	Role of ethics in an organization	
15.2.	Professionalism vs ethics at workplace	
15.3.	Benefit of ethics in the workplace	

RECOMMENDED BOOKS:

1. Occupational Safety and Health For Technologists, Engineers, and Managers by David L. Goetsch, 2015
2. Safety and health in textiles, clothing, leather and footwear by ILO, 2022
3. Ethics in workplace by Dean Bredeson J. D. and keith Goree, 2012
4. Ethics in the workplace by Ottensmeyer, Edward J. 1996

TTW-261 WORKPLACE ETHICS & OHSE

INSTRUCTIONAL OBJECTIVE

1. WORKPLACE ETHICS

1.1. Explain loyalty and its types
1.2. How to be trustworthy on the Job?
1.3. What is Integrity in the workplace?
1.4. Explain the role of respect in work.
1.5. Illustrate the ways to be caring on the Job
1.6. Explain the ways to be fair in the workplace
1.7. Explain the role of responsibility in organizations
1.8. Illustrate the effects and benefits of accountability
1.9. Explain the citizenship aspects in the workplace

2. ETHICAL BEHAVIOR AT WORKPLACE

2.1. Define the six pillars of character on the job
2.2. Explain trustworthiness with a worksheet, on the job.
2.3. Explain Integrity with work sheet, on the job
3.1. Demonstrate the reliability with work worksheet
3.2. Learn about loyalty to the organization
3.3. Elaborate aspects of respect at the Workplace (Respect Role Play: Men & Women)
3.4. Explain the aspects of responsibility in the workplace.

3. MAJOR PRINCIPLES FOR PROFESSIONAL LIFE

3.5. Explain aspects of fairness in the workplace
3.6. Demonstrate the ways to be caring in the workplace
3.7. Learn about the importance of citizenship for organizations

4. WHY PEOPLE DON'T ACT ETHICALLY?

4.1. Illustrate the importance of Integrity and transparency in the workplace
4.2. Explain the importance of respect for diversity in the workplace
4.3. Learn the types of confidentiality and privacy in the workplace
4.4. Learn Social Responsibility

5. LEARNING THE BENEFITS OF ETHICS AT THE WORKPLACE

5.1. What does Asset Protection and Assurance mean
5.2. Learn how Productivity will increase
5.3. Learn how teamwork will be developed
5.4. Illustrate the aspects of public image and Brand Value
5.5. Explain easy and effective ways of decision making and implementation
5.6. Learn how the work environment will become trouble-free
5.7. Learn how there will be no one left negative at the workplace
5.8. Explain the Legal Issues related to workplaces

6. LEARNING THE EFFECTIVE WAYS TO TEACH WORKPLACE ETHICS

6.1. Learn to teach workplace ethics to employees
6.2. Explain the teaching methodology about workplace ethics
6.3. Illustrate the effective ways to teach ethics

7. UNDERSTAND OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEMS

5.1. Explain occupational health and safety policy
5.2. Explain the ways to increase worker participation
5.3. Learn about hazard identification, risk assessment and control
5.4. Illustrate the ways for the management of risk

8. UNDERSTAND HAZARDS AT WORKPLACE

8.1. Describe different types of hazards in workplace
8.2. Assess and analyze the various hazards in work place
8.3. Explain the measures to control these hazards

9. UNDERSTAND SAFETY REQUIREMENTS FOR TOOLS, MACHINES AND EQUIPMENT

9.1. Elaborate the risk control strategies
9.2. Explain safe working systems and procedures
9.3. Express the control measures for different tools, machines and equipment

10. UNDERSTAND PERSONEL PROTECTIVE EQUIPMENT:

10.1. Explain OHSA standards
10.2. Explain Protective equipment for different body parts and systems

11. UNDERSTAND WASTE AND EMISSION MANAGEMENT:

11.1. Explain the emission of smoke and chemicals
11.2. Explain the emission of solid waste and effluent
11.3. Understand the ways to control these wastages
11.4. Understand the environmental impacts of different waste types

12. UNDERSTAND COMPETENCE AND TRAINING

12.1. Understand the ways to train managers
12.2. Understand the ways to train supervisors
12.3. Understand the ways to train workers
12.4. Explain the methods of training to employees
12.5. Explain the ways to increase competence of employees

13. UNDERSTAND GENERAL WORKPLACE ETHICS

13.1. Define and explain the ethics at workplace
13.2. Explain the ethical and unethical behaviors
13.3. Differentiate the different behaviors at workplace
13.4. Learn to tackle different behaviors at workplace

14. UNDERSTAND THE ATTRIBUTES OF WORKPLACE ETHICS

14.1. Demonstrate the attributes of workplace ethics
14.2. Explain the six pillars of character
14.3. Illustrate the ways to improve these characters

15. UNDERSTAND IMPORTANCE OF ETHICS AT WORKPLACE

15.1. Explain the role of ethics at workplace
15.2. Describe professionalism vs ethics at workplace
15.3. Demonstrate the importance of ethics at workplace

3RD Year

سال سوئم

حصہ اول اسلامیات

تدریس مقاصد

قرآن حکیم:

عمومی مقاصد: منتخب سورتوں اور آیات کی روشنی میں اسلام کے بنیادی مقاصد اور عبادات جان سکے

خصوصی مقاصد: طالب علم اس قابل ہو جائے گا کہ۔

سورۃ الفاتحہ، آیت لکرسی، سورۃ بقرہ کی آخری آیات از من الرسول سے اور سورۃ اخلاق کا ترجمہ و تشریح کر سکے

طالب علم درج ذیل کا مفہوم بیان کر سکے

() رب العالمین صرف اللہ تعالیٰ ہے

() اللہ رحم کرنے والا ہے

() قیامت کے دن بادشاہی اللہ کی ہوگی

() عبادات اور استعانت کا حقدار صرف اللہ ہے

() طالب علم درج ذیل کا مفہوم بیان کر سکے

() اللہ پاک ہر عیب سے پاک ہے

() اللہ کے اسمائے حسنہ حق اور قیوم ہیں

() تمام انبیاء پر ایمان لانا ضروری ہے

() رسول، ملائکہ، کتب، سماویہ، پر ایمان لانا فرض ہے

() اطاعت حقیقی صرف اللہ کے لیے ہے

() اسلامی احکامات پر عمل کرنا امساتی بساط میں ہے

() کفر کو اللہ کی مدد کے بغیر شکست نہیں دی جا سکتی

() اللہ ایک ہے

() اللہ کسی کا محتاج نہیں نہ اسکا کوئی شریک ہے

منتخب احادیث:

عمومی مقصد: احادیث کی روشنی میں اسلامی تعلیمات پر عمل پیرا ہو سکے

خصوصی مقاصد:

() احادیث کا ترجمہ بیان کر سکے

() احادیث کی تشریح کر سکے

() معاشرتی اور انفرادی زندگی میں احادیث سے رہنمائی حاصل کر سکے

حقوق و فرائض:

عمومی مقاصد:

() اسلامی معاشرے کا ایک اچھا فرد بن سکے

خصوصی مقاصد:

() والدین کے حقوق و فرائض بیان کر سکے

() ہمسائیوں کے حقوق بیان کر سکے

() بچوں کے حقوق بیان کر سکے

() عورتوں کے حقوق کی پاسداری کر سکے

() بزرگ شہریوں کے حقوق کا خیال رکھ سکے

() مخنث حضرات کے حقوق جان سکے اور ان کے حقوق کی پاسداری کر کے انہیں معاشرے کا ایک مفید فرد بنایا جا سکے

() اسلام میں حقوق و فرائض کی آگاہی کی صورت میں اپنے اندر خدمت خلق کا جذبہ پیدا کر سکے

اسلامی اقدار:

عمومی مقاصد:

() طالب علم جان سکے گا کہ تعلیم کا مقصد حسن اخلاق سے متصف ہونا ہے

خصوصی مقاصد:

() اخلاق کے معنی و مفہوم کو بیان کر سکے

() اسلام میں حسن و اخلاق کی اہمیت بیان کر سکے

() قرآن و سنت کی روشنی میں صبر و استقلال کی اہمیت بیان کر سکے

() ایفائے عہد کی اہمیت بیان کر سکے

() اخوت کے معنی و مفہوم بیان کر سکے

() اخوت اسلامی کی اہمیت بیان کر سکے

نصاب (سال سوئم)

GEN 301

مطالعہ پاکستان

ٹی	پی	سی
1	0	1

کل وقت 12 گھنٹے

حصہ دوئم

موضوعات:

() اسلام کی آ

() قیام پاکستان

() باؤنڈری کمیشن

() ریڈکلف ایوارڈ

() تقسیم بنگال

() تقسیم پنجاب

() مسئلہ مہاجرین

() ریاست کا الحاق

() ریاست جموں کشمیر

() نہری پانی کا تنازعہ

() قرارداد پاکستان

() علماء کے بائیس نکات

() 1956-1962-اور 1973 کے دساتیر کی اسلامی/انسانی حقوق کی دفعات (8 تا 28)۔

() اقلیتوں کے حقوق۔ دیگر محروم طبقات کے حقوق

() پاکستان کا محل وقوع اور اسکی جغرافیائی اہمیت۔ GSP+ کا تعارف اور عملی طریقہ کار

() قدرتی وسائل (تیل، گیس، کوئلہ)

مطالعہ پاکستان (حصہ دوئم)

قیام پاکستان

تدریس مقاصد:

عمومی مقاصد:

() قیام پاکستان کے بعد درپیش مسائل سے آگاہی حاصل کرے اور بیان کرے

خصوصی مقاصد:

() باؤنڈری کمیشن تشکیل اور اس کے فرائض بیان کر سکے

() ریڈکلف اور اس کے ایوارڈ کے بارے بیان کر سکے

() بنگال اور کلکتہ کی تقسیم کی وجوہات بیان کر سکے

() پنجاب کی تقسیم کی تفصیل بیان کر سکے

() مہاجرین کی آمد سے جو مسائل پیدا ہوئے انہیں بیان کر سکے

() ریاستوں کے الحاق کے بارے میں تفصیل بیان کر سکے

() ریاست جموں کشمیر کے بارے میں بیان کر سکے

() نہری پانی کے تنازعہ کو بیان کر سکے

() قرارداد مقاصد کی تفصیلات بیان کر سکے

() 22 علماء کے متفقہ اسلامی نکات بیان کر سکے

() 1973 کے آئین میں انسانی حقوق کی دفعات (28-8)۔اقلیتوں کے حقوق اور دیگر محروم طبقات کے حقوق کے بارے میں جان سکے

() قیام پاکستان کے بعد نفاذ اسلام کی کوششوں کو بیان کر سکے

() پاکستان کے محل وقوع اور اس کی جغرافیائی اہمیت بیان کر سکے اور +GSP کے تعارف اور عملی طریقہ کار بیان کر سکے

() پاکستان میں قدرتی وسائل (تیل، گیس، کوئلہ) کے بارے میں بیان کر سکے

غیر مسلم طلباء کے لیے

GEN301

نصاب اخلاقیات

سال سوئم

ٹی	پی	سی
1	0	1

کل وقت 20 گھنٹے

موضوعات:

() احساس ذمہ داری

() مثبت ذہن

() عدل وانصاف

() قومی خدمت کا جذبہ

() ذکر ونظر کی پاکیزگی

() احترام آدمیت

() شائستگی

() عفوودرگذر

() بردباری

() خودانحصاری

() اثر ونفوذ

() جامعیت

() اپنی ذات کی معرفت (بذریعہ ہم عمر طلباء، اساتذہ، اہم شخصیات)

() بچوں کے حقوق

() عورتوں کے حقوق

() بزرگ شہریوں کے حقوق

() مخنث حضرات کے حقوق

غیر مسلم طلباء کے لیے
نصاب اخلاقیات (سال سوئم)

تدریس مقاصد:

عمومی مقاصد:

() ملکی ترقی کے لیے اعلیٰ اوصاف کے ساتھ بہتر طور پر ملک وملت کی خدمت کر سکے

خصوصی مقاصد: طالب علم اس قابل ہو سکے کہ

() موضوعات کا مطلب بیان کر سکے

() عملی زندگی سے مثالوں کی نشاندہی کر سکے

() موضوعات کی اہمیت بیان کر سکے

() اپنی شخصیت اور معاشرے پر موضوعات کے مطابق اثرات پیدا کرنے کے طریقے بیان کر سکے

() مثبت ذہن کے ساتھ کام کر سکے

() عدل وانصاف سے ادارہ میں، دفتر میں بہتر ماحول پیدا کر سکے

() ماحول کو اخلاقی طور پر پاکیزہ بنائے

() کارکنوں کی بہتر طور پر دل جوئی کر سکے

() کارکردگی میں اضافہ کر سکے

() باہمی احترام کی برکات سے استفادہ کر سکے

() بچوں کے حقوق بیان کر سکے

() عورتوں کے حقوق کی پاسداری کر سکے

() بزرگ شہریوں کے حقوق کا خیال رکھ سکے

() مخنث حضرات کے حقوق جان سکے اور ان کے حقوق کی پاسداری کر کے انہیں معاشرے کا ایک مفید فرد بنایا جا سکے

Mgm-391 ENTREPRENEURSHIP & INDUSTRIAL MANAGEMENT

Total contact hours:	**32 Hrs**	**T**	**P**	**C**
Theory:	**32 Hrs**	**1**	**0**	**1**
Practical	**0 Hrs**			

LEARNING OUTCOMES: At the end of this course students will be able to:

Develop entrepreneurial and managerial skills, familiarize themselves with management principles, start new business ventures, and solve labor issues.

COURSE CONTENTS:

1.	**ENTREPRENEURIAL MINDSET**	**2 Hrs**
1.1.	Who are entrepreneurs, and what are their common characteristics?	
1.2.	How do entrepreneurs think?	
1.3.	The dark side of entrepreneurship	
1.4.	Entrepreneurial motivation	
2.	**ETHICS AND ENTREPRENEURSHIP**	**2 Hrs**
2.1.	Ethics, enterprise, and laws	
2.2.	Ethical responsibility	
2.3.	Ethics and business decisions	
3.	**OPPORTUNITY ASSESSMENT OF NEW VENTURES**	**2 Hrs**
3.1.	Critical factors to new venture development	
3.2.	Reasons for the failure of new ventures	
3.3.	The evaluation process	
4.	**MARKETING RESEARCH FOR NEW VENTURES**	**3 Hrs**
4.1.	Marketing philosophy	
4.2.	Market segmentation	
4.3.	Consumer behavior	
4.4.	Marketing stages for growing ventures	
4.5.	Marketing and pricing strategies	
5.	**FINANCIAL PLANNING FOR ENTREPRENEURIAL VENTURES**	**3 Hrs**
5.1.	Importance of financial information for entrepreneurs	
5.2.	Introduction to key financial statements	
6.	**BUSINESS PLAN FOR ENTREPRENEURIAL VENTURES**	**4 Hrs**
6.1.	Benefits of a business plan	
6.2.	Elements of a business plan	
6.3.	Presentation of a business plan	
7.	**INDUSTRIAL PSYCHOLOGY:**	**2 Hrs**
7.1.	History and definition.	
7.2.	Nature and scope.	
8.	**LEADERSHIP**	**2 Hrs**
8.1.	Definition and types	

8.2. Qualities or good leader

9. MOTIVATION **2 Hrs**

9.1. Definition.

9.2. Types (financial and non-financial motives)

9.3. Contact of motives.

10. MORALE **2 Hrs**

10.1. Importance

10.2. Development

10.3. Measurement

11. HUMAN ENGINEERING **2 Hrs**

11.1. Importance of Human factor in Industry

11.2. Man machine system

11.3. Strategy for making allocation decisions

12. INDUSTRIAL FATIGUE AND BOREDOM **2 Hrs**

12.1. Definition and distinction

12.2. Psychological and distinction

12.3. Objective causes

12.4. Prevention

13. INDUSTRIAL ACCIDENTS **2 Hrs**

13.1. Psychological causes

13.2. Objective causes

13.3. Prevention

14. INDUSTRIAL MANAGEMENT **2 Hrs**

14.1. Introduction

14.2. Functions of management

RECOMMENDED BOOKS:

1. Entrepreneurship 10th Edition by Robert Hisrich, Michael Peters, and Dean Shepherd, McGrawHill, 2016
2. Entrepreneurship 7th Edition by Donald Kuratko and Richard Hodgetts, Thomson South-Western,2007
3. Smith Wakley. Psychology of Industrial behaviors. McGraw-Hill. New York.

Mgm-391 ENTREPRENEURSHIP & INDUSTRIAL MANAGEMENT

INSTRUCTIONAL OBJECTIVES:

1. ENTREPRENEURIAL MINDSET

1.1 State the entrepreneurs and explain their common characteristics
1.2 Explain how entrepreneurs think
1.3 Understand the dark side of entrepreneurship
1.4 Explain the entrepreneurial motivation

2. ETHICS AND ENTREPRENEURSHIP

2.1 State and explain the terms of ethics, enterprise, and laws
2.2 Explain ethical responsibility
2.3 Illustrate the ethics of business decisions

3. OPPORTUNITY ASSESSMENT OF NEW VENTURES

3.1 Understand the critical factors of new venture development
3.2 Explain reasons for the failure of new ventures
3.3 Apprehend the evaluation process

4. MARKETING RESEARCH FOR NEW VENTURES

4.1 Understand the marketing philosophy
4.2 Explain the market segmentation
4.3 Illustrate consumer behavior
4.4 Explain marketing stages for growing ventures
4.5 Explain marketing and pricing strategies

5. FINANCIAL PLANNING FOR ENTREPRENEURIAL VENTURES

5.1 Understand the importance of financial information for entrepreneurs
5.2 Explain the key financial statements
5.3 Illustrate the ways of financial planning
5.4 Describe the importance of entrepreneurial ventures

6. BUSINESS PLAN FOR ENTREPRENEURIAL VENTURES

6.1 State the benefits of a business plan
6.2 Explain the elements of a business plan
6.3 Describe the ways to present a business plan

7. INDUSTRIAL PSYCHOLOGY

7.1 Describe a brief history of industrial psychology.
7.2 Describe in detail the definition of industrial psychology.
7.3 State the nature and scope of industrial psychology.
7.4 Explain the ways to tackle industrial psychology

8. LEADERSHIP

8.1 Define leadership
8.2 Describe types of leadership
8.3 State qualities of a good leader
8.4 Explain the requirements of a good leader for industries

9. MOTIVATION

9.1 Define and explain motivation.

9.2 Describe financial and non-financial motives
9.3 Explain the conflict of motives
9.4 Illustrate the ways to boost the motivation of workers

10. MORALE

10.1 State the importance of morale
10.2 Describe the development of morals
10.3 State the method of measurement of morals
10.4 Illustrate the ways to boost the morale of workers

11. HUMAN ENGINEERING

11.1 Explain the importance of human engineering in industry
11.2 Explain the man-machine system
11.3 Explain the strategy for making allocation decisions

12. INDUSTRIAL FATIGUE AND BOREDOM

12.1 Define fatigue and boredom
12.2 Describe psychological causes of fatigue and boredom
12.3 Describe the objective causes of fatigue and boredom
12.4 Explain measures to prevent fatigue and boredom

13. INDUSTRIAL ACCIDENTS

13.1 Define motivation
13.2 Describe financial and non-financial motives
13.3 Explain conflict of motives
13.4 Explain psychological causes of industrial accidents
13.5 Explain the objective causes of industrial accidents
13.6 Explain measures to prevent industrial accidents

14. INDUSTRIAL MANAGEMENT

14.1 Define management
14.2 State functions of management
14.3 Enlist subdivision of management
14.4 Explain the objectives of industrial management

TTW-313 TEXTILE CALCULATIONS

Total Contact Hours		**160 Hrs**			
Theory	**:**	**64 Hrs**	**T**	**P**	**C**
Practicals	**:**	**96 Hrs**	**2**	**3**	**3**

LEARNING OUTCOMES: At the end of this course, students will be able to:

1. Plan a complete mill as per the requirements
2. Solve textile numerical problems.
3. Analyze the efficiency and productivity of various processes.

COURSE CONTENTS

1.	**YARN NUMBERING SYSTEM**	**4 Hrs**
1.1	Count definition	
1.2	Indirect systems of yarn numbering	
1.3	Direct system of yarn numbering	
2.	**FOLDED YARN**	**5 Hrs**
2.1	Numbering of folded yarn	
2.2	Resultant counts	
2.3	Calculation of the costing of folded yarn	
3.	**DIFFERENT TYPES OF GEARS**	**5Hrs**
3.1	Different types of gears	
3.2	Problem of speed calculation	
3.3	Worm, Worm Wheel. Ratchet Wheel and mangle wheel calculation	
4.	**YARN DIAMETER CALCULATION**	**5 Hrs**
4.1	Introduction of diameter	
4.2	Diameter of cotton yarn	
5.	**SPINNING CALCULATION**	**5Hrs**
5.1	Mechanical Draft and Actual Draft	
5.2	Beaters' Speed and Waste Calculations	
5.3	Twist calculations	
5.4	Open-end/Rotor Spinning Draft and Twist calculation	
6.	**SPINNING PRODUCTION FORMULAS**	**5 Hrs**
6.1	All process production formula and numerical related to processes	
6.2	Raw materials and yarn related calculations	
7.	**YARN COST CALCULATION**	**5Hrs**
7.1	Material Cost Calculation	
7.2	Labor cost calculation	
8.	**FABRIC CALCULATION**	**5Hrs**
8.1	Fabric whole set calculations	
8.2	Factors involved in warping calculation	
8.3	Warping calculation	
9.	**SIZING CALCULATION**	**5Hrs**

9.1 Factors involved in sizing calculations
9.2 Size percentage calculation

10. REED & HEALD CALCULATION 5Hrs

10.1 Reed Counting System
10.2 Interconversion of Reed Count

11. COVER FACTOR 5Hrs

11.1 Cover Factor of warp
11.2 Cover Factor of weft

12. CLOTH CALCULATION 5Hrs

12.1 Warp and weft contraction
12.2 Warp calculation
12.3 Weft calculation

13. LOOM PRODUCTION CALCULATION 5Hrs

13.1 Production of loom
13.2 Efficiency of loom

14. TEXTILE PROCESSING CALCULATIONS

14.1 Dyes and chemicals consumption calculations
14.2 Wet process calculations

15. GARMENTS MANUFACTURING CALCULATIONS

15.1 Patterning calculations
15.2 Cutting calculations
15.3 Stitching calculations
15.4 Thread calculations
15.5 Process calculations

REFERENCE BOOKS: -

1. Weaving Calculation by sen Gupta D.B. Tara Porewala Son & Co Boruby (India)
2. Cotton Spinning Calculation Saddique Pakistan.

TTW-313 TEXTILE CALCULATIONS

INSTRUCTIONAL OBJECTIVES

1. YARN NUMBERING SYSTEM

1.1 Define yarn numbering and its requirements
1.2 Explain Indirect systems of yarn numbering
1.3 Describe direct system of yarn numbering.
1.4 Describe Universal system of numbering
1.5 What is Inter conversion of counts

2. FOLDED YARN

2.4 Define numbering of folded yarn.
2.5 Explain the resultant count and its importance
2.6 Describe average counts.
2.7 Describe Calculation and costing of folded yarn.

3. DIFFERENT TYPES OF GEARS

3.4 Define different types of gears
3.5 Describe problems of speed calculation.
3.6 Describe speed calculation by belt, pulleys and rope.
3.7 Explain the slippage calculation in belts and pulleys

4. YARN DIAMETER CALCULATION

4.3 Describe diameter of yarn
4.4 Describe and explain calculation of diameter of cotton yarn.
4.5 Describe Diameter of worsted yarn.
4.6 Illusrate the practical relations related to yarn diameter

5. SPINNING CALCULATION

5.5 Differentiate Mechanical Draft and Actual Draft.
5.6 Explain Blow Room Beaters Speed calculations
5.7 Explain Blow Room Waste calculation
5.8 Calulate the Hank of Lap, sliver and roving
5.9 Describe the calculations of drafts at card, drawframe, roving, comber and ring
5.10 Calculations of wastages during different processes
5.11 Describe Open end/Rotor Spinning Draft and Twist calculation
5.12 Describe the twist calculations at ring frame
5.13 Describe Autoconer Speed and efficiency calculation

6. SPINNING PRODUCTION FORMULAS

6.3 Explain blow Room production formula and numerical related to Blow Room
6.4 Explain card Production formula and numerical related to card
6.5 Explain drawing production formula and numerical related to Drawing Frame
6.6 Explain comber production formula and numerical related to Comber
6.7 Explain simplex production formula and numerical related to Roving Frame
6.8 Explain ring production formula and numerical related to Ring Frame
6.9 Explain winding production formula and numerical related to Cone Winding

7. YARN COST CALCULATION

7.3 Explain material Cost calculation
7.4 Explain labor cost calculation
7.5 Define factory overhead
7.6 Explain the total Cost Calculation
7.7 Explain the numerical related to yarn costing

8. FABRIC CALCULATION

8.4 Describe the whole fabric set calculations
8.5 Explain the factors involved in warping calculation
8.6 Define warping calculation
8.7 Explain the Production of warping
8.8 Explain the examples and numerical examples related to warping

9. SIZING CALCULATION

9.3 Explain the factors involved in sizing calculations
9.4 Explain sizing calculations
9.5 Define size percentage calculation
9.6 Explain the examples and numerical examples related to sizing.

10. REED & HEALD CALCULATION

10.3 Explain Reed Counting System
10.4 Define the interconversion of the reed count
10.5 Explain the Heald Counting System
10.6 Explain the examples and numerical related to reeds & healds

11. COVER FACTOR

11.3 Explain the cover Factor of warp
11.4 Explain the cover Factor of weft
11.5 Explain the cover Factor of different fabrics

12. CLOTH CALCULATION

12.4 Explain warp and weft contraction
12.5 Explain warp calculation
12.6 Explain weft calculation
12.7 Explain the calculation per yard of running fabric
12.8 Explain the calculation square per yard of fabric
12.9 Explain Material and labor cost of fabric

13. LOOM PRODUCTION CALCULATION

13.3 Explain the production of loom
13.4 Explain the efficiency of the loom
13.5 Explain the examples and numerical related to loom Production

14. TEXTILE PROCESSING CALCULATIONS

14.1 Dyes consumption calculations
14.2 Chemical consumption calculations
14.2 Wet process calculations including add-on, wet pickup, steam, and water calculations

15. GARMENTS MANUFACTURING CALCULATIONS

15.6 Patterning calculations

15.7 Cutting calculations
15.8 Stitching calculations
15.9 Thread calculations
15.10 Process calculations

TTW-313 TEXTILE CALCULATIONS

LIST OF PRACTICAL

96 Hrs

1. Study and calculations of dimension, density, and volume of bales of different raw materials and calculate stacking efficiency of bales in the warehouse.
2. Study and calculation of moisture regain of different fibers and comparison of moisture meter and oven dry methods.
3. Calculate R.H.% in different departments with dry/wet hygrometer and digital meter.
4. Study and calculation of cleaning efficiency and fiber growth on blow room machines.
5. Study and calculation of cleaning efficiency and fiber growth on card machine.
6. Study and calculation of transfer ratio and condensation factor on card machine.
7. Study and calculation of different drafts (Actual and Mechanical, Roller and Disperse) at Card and Drawing.
8. Study and calculation of different drafts (Actual and Mechanical, Roller and Disperse) at Drawing.
9. Study and calculation of different drafts (Actual and Mechanical, Roller and Disperse) at Roving.
10. Study and calculation of different drafts (Actual and Mechanical, Roller and Disperse) at Ring.
11. Calculation of percentage of wrap/core components in the composite yarn
12. Study and calculation of yarn diameter and no. of fibers per cross section with help of digital microscope.
13. Study and calculation of wax percentage on the yarn and ways to change this percentage.
14. Prepare 16/1 and 30/1 carded yarn for the knitting industry. Decide all process parameters using your previous knowledge.
15. Calculation of warping ends based on the required GSM of the fabric.
16. Calculation of size percentage for specific fabric.
17. Calculation of size ingredients to formulate good quality fabric.
18. Study and calculation of heat and water usage in wet processing.
19. Study and calculations of dyes and chemical quantities in different wet processes.
20. Calculate the consumption of waste in garment manufacturing processes.
21. Calculate thread consumption in different articles of garment manufacturing.
22. Perform costing of a complete garment.

TTW-321 TECHNICAL TEXTILES

Total contact hours	**32 Hrs**			
Theory	**32Hrs**	**T**	**P**	**C**
Practical	**0 Hrs**	**1**	**0**	**1**

LEARNING OUTCOMES: At the end of this course students will be able:

1. Describe technical textiles and their classifications.
2. Provide a comprehensive explanation of non-woven textiles, specifically focusing on woolen non-wovens, including their manufacturing processes, classification systems, and material characteristics used.
3. Describe textile composites and their classification and characteristics of the material used.
4. Demonstrate technical textiles applications in diverse fields.

COURSE CONTENTS:

1. INTRODUCTION & CLASSIFICATION OF TECHNICAL TEXTILES 6 Hrs

1.1. Introduction to technical textiles
1.2. Introduction to non-woven textiles
1.3. Introduction to textile composites
1.4. Use of wool fibers in technical textiles
1.5. Classification of technical textiles

2. NON-WOVEN TEXTILES 8 Hrs

2.1 Manufacturing techniques of non-woven fabric
2.2 Properties of non-woven fabrics
2.3 Use of wool fibers in non-wovens

3. TEXTILE COMPOSITES AND ITS APPLICATIONS 6 Hrs

3.1. Composites for Mobi Tech and Indu Tech
3.2. Composites for Geo Tech and Home Tech

4. APPLICATIONS OF TECHNICAL TEXTILE IN DIFFERENT FIELDS 12 Hrs

4.1. Agro tech
4.2. Build tech
4.3. Cloth tech
4.4. Mobi tech
4.5. Med tech
4.6. Pro tech
4.7. Pack tech
4.8. Sport tech
4.9. Indu tech
4.10. Geo tech
4.11. Oeko tech
4.12. Home tech

R ECOMMENDED BOOKS:

1. Horrocks A.R. and Anand S.C., “Handbook of Technical Textiles”, The Textile Institute, Manchester, 2000, ISBN:1855733854
2. Adanur S., “Wellington Sears Handbook of Industrial Textiles”, Technomic Publishing Co. Inc., 1995, ISBN :1–56676–340–1

TTW-321 TECHNICAL TEXTILES

INSTRUCTIONAL OBJECTIVE: -

1. TECHNICAL TEXTILES

1.1. Learn Technical Textiles
- 1.1.1. Basic concepts
- 1.1.2. Growth of industrial textiles
- 1.1.3. Engineering textile structures for industrial purposes.
- 1.1.4. Difference with non-industrial textiles
- 1.1.5. Classification
- 1.1.6. Types of fibers used and properties: Ultra fine, Micro fibers, Nano fibers, Hollow fibers, Aramid fibers, Carbon, Nomex, Kevlar, glass, and wool fibers

1.2. Learn Non-woven textile
- 1.2.1. Introduction to non-woven fabrics
- 1.2.2. Fiber and polymer selection
- 1.2.3. Web formation processes
- 1.2.4. Web handling and transport processes
- 1.2.5. Web bonding processes
- 1.2.6. Wool based non-woven fabrics

1.3. Learn Textile Composites
- 1.3.1. Production, Properties and use of textile composites like tyres, hoses, and belts
- 1.3.2. Uses of textiles in rigid composites
- 1.3.3. Properties and applications
- 1.3.4. Use of wool in composites

2. NON-WOVEN TEXTILES

2.1. Learn Manufacture Techniques of Non-Woven fabric
- 2.1.1. The manufacture-structure-property relations of selected nonwoven materials
- 2.1.2. Study of nonwoven manufacturing routes for different product types
- 2.1.3. Adhesive bonded
- 2.1.4. Needle punched
- 2.1.5. Stitch bonded
- 2.1.6. Spun bonded fabrics, woven fabrics

2.2. Learn Properties of Non-Woven Fabrics
- 2.2.1. Finishing and functionalization of nonwoven fabrics
- 2.2.2. Characterization and testing,
- 2.2.3. Principles of design for performance
- 2.2.4. Adhesive bonded
- 2.2.5. Needle punched
- 2.2.6. Stitch bonded
- 2.2.7. Spun bonded fabrics, woven fabrics
- 2.2.8. Various uses of non-woven fabrics and their applications

3. TEXTILE COMPOSITES AND ITS APPLICATIONS

3.1 Learn Composites for Mobi Tech

3.2 Composites for Indu Tech

3.3 Composites for Geo Tech

3.4 Composites for Home Tech

4. APPLICATIONS OF TECHNICAL TEXTILE IN DIFFERENT FIELDS

4.1. Learn Agro tech
- 4.1.1. Introduction of Agricultural applications of textiles
- 4.1.2. Erosion control of soil
- 4.1.3. State Application for drainage

4.2. Learn Build tech
- 4.2.1. Introduction of Textiles in Civil Engineering Applications, Uses, and Properties
- 4.2.2. Road construction
- 4.2.3. Sewerage control etc.
- 4.2.4. Awnings and canopies
- 4.2.5. Roofing material
- 4.2.6. Fiber reinforced concrete and cement
- 4.2.7. Learn Acoustic and heat insulation textiles

4.3. Learn Cloth tech
- 4.3.1. Definition
- 4.3.2. Classification
- 4.3.3. Safety and Protective Clothing (Environmental hazard)
- 4.3.4. Types of Fibers used
- 4.3.5. Wool based cloth tech applications
- 4.3.6. Coated fabrics
  - Design
  - Production
  - Base cloth commonly used materials
  - coating techniques
  - Waterproof fabrics
  - Gauze fabrics
  - Properties and Applications
  - Properties and application of High temperature clothing, flame protective clothing, chemical Protective Clothin, Electro Protective Clothing, High visibility clothing
  - Defense clothing (Camouflage dress, Bulletproof, Nonvisibility clothing, tent, and parachute)

4.4. Learn Mobi tech
- 4.4.1. Definition
- 4.4.2. Raw material used
- 4.4.3. Applications

4.5. Learn Medical Textiles
- 4.5.1. Definitions
- 4.5.2. Material used in bio-textiles
- 4.5.3. Characteristics of material used
- 4.5.4. Use of wool fibers in medical textiles
- 4.5.5. Classification of Surgical textiles
  - Non-implantations textiles
  - Application and Fibers used in Non-implantable materials like wound dressing, Bandage and gauze cloth
  - Textiles for implantations

- Application and Fibers used in implantable materials like vascular graft sutures and heart valves
- Learn Textiles for extra-corporeal devices
- Fiber requirements for extra corporeal devices such as skin, liver and kidney
- Application and fiber requirements in healthcare and hygiene products such as surgical gowns, masks and wipes

4.6. Learn Pro tech
- 4.6.1. Introduction of Textiles in protective clothing
- 4.6.2. Protection against heat, impact and others for safety
- 4.6.3. Fabrics in defense system and weapons
- 4.6.4. other applications

4.7. Learn Pack tech
- 4.7.1. Definition
- 4.7.2. Raw material used
- 4.7.3. Use of wool in packing industry
- 4.7.4. Applications

4.8. Learn Sport tech
- 4.8.1. Introduction of Sports and recreation textiles
- 4.8.2. General; Sports uniforms
- 4.8.3. Wool for sports textiles
- 4.8.4. Applications (Baseball, Tennis; Football; Golf and hockey equipment's; Skates; Bikes; Marine products; Textiles in sports surfaces; Fabrics for children fun and play.)

4.9. Learn indu tech
- 4.9.1. Introduction of textiles in miscellaneous industrial applications
- 4.9.2. Raw material / properties
- 4.9.3. Wool for indu tech applications
- 4.9.4. Applications

4.10. Learn Geo tech
- 4.9.5. Introduction of textiles in miscellaneous Geo applications,
- 4.9.6. Raw material/properties
- 4.9.7. Wool for Geo tech applications
- 4.9.8. Applications

4.11. Learn Oeko tech
- 4.9.9. Introduction of textiles in miscellaneous environmental applications,
- 4.9.10. Raw material / properties
- 4.9.11. Wool for oeko tech applications
- 4.9.12. Applications

4.12. Learn Home tech
- 4.9.13. Introduction of textiles in miscellaneous home applications,
- 4.9.14. Raw material / properties
- 4.9.15. Wool for home tech applications
- 4.9.16. Applications

TTW-333 TEXTILE TESTING AND QUALITY CONTROL

Total contact hours:	**160 Hrs**	**T**	**P**	**C**
Theory:	**64 Hrs**	**2**	**3**	**3**
Practical	**96 Hrs**			

Pre-requisite:

AIMS: To induce the knowledge of various parameters, standards, and characterizations/testing to ensure quality of textiles at different manufacturing stages, such as fibers, yarns, fabric, wet processing, and garments manufacturing.

LEARNING OUTCOMES: At the end of this course, students will be able:

1. Describe knowledge of various parameters, standards, and characterizations/testing to ensure quality of textiles at different manufacturing stages, such as fibers, yarns, fabric, wet processing, and garments manufacturing.
2. Perform different tests as per various international standards

COURSE CONTENTS:

1. QUALITY CONTROL IN FIBERS 12 Hrs

1.1 Measurement of fiber inherent properties
1.2 Measurement of fiber tensile properties
1.3 Measurement of fiber Surface properties

2. QUALITY CONTROL IN YARN MANUFACTURING: 12 Hrs

2.1 Measurement of yarn evenness properties
2.2 Measurement of yarn tensile properties
2.3 Measurement of yarn surface properties

3. QUALITY CONTROL IN FABRIC MANUFACTURING: 16 Hrs

3.1 Analysis of woven fabric properties
3.2 Analysis of knitted fabric properties

4. QUALITY CONTROL IN WET PROCESSING OF FABRICS: 5 Hrs

4.1 Analysis of color fastness, shrinkage, skewness, Bowness of fabrics against different conditions
4.2 Measurement of pH of fabrics at different conditions

5. QUALITY CONTROL OF FINISHED FABRICS 5 Hrs

5.1 Measurement of properties of finished fabric
5.2 Methods to test the properties of finished fabrics

6. SYSTEMS FOR FABRIC INSPECTION 6 Hrs

6.1 Inspection systems

6.2 Inspection machines

7. ISO, ASTM, AATCC STANDARDS **8 Hrs**

7.1. Inspection systems

7.2. Inspection machines

RECOMANDED BOOKS:

1. Physical testing of textiles by B P Savile, 1999
2. Principles of textile testing by JE Booth, 1986
3. Chemical testing of textiles by Qinguo Fan, 2005

TTW-333 TEXTILE TESTING AND QUALITY CONTROL

INSTRUCTIONAL OBJECTIVES

1. QUALITY CONTROL IN FIBERS

1.1 Explain the physical properties of raw fibers using different testing methods
1.2 Explain the principles and methodology of different fiber testing techniques
1.3 Illustrate the qualitative and quantitative analysis of different fibers
1.4 Analysis of fiber fineness, length, and strength
1.5 Analysis of fiber maturity, neps, and moisture

2. QUALITY CONTROL IN YARN MANUFACTURING

2.1. Explain different testing techniques to control the quality of manufactured yarn
2.2. Explain the principle and methodology of various yarn testing techniques
2.3. Analysis of yarn count, twist, strength and evenness
2.4. Analysis of yarn neps, hairiness, coefficient of friction

3. QUALITY CONTROL IN FABRIC MANUFACTURING

3.1. Explain different testing techniques to control the quality of manufactured fabrics
3.2. Explain the principles and methodology of various fabric testing techniques
3.3. Analysis of woven and knitted fabric construction, tensile, tear, and bursting properties
3.4. Analysis of fabric GSM, pilling, abrasion, Bowness, and spirality

4. QUALITY CONTROL IN WET PROCESSING OF FABRICS

4.1. Explain the principle and methodology of various wet-processed fabric testing techniques
4.3 Describe the testing technique to analyze color fastness to crocking, perspiration, washing, and home laundering
4.4 Analyze color fastness to light and pH of fabric after usage

5. QUALITY CONTROL OF FINISHED FABRICS

5.1. Explain the principle and methodology of various finished fabric testing techniques
5.2. Describe the ways to test absorbency, crease recovery, and bending rigidity of fabrics
5.3. Explain the methods to measure water repellency, flame retardancy, and other properties of fabrics

6. SYSTEMS FOR FABRIC INSPECTION

6.1. Explain systems for fabric inspection
6.2. Explain the 4-point and 10-point inspection systems
6.3. Describe the types of inspection machines
6.4. Explain the inspection machine's working and performance
6.5. Enlist the defects in fabric due to fibers, yarns, fabric manufacturing, or processing

7. ISO, ASTM, AATCC STANDARDS

7.1. Understand the need for different standards
7.2. Explain ISO standards and their classification
7.3. Illustrate the other standards
7.4. Explain the application of standards in textiles

TTW-333 TEXTILE TESTING AND QUALITY CONTROL

LIST OF PRACTICAL

96 Hrs

1. Qualitative analysis of different fibers using an optical microscope
2. Quantitative analysis of different fibers in a blend using solvents
3. Measure the fiber's strength using a fiber strength tester
4. Test the fiber fineness using Spinlab Micronair
5. Measure the moisture content of different fibers
6. Determine the single yarn strength
7. Determine the yarn lea strength
8. Determine the yarn twist
9. Determine the yarn count
10. Measure the coefficient of friction of yarn
11. Measure fabric tensile strength using a tensile strength tester
12. Test fabric tear and bursting strength
13. Determine the bending rigidity of fabric using the bending length tester
14. Determine the crease recovery of a fabric using the crease recovery angle tester.
15. Calculate skewness and Bowness of the given fabrics
16. Evaluate the pilling of fabric using the Martindale pilling tester
17. Measure fabric abrasion using the abrasion tester
18. Determine the strength and growth in knitted fabrics
19. Determine the fabric shrinkage as per the given standard
20. Measure the absorbency of bleached and colored fabrics
21. Measure the pH of bleached fabrics
22. Measure the whiteness of a bleached fabric
23. Measure the degree of mercerization of a fabric through barium activity number
24. Determine the color fastness to rubbing of dyed and printed fabrics
25. Determine the color fastness to washing of dyed and printed fabrics
26. Determine the color fastness to home laundering of dyed and printed fabrics
27. Determine the color fastness to perspiration of dyed and printed fabrics
28. Observe the color fastness to light of dyed and printed fabrics
29. Observe the color fastness to bleach of dyed and printed fabrics
30. Determine the flame retardancy of a finished fabric
31. Determine the water repellency of a finished fabric
32. Determine the seam strength through different fabrics

TTW-343 ADVANCE SPINNING TECHNIQUES AND SPECIALTY YARNS

Total contact hours:	**160 Hrs**	**T**	**P**	**C**
Theory:	**64 Hrs**	**2**	**3**	**3**
Practical	**96 Hrs**			

LEARNING OUTCOMES: At the end of this course, students will be able to:

- Describe different spinning techniques and types of fancy yarns, their production, properties, and end uses.
- Perform and handle different processes to produce specialty and fancy yarns.

COURSE CONTENTS:

1.	**INTRODUCTION**	**3 Hrs**
1.1.	Classification & summary of various traditional & modern spinning techniques	
1.2.	Development of new spinning techniques	
2.	**YARN STRUCTURE AND PROPERTIES FROM DIFFERENT SPINNING TECHNIQUES**	**3 Hrs**
2.1	Ring spun yarn Structure and Properties	
2.2	Rotor spun yarn Structure and Properties	
3.	**OPEN END SPINNING METHODS**	**3 Hrs**
3.1	Principle of yarn formation of open end spinning processes	
3.2	Advantages of open end spinning	
4.	**ROTOR SPINNING**	**3 Hrs**
4.1	Importance and potential of rotor spinning	
4.2	Principle of rotor spinning along with machine data and structure	
5.	**ROTOR SPINNING ADVANCED**	**3 Hrs**
5.1	Yarn path and parts on advanced rotor machine	
5.2	Automation of rotor spinning machines, operating robots for piecing and package change	
5.3	Selection of raw material, its preparation for new rotor spinning	
6.	**GENERAL INTRODUCTION**	**3 Hrs**
6.1.	Primary classification of Yarns	
6.2.	Reasons of making great varieties of yarns	
7.	**TYPES OF STAPLE SPUN YARN**	**4 Hrs**
7.1.	Classifications of yarns w.r.t. fiber length, yarn construction	
7.2.	Classifications of yarns w.r.t. different spinning techniques and different end uses	
8.	**TYPES OF FILAMENT YARN**	**4 Hrs**
8.1.	Classifications of yarns w.r.t. fiber length, yarn construction	
8.2.	Classifications w.r.t. origin, no. of filaments and surface characteristics	
9.	**TWISTED YARNS**	**7 Hrs**
9.1.	Yarn twisting and	
9.2.	Objectives of yarn twisting/folding and twisted yarn properties	
9.3.	Yarn texturing and its objectives	
9.4.	Uses of textured yarns	
10.	**OPEN END SPINNING METHODS OTHER**	

	THAN ROTOR SPINNING:	**17 Hrs**
10.1	Electrostatic spinning method, its Principle, Operation & Specifications.	
10.2	Air vortex spinning method, its Principle, Operation & Specifications	
10.3	Comparison of Vortex yarns structure to other yarns	
10.4	Friction spinning method, its Principle, Operation, Specifications	
10.5	Comparison of friction yarns structure to other yarns	
11.	**MISCELLANEOUS NEW SPINNING METHODS:**	**2 Hrs**
11.1.	Composite yarn spinning on friction spinning	
11.2.	Twist spinning and Self twist spinning techniques	
11.3.	Twist less Spinning	
11.4.	Core yarn spinning	
11.5.	Wrap Spinning method	
11.6.	False twist spinning methods	
11.7.	Sirospun Process	
11.8.	Solospun, Jetring, Jetwind processes	
12.	**YARN STRUCTURE AND PROPERTIES FROM DIFFERENT SPINNING TECHNIQUES:**	**2 Hrs**
12.1.	Air jet and friction spun yarn Structure and Properties	
12.2.	Wrap spun yarn Structure and Properties	
13.	**SEWING THREAD:**	**4 Hrs**
13.1.	Sewing thread.	
13.2.	Requirement and properties of sewing thread	
13.3.	Different types of sewing thread	
13.4.	Different types of thread packages and uses of sewing thread	
14.	**FANCY YARNS:**	**4 Hrs**
14.1.	Fancy/novelty yarn	
14.2.	Structure and properties of different types of fancy yarns	
14.3.	Production methods of fancy yarns and the design of production methods	
14.4.	Applications and uses of fancy yarns	
15.	**FIBER ROPES:**	**2 Hrs**
15.1.	Ropes types and categories	
15.2.	Manufacturing of ropes	

RECOMMENDED BOOKS:

1. Technical Textile Yarns by R. Alagirusamy and A. Das Woodhead Publishing Limited, 2010.
2. Fancy Yarns of The Textile Institute.
3. Synthetic filament yarns texturing technology
4. Sewing threads (textile progress vol. 16 ‘1987’)
5. Fiber rope technology

TTW-343 ADVANCE SPINNING TECHNIQUES AND SPECIALTY YARNS

INSTRUCTIONAL OBJECTIVES

1. INTRODUCTION

1.1. Understand the classification of traditional spinning methods

1.2. Explain the modern spinning techniques

1.3. Classify new spinning techniques

2. YARN STRUCTURE AND PROPERTIES FROM DIFFERENT SPINNING TECHNIQUES

2.1 Understand the ring spun yarn structure and properties

2.2 Understand the rotor spun yarn structure and properties

2.3 Differentiate the both structures and properties

3. OPEN END SPINNING METHODS

3.1 Illustrate the principle of yarn formation of open end spinning processes

3.2 Classify the advantages of open end spinning

3.3 Explain the pros and cons of open end spinning

4. ROTOR SPINNING

4.1 Describe the importance and potential of rotor spinning

4.2 Explain the principle of rotor spinning along with machine data and structure

5. ROTOR SPINNING ADVANCED

5.1 Understand the yarn path and parts on new rotor machine

5.2 Explain the automation of the advanced rotor spinning machine

5.3 Illustrate the selection of raw material, its preparation for rotor spinning

6. GENERAL INTRODUCTION

6.1. Classify the types of yarns

6.2. Understand the seasons for making great varieties of yarns

7. TYPES OF STAPLE SPUN YARN

7.1. Explain classifications of yarns w.r.t. fiber length, yarn construction

7.2. Explain classifications of yarns w.r.t. different spinning techniques and different end uses

8. TYPES OF FILAMENT YARN

8.1. Explain classifications of yarns w.r.t. fiber length, yarn construction

8.2. Explain classifications w.r.t. origin, no. of filaments, and surface characteristics

9. TWISTED YARNS

9.1. Understand yarn twisting and objectives

9.2. Explain yarn texturing and its objectives

9.3. Illustrate uses of textured yarns

10. OPEN END SPINNING METHODS OTHER THAN ROTOR SPINNING

10.1 Understand the electrostatic spinning method, its principle, operation & specifications.

10.2 Understand air vortex spinning method, its principle, operation & specifications

10.3 Compare the vortex yarn structure to other yarns

10.4 Understand the friction spinning method, its principle, operation, and specifications

10.5 Compare friction yarns to other yarns

11. MISCELLANEOUS NEW SPINNING METHODS

11.1. Understand twist spinning and self twist spinning techniques

11.2. Understand twist less Spinning

11.3. Explain core yarn spinning

11.4. Understand wrap spinning method

11.5. Explain false twist spinning methods

11.6. Understand Sirospun process

11.7. Understand Solospun, Jetring, Jetwind processes

12. YARN STRUCTURE AND PROPERTIES FROM DIFFERENT SPINNING TECHNIQUES

12.1. Understand air jet and friction spun yarn Structure and Properties

12.2. Explain wrap spun yarn structure and properties

13. SEWING THREAD

13.1. Understand the sewing threads

13.2. Explain requirements and properties of sewing thread

13.3. Illustrate Different types of sewing thread

13.4. Classify different types of thread packages and uses of sewing thread

14. FANCY YARNS

14.1. Explain the fancy/novelty yarn

14.2. Understand the structure and properties of different types of fancy yarns

14.3. Illustrate the production methods of fancy yarns and the design of production methods

14.4. Explain the applications and uses of fancy yarns

15. FIBER ROPES

15.1. Understand the ropes types and categories

15.2. Explain the manufacturing of ropes

15.3. Categorize the types of ropes

15.4. Describe the applications of ropes

TTW-343 ADVANCE SPINNING TECHNIQUES AND SPECIALTY YARNS

LIST OF PRACTICAL

96 Hrs

1. Study of Yarn Take-up (Winding) Mechanism on Rotor Spinning
2. Perform the change in draft on Rotor Machine and analyze the yarn characteristics.
3. Perform the change in Twist on Rotor Machine and analyze the yarn characteristics.
4. Structural analysis of Ring and Rotor spun yarn
5. Analyze the working principle of Robot on Rotor machine
6. Analyze the splicing mechanism on the rotor spinning machine.
7. Observe the starter tube system on Rotor machine
8. Study of MJS Spinning System
9. Study of MJS Drafting System
10. Study of Twisting and Winding on MJS Machine
11. Prepare the fiber neps on the nep formation machine
12. Prepare neppy sliver by using Blow Room, Card & Draw Frame and analyze its properties
13. Prepare neppy roving from neppy sliver on simplex and analyze the characteristics.
14. Develop neppy yarn from neppy roving on the ring frame, analyze the characteristics.
15. Develop Marl Yarn on M.D.C Ring doubling machine
16. Develop fancy colored yarns by blending colored slivers on the draw frame
17. Manufacture chain yarns at ring spinning frame equipped with Siro spinning system
18. Prepare core-spun yarn at ring spinning frame equipped with core spinning attachment.
19. Determine the elastomer percentage in a given sample of core-spun yarn by the physical method
20. Determine the elastomer percentage in a given sample of core-spun yarn by chemical method
21. Perform the pattern analysis of Slub Yarns
22. Develop zero twist yarn on ring doubling machine

TTW-353 TEXTILE & WOOL COLORATION AND FINISHING

Total Contact Hours		**160 Hrs**			
Theory	**:**	**64 Hrs**	**T**	**P**	**C**
Practicals	**:**	**96 Hrs**	**2**	**3**	**3**

LEARNING OUTCOMES: At the end of this course students will be able to:

- Demonstrate knowledge of coloration, finishing, and coating of wool and other textiles
- Perform coloration and finishing of textile substrates independently

COURSE CONTENTS:

1.	**CLASSIFICATION OF DYEING PROCESS**	**6 Hrs**
1.1	Exhaust dyeing (jigger, winch, jet)	
1.2	Semi-continuous (Cold pad batch dyeing)	
1.3	Continuous dyeing (thermosole, pad steam)	
2.	**BASICS OF WOOL DYEING**	**4 Hrs**
2.1	Affinity and mechanism of wool dyeing	
2.2	Rate of wool dyeing	
2.3	Theory of wool dyeing	
3.	**DYEING OF WOOL WITH ACID AND CHROME DYES**	**3 Hrs**
3.1.	General structure and properties of acid and chrome dyes	
3.2.	Chemistry and types of acid and chrome dyes	
4.	**DYEING OF WOOL WITH REACTIVE DYES**	**3 Hrs**
4.1.	General structure and properties of reactive dyes	
4.2.	Interaction between reactive dyes and wool	
4.3.	Auxiliaries for dyeing of wool with acid and chrome dyes	
5.	**BLENDS DYEING**	**6 Hrs**
5.1.	Process sequence of dyeing of different blends with wool fibers	
6.	**INTRODUCTION TO FINISHING**	**2 Hrs**
6.1.	Objectives	
6.2.	Types of finishes	
6.3.	Application techniques in textile finishing	
7.	**SOFT FINISHES**	**4 Hrs**
7.1.	Objectives	
7.2.	Mechanism of softening	
7.3.	Cationic, anionic and nonionic softeners	
7.4.	Silicone softeners	
7.5.	Application of softeners on fabrics	
8.	**CREASE RESISTANT FINISHES**	**4 Hrs**
8.1.	Objectives	
8.2.	Mechanism of creasing and crease resistance	
8.3.	Chemistry of resin	
9.	**WATER REPELLENT FINISHES**	**4 Hrs**
9.1.	Objectives	

9.2.	Theory of wetting	
9.3.	Mechanism of water repellency	
9.4.	Chemistry of water repellents	
9.5.	Application of water repellent finishes	
10.	**FLAME RETARDANT FINISHES**	**4 Hrs**
10.1.	Objectives	
10.2.	Theory of burning	
10.3.	Mechanisms of flame retardancy	
11.	**SOIL RELEASE FINISHES**	**3 Hrs**
11.1.	Objectives	
11.2.	Theory of wetting	
11.3.	Mechanism of water repellency	
12.	**ANTIMICROBIAL FINISHES**	**3 Hrs**
12.1.	Objectives	
12.2.	Mechanism of microbial inhibition	
12.3.	Application of antimicrobial finishes	
13.	**ANTISTATIC FINISHES**	**2 Hrs**
13.1.	Objectives	
13.2.	Mechanism of static charge reduction	
13.3.	Different antistatic agents	
14.	**ANTIPILLING FINISHES**	**2 Hrs**
14.1.	Objectives	
14.2.	Mechanism of pilling antipilling finishes	
14.3.	Application of antipilling finishes	
15.	**HAND BUILDING FINISHES**	**2 Hrs**
15.1.	Objectives	
15.2.	Durable and non-durable hand building finishes	
16.	**NON-SLIP FINISHES**	**2 Hrs**
16.1.	Objectives	
16.2.	Mechanism of non-slip finishes	
16.3.	Application of non-slip finishes	
17.	**FINISHING OF FABRICS BY ENZYMES**	**2 Hrs**
17.1.	Advantages	
17.2.	Applications of enzymes in textiles	
18.	**RAISING PROCESS**	**2 Hrs**
18.1.	Objectives	
18.2.	Raising process	
19.	**CALENDERING PROCESS**	**2 Hrs**
19.1.	Objectives	
19.2.	Calendering process	
20.	**DECATISING**	**2 Hrs**
20.1.	Objectives	
20.2.	Decatising process	
20.3.	Decatising machine	
21.	**SHRINK PROOFING TREATMENTS IN WOOL**	**2 Hrs**

21.1. Objectives
21.2. Shrinkage in fabrics
21.3. Techniques for shrink proofing treatments

RECOMENDED BOOKS

1. Basic Principles of Textile Coloration by Arthur D Broadbent, 2001
2. Wool Dyeing by D. M. Lewis, 1992
3. A Practical Introduction to the Dyeing and Finishing of Wool Fabrics by Park, J.,Marriott, F.W.,Bearpark, Ian, 1986
4. Principles of Textile Finishing by Asim Kumar Roy Chaudhry, 2017
5. Textile Finishing, Basic Concepts and Application by D. Gopalakrishnan, 2018
6. A Practical Introduction to the Dyeing and Finishing of Wool Fabrics by Park, J.,Marriott, F.W.,Bearpark, Ian, 1986

TTW-353 TEXTILE & WOOL COLORATION AND FINISHING

INSTRUCTIONAL OBJECTIVES

1. CLASSIFICATION OF DYEING PROCESS

1.1 Explain process and machinery for exhaust dyeing
1.2 Explain process and machinery for cold pad batch dyeing
1.3 Explain machinery for continuous and semi-continuous dyeing

2. BASICS OF WOOL DYEING

2.1 Explain interaction between dyes and wool
2.2 Explain general theory and mechanism of wool dyeing
2.3 Explain kinetics of wool dyeing

3. DYEING OF WOOL WITH ACID AND CHROME DYES

3.1 Explain the properties and structure of acid dyes for wool
3.2 Perform the dyeing of wool with acid and chrome dyes

4. DYEING OF WOOL WITH REACTIVE DYES

4.1 Explain the properties and structure of reactive dyes for wool
4.2 Perform the dyeing of wool with reactive dyes

5. BLENDS DYEING

5.1 Process sequence of dyeing of different blends with wool fibers
5.2 Chemicals used at each step of the process

6. FUNDAMENTALS OF FINISHING

6.1 Explain the objectives of finishing
6.2 Understand the general characteristics and applications of finishing
6.3 Describe application techniques in textile finishing
6.4 Understand machinery in textile finishing

7. SOFT FINISH

7.1 Explain the origin of stiffening in textiles and the mechanism of softening
7.2 Illustrate the characteristics and chemistry of different softeners and their properties
7.3 Apply different softeners on fabrics

8. CREASE RESISTANT FINISHES

8.1 Explain the origin of creases and the mechanism of crease resistance
8.2 Illustrate the characteristics and chemistry of different formaldehyde and formaldehyde-free resins
8.3 Apply different crease resistant finishes on fabrics

9. WATER REPELLENT FINISHES

9.1 Explain the theory of wetting
9.2 Describe the mechanism of water repellency
9.3 Describe characteristics and chemistry of different water repellents
9.4 Apply different water repellent finishes on fabrics

10. FLAME RETARDANT FINISHES

10.1 Explain theory of burning
10.2 Illustrate mechanisms of flame retardancy
10.3 Describe characteristics and chemistry of different flame retardants
10.4 Explain flame retardants for wool and other fibers
10.5 Apply different flame retardant finishes on fabrics

11. SOIL RELEASE FINISHES

11.1 Explain theory of soiling
11.2 Illustrate the mechanism of soil repellency
11.3 Explain characteristics and chemistry different soil release agents
11.4 Apply different soil release finishes on fabrics

12. ANTIMICROBIAL FINISHES

12.1 Explain attachment of microbes to fabrics
12.2 Illustrate the mechanism of soil repellency
12.3 Explain characteristics and chemistry different soil release agents
12.4 Apply different soil release finishes on fabrics

13. ANTISTATIC FINISHES

13.1 Explain development of static charges on fabrics
13.2 Illustrate the mechanism of charge dissipation
13.3 Explain characteristics and nature of antistatic agents
13.4 Apply different antistatic finishes on fabrics

14. ANTI-PILLING FINISHES

14.1 Explain phenomenon of pilling in fabrics
14.2 Illustrate the mechanism of anti-pilling finishes
14.3 Explain characteristics and nature of anti-pilling agents
14.4 Apply different anti-pilling finishes on fabrics

15. HAND BUILDING FINISHES

15.1 Explain characteristics and nature of hand building finishes
15.2 Apply different hand building finishes on fabrics

16. NON-SLIP FINISHES

16.1 Explain the chemistry and mechanism of non-slip finishes
16.2 Apply different non-slip finishes on fabrics

17. FINISHING OF FABRICS BY ENZYMES

17.1 Explain chemistry and working mechanism of enzymes
17.2 Explain parameters affecting enzyme activity
17.3 Apply different enzyme finishes on fabrics

18. RAISING PROCESS

18.1 Explain raizing process
18.2 Explain raising machine
18.3 Describe properties of a fabric induced by raizing of fabrics

19. CALENDERING PROCESS

19.1 Explain calendering process
19.2 Explain calender machine
19.3 Describe properties of a fabric induced by calendaring process

20. DECATISING

20.1 Explain decatizing process
20.2 Explain decatizing machine
20.3 Describe properties of a fabric induced by decatizing process

21. SHRINK PROOFING TREATMENTS IN WOOL

21.1 Explain the phenomenon of shrinkage in a fabric
21.2 Explain different techniques for shrinkage control

TTW-353 TEXTILE & WOOL COLORATION AND FINISHING

LIST OF PRACTICAL **96 HRS**

1. Apply acid dyes on wool fabrics, varying different parameters.
2. Apply reactive dyes on wool fabrics, varying different parameters.
3. Perform dyeing of polyester and wool blended fabrics
4. Perform dyeing of wool and nylon blended fabrics
5. Perform dyeing of wool and cotton blended fabrics
6. Perform dyeing of wool and acrylic blended fabrics
7. Study the effect of different concentrations of cationic and anionic softeners on the properties of fabric
8. Study the effect of different concentrations of silicone softeners on the properties of fabric
9. Study the effect of different concentrations of polyethylene-based softeners on the properties of fabric
10. Study the effect of different concentrations of resins on crease recovery and mechanical properties of finished fabrics
11. Observe the effect of curing temperature and time on crease recovery and mechanical properties of resin finished fabrics
12. Observe the effect of softener addition in resin finishing of fabrics
13. Compare the formaldehyde based and formaldehyde free resins for crease recovery and other mechanical properties of finished fabrics
14. Compare the resin finishing of cotton and wool fabrics for crease recovery characteristics
15. Study the effect of different concentrations of flame retardants on flame retardancy and mechanical properties of finished fabrics
16. Observe the effect of process conditions time on flame retardancy and mechanical properties of finished fabrics
17. Study the effect of softener addition in flame retardant finishing of fabrics
18. Compare the flame retardant finishing of cotton, polyester and wool fabrics for flame retardancy
19. Apply the soil release finish on fabrics and evaluate the soil release characteristics
20. Study the effect of different process parameters on the soil release characteristics of fabrics
21. Apply the stiffening agents on fabrics and evaluate the fabric properties
22. Apply the antistatic agents on fabrics and evaluate the fabric properties
23. Apply the antipilling agents on fabrics and evaluate the fabric properties
24. Study the effect of different chemical treatments on shrinkage of wool fabrics
25. Study the effect of mechanical treatment on the shrinkage of wool fabrics
26. Apply combined water repellent and flame retardant finishes on fabrics

TTW-361 SUSTAINABILITY IN TEXTILE

Total contact hours:	**32 Hrs**	**T**	**P**	**C**
Theory:	**32 Hrs**	**1**	**0**	**1**
Practical	**0 Hrs**			

LEARNING OUTCOMES: At the end of this course, students will be able to:

1. Explain sustainability, sustainable development goals, and analyze various textile-related aspects of sustainability.
2. Demonstrate the importance of sustainable fibers, dyes, and textile materials, and evaluate different green practices in the textile industry
3. Utilize the tools to illustrate the necessity for the sustainable development of textile products.

COURSE CONTENTS:

1. SUSTAINABILITY AND GREEN PRACTICES **2 Hrs**

1.1. Introduction of sustainability and green practices
1.2. Aspects of sustainability and green practices
1.3. Importance of sustainability

2. ASSESSMENT TOOLS FOR SUSTAINABILITY **3 Hrs**

2.1. Evaluation of sustainability in textiles
2.2. Classifications of Assessment Tools
2.3. Life Cycle Assessment

3. SUSTAINABLE DEVELOPMENT GOALS **2 Hrs**

3.1. 17 SDGs
3.2. Subcategories of SDGs

4. ENVIRONMENTAL SUSTAINABILITY IN TEXTILES **3 Hrs**

4.1. Environmentally Sustainable Consumption
4.2. Environmentally Sustainable and Green Production
4.3. Phases of Environmental Sustainability

5. SOCIAL SUSTAINABILITY IN TEXTILES **5 Hrs**

5.1. Working Environment in Textile Industry
5.2. Hazards in Textile Industry
5.3. Wages and Work Time
5.4. Gender Equality
5.5. Child Labour
5.6. Labour Rights
5.7. Different social standards

6. ENVIRONMENT FRIENDLY RAW MATERIALS AND DYES **5 Hrs**

6.1. Environmentally unfriendly raw materials
6.2. Sustainable and green fibers,
6.3. Sustainable synthetic or man-made fibers
6.4. Natural dyes
6.5. Synthetic sustainable dyes

7.	**SUSTAINABLE PRACTICES IN THE TEXTILE INDUSTRY**	**5 Hrs**
7.1.	Global Organic Textile Standards	
7.2.	American National Standards Institute (ANSI) Standards	
7.3.	OEKO-TEX® Certification	
7.4.	ISO standards	
7.5.	Textile Exchange (TE) Standards	
8.	**SUSTAINABLE WATER TREATMENTS**	**2 Hrs**
8.1.	Low water consumption technologies	
8.2.	Sustainable chemical management	
8.3.	Green ways to treat wastewater	
9.	**SUSTAINABLE TEXTILE AND APPAREL PRODUCTION**	**3 Hrs**
9.1.	Garment care: laundering and disposing of garments	
9.2.	Recycling of textiles and clothing	
10.	**SUSTAINABLE DESIGN AND BUSINESS MODEL IN TEXTILE AND FASHION**	**2 Hrs**
10.1.	Sustainable Business Models and Archetypes	
10.2.	Sustainable Design Elements	

RECOMANDED BOOKS:

1. Sustanability in textile industry, By Subramanian Senthilkannan Muthu, 2017
2. Handbook of sustainable textile production, By Marion I. Tobler-Rohr, 2011
3. Sustainable Fibers and Textiles, By Subramanian Senthilkannan Muthu, 2017
4. Recycling textile and plastic waste, By A Richard Horrocks, 19

TTW-361 SUSTAINABILITY IN TEXTILE

INSTRUCTIONAL OBJECTIVES :-

1. SUSTAINABILITY

1.1. What is sustainability

1.2. Describe why sustainability is important

1.3. Understand the aspects of sustainability

1.4. Explain the importance of sustainability

2. ASSESSMENT TOOLS FOR SUSTAINABILITY

2.1. Explain the evaluation of sustainability in textiles

2.2. Describe the classifications of assessment tools

2.3. Understand the Life Cycle Assessment

2.4. Understand Life Cycle Thinking

3. SUSTAINABLE DEVELOPMENT GOALS

3.1. Illustrate the importance of 17 SDGs

3.2. Explain the subcategories of SDGs

4. ENVIRONMENTAL SUSTAINABILITY IN TEXTILES

4.1. Describe the environmentally sustainable consumption

4.2. Explain the environmentally sustainable production

4.3. Categorize the phases of environmental sustainability

5. SOCIAL SUSTAINABILITY IN TEXTILES

5.1. Understand the working environment in textile industry

5.2. Explain the hazards in textile industry

5.3. Describe wages and work time

5.4. Understand the gender equality

5.5. Explain why child labour is prohibited

5.6. Explain the labour rights

5.7. Explain the different social standards

6. ENVIRONMENT FRIENDLY RAW MATERIALS AND DYES

6.1. Explain the environment friendly raw materials

6.2. Understand the sustainable fibers

6.3. Describe the sustainable synthetic or man-made fibers

6.4. Understand the natural dyes

6.5. Explain the synthetic sustainable dyes

7. SUSTAINABLE PRACTICES IN TEXTILE INDUSTRY

7.1. Understand the Global Organic Textile Standards

7.2. Understand the American National Standards Institute (ANSI) Standards

7.3. Describe the OEKO-TEX® Certification

7.4. Understand the ISO standards

7.5. Describe the Textile Exchange (TE) Standards

8. SUSTAINABLE WATER TREATMENTS

8.1. Describe the low water consumption technologies

8.2. Explain the sustainable chemical management

9. SUSTAINABLE TEXTILE AND APPAREL PRODUCTION

9.1. Explain the garment care - laundering and disposing of garments

9.2. Describe the recycling of textiles and clothing

10. SUSTAINABLE DESIGN AND BUSINESS MODEL IN TEXTILE AND FASHION

10.1. Understand the sustainable business models and archetypes

10.2. Explain the sustainable design elements

TTW-373 SPECIAL PROJECT ON WOOL

Total contact hours:	**288 Hrs**	**T**	**P**	**C**
Theory:	**0 Hrs**	**0**	**9**	**3**
Practical	**288 Hrs**			

LEARNING OUTCOMES: At the end of this course, students will be able to:

- Engage in creative thinking, acquire comprehensive professional knowledge pertinent to projects, and execute innovative initiatives either independently or collaboratively under the supervision of educators, achieving tangible outcomes.

PHASES IN THE PROJECT: **288 Hrs**

1. Literature Review and market analysis for new product/process development
2. Identification of research problem/idea generation for new product/process which would be beneficial for the community
3. Finalize the objectives of the project
4. Prepare the design of the experiment (DOE)/steps in consultation with teachers/supervisors/industry
5. Procurement/manage the raw materials for the execution of the project
6. Prepare a report expressing the introduction of new product/field, literature review/market analysis, research gap/research problem, project objectives, DOE, materials, and methods.
7. Sample/product preparation as per design of experiment/steps
8. Testing of all the prepared samples
9. Analysis of all the testing results
10. Write a comprehensive conclusion of the project
11. Prepare and present final product and final report expressing the Introduction of field, literature review/market analysis, research gap/research problem, project objectives, DOE, materials, and methods, testing, results, analysis, and conclusion.

LIST OF LABS

LIST OF MACHINERY / EQUIPMENT TOOLS

Important Note: Preferably, all the equipment and machines should be small/lab scale/Models

Textile Spinning Lab

Sr. No.	Items	Quantity
1	Wool sorting machine	1
2	Wool scouring and drying machine	1
3	Wool carbonizing and drying machine	1
4	Wool mechanical carbonizing machine	1
5	Bale/fiber opening machine	1
6	Medium Opening & Cleaning machine	1
7	Fine Opening machine	1
8	Dust cleaning machine	1
9	Waste filter setup	2
10	Chute Feed Line	1
11	Fiber & Impurity Analyzer	1
12	Flat Grinding Machine	1
13	Carding machine	2
14	Wool tendem card machine	2
15	Drawing Finisher single delivery	1
16	Wool Gilling machine	1
17	Lap Former	1
18	Comber	1
19	Simplex Frame	1
20	Simplex Frame for woolen	1
21	Ring frame with all attachments	1
22	Ring frame for woolen	1
23	Cone Winding	1
24	Doubling & Twisting machine	1
25	Rotor Spinning Frame	1
26	Air vortex spinning frame	1
27	Cots Grinding machine	1
28	Top Roller Eccentricity Tester	1
29	Weight Balance (Mechanical)	1
30	Weight Balance (Electronic)	1
31	Hardness meter	2
32	Compressed air meter	2
33	Pneumatic pressure meter	2
34	Stroboscope	1
35	Specialty yarn machines	2
36	Laces formation machine	1

37	Elastic formation machine	1
38	Air covering machine	1
39	Compressor 10 KW	1

Textile Weaving & Knitting Lab

Sr. No.	Items	Quantity
1	Fabric Cutter	1
2	Tensioner Meter	1
3	Refracto meter	1
4	Hygro meter	10
5	Techo meter digital	1
6	Vibration meter	1
7	Knotting M/c	2
8	Splicing machine	2
9	Water jet loom	1
10	Air blower	1
11	Grinder small	1
12	Vacummax	1
13	Projection microscope	1
14	Shuttle loom Dobby	1
15	Power Loom (Lab Model required) Semi Automatic	1

16	Power Loom(Lab Model Required) Automatic with Speed adjustable	1
17	Jacquard machine	1
18	Sizing machine	1
19	Card Punching Machine	1
20	Lacing Machine	1
21	Projectile Loom	1
22	Rapier Loom	1
23	Air Jet Loom	1
24	Paper punching for Rapier	4
25	Leno winder for Air Jet	2
26	Knitting Machine Interlock	1
27	Knitting Rib Latest	1
28	Knitting Jacqard	1
29	Flat Knitted machine	1
30	GSM cutter	1
31	Pick glass	25
32	Micro Profile Projector	1
33	Reeds	15
34	Trolley for Yarn movement	1
35	Dobby Box	1
36	Warp Knitting Machine for Narrow Fabric	1
37	Lab scale woolen knitting machine	1
38	Braiding machine	1
39	hand Flat knitting machine	1
40	Gloves knitting machine	1
41	Socks knitting machine	1
42	Compressor 20 KW	1

Textile Dyeing & Finishing Lab

Sr. No.	Items	Quantity
1	Mechanical stirrer	1
2	Lab scale heating bath	1
3	lab scale weighing balance	1
4	lab scale padder	1
5	lab scale steamer	1
6	Lab scale oven	1
7	H / T Sample Dying Machine	1
8	Jigger dyeing machine	1
9	Winch dyeing machine	1
10	Jet dyeing machine	1
11	Lab Scale Blocks for printing	1
12	Lab Scale Printing Table	1
13	Package dyeing machine	1
14	Lab Scale Light Box	1
15	Flat bed screen printing machine	1
16	Digital Printing Machine	1
17	Lab scale stenter machine	1
18	Lab scale calendaring machine	
19	Lab scale coating machine	1
20	Lab Scale Sanforizing Machine	1
21	Lab Scale raizing Machine	1
22	lab scale weighing balance	1
23	Digital Lux Meter	1
24	Viscometer	1
25	pH meter	1
26	Thermometer	1
27	Fire extinguisher	1
28	Lab scale woolen milling machine	1
29	Lab scale woolen fabric washing machine	1
30	Lab scale tumble dryer machine	1
31	Lab scale woolen fabric drying machine	1
32	Lab scale woolen dyeing machine	1
33	Lab scale woolen raising machine	1
34	Lab scale woolen fabric pressing machine	1
35	Lab scale fabric stitching machine	1
36	Cone dyeing machine	1
37	Compressor 10 KW	1

38	Hotplate magnetic stirrer	5

Textile Pattern & Garments Lab

Sr. No.	Items	Quantity
1	Single Needle Lockstitch sewing machines	25
2	Vacuum Ironing Tables	3
3	Industrial Steam Iron	3
4	Single Needle Lock Stitch Machine	10
5	Double Needle Lock Stitch Machine	10
6	Over Lock Machine	10
7	Chain Stitch Sewing Machine	10
8	Bartake Sewing Machine	10
9	Button Sewing Machine	10
10	Digital Heat Press Machine	2
11	Automatic Pattern Sewing Machine	2
12	Elastic Attaching Machine	2
13	Post Bed Lockstitch Machine	2
14	1 Needle 2 Thread Lock Stitch sewing machine	3
15	2 Needle 5 Thread Safety Stitch sewing machine	1
16	2 Needle 4 Thread over lock sewing machine	3
17	1 Needle 2 Thread over lock sewing machine	1
18	3 Needle 5 Thread Interlock sewing machine	1
19	3 Needle 5 Thread Interlock sewing machine	2
20	3 Needle 5 Thread Interlock sewing machine	1
21	3 Needle 5 Thread Interlock sewing machine	1
22	12 Needle 24 Thread Chain stitch sewing machine	1
23	2 Needle 4 Thread Chain stitch sewing machine	1
24	1 Needle 1 Thread Blind Stitch sewing machine	1
25	Cloth Cutting Machine (8")	1
26	Tape cutting machine	1
27	Button Holing Machine	1
28	Sample Embroidery Machine	1
29	Buck Press Machine	1
30	Fabric Label Printer	1
31	Button Hole Machine	1
32	Unit Production System	1
33	3D Body Scanner	1
34	Female Mannequins	10
35	Male Mannequins	10
36	Inches tape	20
37	Set squares	50
38	French Curves	50
39	Pattern sheets	As per requirement
40	Needles of machines	As per requirement
41	Patten Tables	10
42	Compressor 10Kw	1

43	Light Board Tables	10

Textile Testing & Quality Control Lab

Sr. No.	Items	Quantity
1	Air Conditioner Testing Lab. 2tons	4
2	Yarn Strength Tester	1
3	Yarn Tension Meter	1
4	Lacing Machine	1
5	Martindale Pilling Tester	1
6	Light Fastness Tester	1
7	Launder-o-Meter	1
8	Washing/Laundering Machine	1
9	Spectrophotometer for whiteness measurement	1
10	Perspirometer	1
11	Crock Meter	1
12	Fabric Stiffness Tester	1
13	GSM cutter	1
14	Moisture Regain Oven	1
15	Vertical Flame Retardency Tester	1
16	Spray Rating Tester for water Repellency	1
17	Crease Recovery Tester	1
18	Day Light Box	1
19	Moisture Meter	1
20	Combined Lab Oven	1
21	Digital Lux Meter	1
22	Visco Meter	1
23	Stirrer	1
24	ICI M & S Pilling Tester	1
25	Fabric Inspection Table	1
26	Shirley 4 feet Crimp Tester	1
27	High Volume Instrument (HVI)	
28	Projection Microscope	1
29	Optical Microscope	1
30	Wrap reel Hand Operated	1
31	Wrap reel automatic	1
32	Twist Tester Hand Driven	1
33	Twist Tester Automatic	1
34	Pressley Cotton Fiber Strength Tester	1
35	Precision Balance	1
36	Wira Cotton Fineness Meter	1
37	Hatra Crimp Rigidity Apparatus	1
38	Stereo Microscope	1
39	Comb fiber Length Tester	1

40	Electric Moisture Meter	1
41	P.H Meter	2
42	Fabric Strength Tester with Computer	1
43	Yarn Quadrant Balance	1
44	Manual Fabric Sample Cutter	1
45	Tear Strength Tester	1
46	Yarn Count Balance	1
47	Burst Strength Tester	1
48	Thickness Gauge	1
49	Shore Hardness Tester	1
50	Electronic Yarn Count Balance with Computer	1
51	Uster Yarn Evenness Tester	1
52	Uster Classimate Yarn Tester (For Yarn Testing Lab) Swiss Made	1
53	Lea Tensile Strength Tester	1
54	Fire Extinguisher	1
55	Humidifier	1
56	Neps Counting Plates	2
57	Pick Counter 1" Square	10
58	Compressor 10 KW	1
59	Advance fiber investigation system	1

Computer/IT Lab

Sr. No.	Items	Quantity
1	Computer Systems	50
2	Computer Tables and Chairs	50
3	Printer (Laser)	2
4	Windows and important Softwares	50
5	Textile design softwares	50
6	Scanner (Flatbed)	2
7	Internet Connection (at least 100 MB/S)	1
8	Entry Level Server (As per TEVTA specification)	As per requirement
9	Network Equipment (As per TEVTA specification)	As per requirement
10	Wifi routers	10
11	Projectors	10
12	Laptop	As per requirement

"Physics" & "Chemistry" Labs Equipment Lists will be same as for Other Technologies

CHEMISTRY LABORATORY

List of apparatus and Chemicals required for DAE Chemistry practical of all Technologies. (For 50 Students)

1. List of Apparatus

Sr. #	Apparatus	Specification	Quantity
1.	Beakers 100ml	100ml	50 Nos.
2.	Beakers 250 ml Beakers 500 ml	250ml 500 ml	50 Nos. 25 Nos.
3.	Glass Rod	8 inches	25 Nos.
4.	Funnel	3 inches or 75mm	25 Nos.
5.	China Dish	60cc	25 Nos.
6.	Filter paper sheets	10 x 12 inches	100 Sheets
7.	Sprit Lamp or Bunsen Burner	With stop cork	50 Nos.
8.	Tripod stand	8 inches / 6 inches	50 Nos.
9.	Thermometer	(110 ^{o}C)	50 Nos.
10.	Capillary tubes	Good Quality	5 Packs
11.	Universal pH Paper Rang (1-14)	1-14	20 Packs
12.	Chromatograph Tank	-----	50 Nos.
13.	Cork with hook	------	25 Nos.
14.	Watch Glass	3"	50 Nos.
15.	Glass pipe	Local	10 m
16.	Ostwald's Viscometer	------	50 Nos.
17.	Pipette 10ml	10 ml	50 Nos.
18.	Specific Gravity Bottle	25 ml	25 Nos.

19.	Analytical / Electronic Balance	0.1 gm to 500 gm	06 Nos.
20.	Crucible with lid	-----	10 Nos.
21.	Stop watch	Digital	25 Nos.
22.	Pipette sucker	------	25 Nos.
23.	Stalagmometer	------	50 Nos.
24.	Pinch Cock	------	50 Nos.
25.	Rubber Tubes	½ “	50 Nos.
26.	Hoffman’s Voltameter	------	10 Nos.
27.	Connecting Wires	------	20 Meter
28.	Battery (12 V) D.C /Adapter	300 milli ampere	10 Nos.
29.	Distilled Water Plant. (Gas or Electric)	5 liter /h	02 Nos.
30.	Copper Foils (5cm x 2cm)	5cm x 2cm	10 Nos.
31.	Ammeter	0-3 ampere	10 Nos.
32.	Test Tubes	16 x 150 mm	300 Nos.
33.	Test Tubes Stands	Steel	25 Nos.
34.	Tube Test Brush	Good Quality	25 Nos.
35.	Test Tube Holder	Good Quality	25 Nos.
Sr. #	**Apparatus**	**Specification**	**Quantity**
36.	Platinum wire	------	25 Nos.
37.	Measuring Flask	1 Litre	10 Nos.
38.	Measuring Flask	500 ml	10 Nos.
39.	Measuring Flask	250 ml	10 Nos.
40.	Measuring Flask	1000 ml	10 Nos.
41.	Graduated Cylinder Graduated Cylinder	100 ml 50 ml	25 Nos. 25 Nos.
42.	Kipp’s Apparatus	250 ml	4 Nos.
43.	Desiccators	150 mm	2 Nos.

44.	Conical Flask	250 ml	50 Nos.
45.	Burette	50 ml	50 Nos.
46.	Iron stand with clamps	------	50 Nos.
47.	Wire Gauze	------	50 Nos.
48.	Hot Plate	Small Size 8”	2 Nos.
49.	Fusion tubes	Glass	250 Nos
50.	Pestle and Mortar	Medium Size	2 Nos.
51.	Wash Bottle - plastic	Medium Size	20 Nos.
52.	Dropper	Medium Size	20 Nos.
53.	Glass Stirrer	Medium Size	50 Nos.
54.	Steal Spatula	Medium Size	25 Nos.
55.	Water Bath	Ordinary Size	20 Nos.
56.	Burette Stand		25 Nos.
57.	Tongs		25 Nos.

2. List of Chemicals

Sr. #	Apparatus	Specification	Quantity
1.	Sodium Chloride	BDH/ Merck/China	500gm
2.	Copper Sulphate		1000 gm
3.	Naphthalene		500 gm
4.	Hydro Chloric Acid		5 Liter
5.	Nitric Acid		5 Liter
6.	Acetone		5 Liter
7.	Benzene		5 Liter
8.	Ether		2 ½ Liter

9.	Ammonia		2 ½ Liter
10.	Ethanol		2 ½ Liter
11.	Butanol		2 ½ Liter
12.	Potassium Dichromate		500 gm
13.	Zinc sulphate		500 gm
14.	Phenolphthalene		500 gm
15.	Carbon Tetra Chloride		2 ½ Liter
16.	Sand paper		10 No.
17.	Silver Nitrate		250 gm
18.	Sodium Hydroxide		2 Kg
19.	Potassium Hydroxide		500 gm
20.	Sodium Carbonate		500 gm
21.	Potasium Nitrate		500 gm
22.	Potassium Chromate		500 gm
23.	Cobalt Nitrate		500 gm
24.	Borax		500 gm
25.	Potassium Iodide		500 gm
26.	Sodium Thiosulphate		500 gm
27.	Stannous Chloride		500 gm
28.	Phosphoric acid		One Liter
29.	Disodium Hydrogen Phosphate		500 gm
30.	Sodium Stannate		500 gm
31.	Ammonium Molybdate		500 gm
32.	Ammonium Chloride		500 gm
33.	Ammonium Sulphocyanide		500 gm
34.	Sodium Phosphate		500 gm
35.	Ammonium Sulphate		500 gm

36.	Ammonium Oxalate		500 gm
37.	Ammonium Carbonate		500 gm
38.	Picric acid		500 gm
39.	Nesslers reagent		500 gm
40.	Tartaric Acid		500 gm
41.	Potasium Pyroantimonate		500 gm
42.	Potasium Sulphate		500 gm
43.	Magnesium Sulphate		500 gm
44.	Calcium Chloride		500 gm
45.	Lead Acetate		500 gm
46.	Starch (Powder)		500 gm
47.	Potassium Permanganate		500 gm
48.	Diphenyl amine		500 gm
49.	Barium Chloride		500 gm
50.	Ferric Chloride		500 gm
51.	Ferrous Chloride		500 gm
52.	Ferrous Sulphate		500 gm
53.	Ferric Sulphate		500 gm
54.	Barium Nitrate		500 gm
55.	Ammonium Acetate		500 gm
56.	Potassium Ferro cyanide		500 gm
57.	Methyl Orange		One pack
58.	Ammonium Sulphide Yellow		One Liter
59.	Acetic Acid		2 ½ Liter
60.	Paraffin (Wax)		01 kg
61.	Dimethyl Glyoxime (DMG)		200 g
62.	Sulphuric Acid		5 Liter

63.	Sodium Cobalt nitrate		500 gm
64.	Sodium Sulphide		500 gm
65.	Methylated Spirit		5 Liter
66.	Cadmium Sulphate		500 gm
67.	Mercuric Chloride		500 gm
68.	Plumbic Chloride		500 gm
69.	Bismuth Chloride		500 gm
70.	Antimonium Sulphate		500 gm
71.	Aluminum sulphate		500 gm
72.	Manganese Sulphate		500 gm
73.	Nickel Sulphate		500 gm
74.	Sodium Bicarbonate		500 gm
75.	Barium Chloride		500 gm
76.	Potassium Ferricyanide		500 gm
77.	Lead Nitrate		500 gm
78.	Sodium Phosphate		500 gm
79.	Zinc chloride		500 gm
80.	Zinc nitrate		500 gm

PHYSICS LABORATORY

List of Apparatus (for 50 Students)

Sr. #	Apparatus	Specification	Quantity
1.	Vernier Calipers	------	50 Nos.
2.	Solid Cylinders (Brass)	set of three	50 Nos.
3.	Magnifying Glass	3”	50 Nos.

4.	Micrometer (screw gauge)	0.25mm	50 Nos.
5.	Wire pieces (iron made)	10 cm long 2mm dia	25 Nos.
6.	Fletcher's trolley	with all accessories	12 Nos.
7.	Weight boxes	0.1 mg to 200g	12 Nos.
8.	Pan	50 gm	25 Nos.
9.	Gravesand's apparatus	(with pulleys, spirit level, plumb line) with weight 10X5=50 gm brass	25 each
10.	Hanger and slotted	weights 20x5=100 gm	25 each
11.	Set square		50 set
12.	Spring balance	100gm, 250gm, 500gm	50 each
13.	Iron stands	big	50 Nos.
14.	Meter strips/rod	(wooden)	50 Nos.
15.	Wedges	(wooden)	25 Nos.
16.	Searl's apparatus/young's modulus apparatus		12 Nos.
17.	Slotted weights with hanger	(for searle's apparatus) ½ x 5kg = 2.5 kg 1x5kg = 5 kg	50 each
18.	measuring tap		12 Nos.
19.	Steel wires	0.36mm and 0.45mm dia	50 m
20.	Helical spring with weight	50x5 = 250 gm brass	50 Nos.
21.	Iron stand	tripod base	50 Nos.
22.	Pan with pointer	usable with helical spring	50 Nos.
23.	Sonometer	wooden resonance box	12 Nos.
24.	Rubber pad	striking hammer rubber type	50 Nos.
25.	Tuning forks	(consisting forks of frequency approx. (440 hz, 512 hz,480 hz)	2 set of 16 forks

26.	Resonance apparatus	complete with plastic tube	12 Nos.
27.	Beakers	100 ml	50 Nos.
28.	Thermometer	½ degree upto 110° C ½ degree upto nearly240°F	50 Nos.
29.	Kundt's tube	Complete set	12 Nos.
30.	Screen metal	300rnm x 300mm painted white	25 Nos.
31.	Electrical lamp	Table lamp type adjustable height and direction	25 Nos.
32.	Point source adjustment	Wooden box type	25 Nos.
33.	Spherical ball	Different diameter 76mm with hook 19mm	25 Nos.
34.	Drawing boards		50 Nos.
35.	Mirror strips		50 Nos.
36.	Concave mirror	Focal length 150mm Focal length 250mm	50 Nos.
37.	Up rights with needles		50 Nos.
38.	Up rights for lens holding		50 Nos.
	Index rod		50 Nos.
40.	Convex lens	Focal length 150mm Focal length 250mm	50 Nos.
41	Optical bench		50 Nos.
42.	Glass – slabs		50 Nos.
43.	Microscope vernier	Traveling Type	8 Nos.
44.	Spectrometer	Complete Set	8 Nos.
45.	Sodium Lamp	18Watt	8 Nos
46.	Prism		50 Nos
47.	Spirit Level		50 Nos
48.	Pin Hole Camera	Kit complete made of card Board	50 Nos

49.	Sextant		12 Nos.
50.	Hypsometer		25 Nos
51.	Lead Shots	1 kg packet	12 Nos
52.	Calorimeter	Copper made with wooden lid	25 Nos
53.	Expansion Apparatus	Complete set with spherometer arrangements	12 Nos.
54.	Galvanometer	3 mA	50 Nos
55.	Power Supply	0-10 volts Variable – 5 Amp	12 Nos.
56.	Gas Burner/ Spirit lamps		25 Nos
57.	Balance	Physical	12 Nos.
58.	Wet and dry bulb hygrometer		12 Nos
59.	Beaker	250ml	50 Nos
60.	Blotting Paper		20 sheets
61.	Steam Generator	Complete with delivery tube and water trap system	12 Nos.
62.	Tripod with wire gauze		50 Nos
63.	Resined Flannel cloth		2 Meter

Mechanical Workshop lab

WELDING AND FORGING SHOP

Sr. No.	Name of Item with Specifications	Qty. Required
1)	Oxygen Gas Cylinder.	02
2)	Acetylene Gas Cylinder	02
3)	Oxygen Hose (10 m)	02
4)	Acetylene Hose (10 m)	02
5)	Cylinder Key	02

6)	Adjustable Spanner	02 Set
7)	Oxygen Cylinder Regulators	02
8)	Acetylene Cylinder Regulators	02
9)	Gas Welding Blow Pipe / Torch Set (injector Type)	02
10)	Gas Welding Blow Pipe / Torch Set (Non Injector Type)	02
11)	Gas Cutting Torch	02
12)	Tip Cleaner	02
13)	Gas welding Goggle	20
14)	Spark Lighter	05
15)	Leather Gloves.	10 pair
16)	Leather Apron	10
17)	Chipping Hammer	10
18)	Bench Vice	02
19)	Clear Goggles.	10
20)	Gas Manifold System	01
21)	Measuring Tape.	06
1)	Black Smith Vice	02
2)	FLATTER	04
3)	FORGING HAMMERS.	05
4)	Hot Chisel	10
5)	Cold Chisel Set.	10
6)	Tong Set	10
7)	Top and Bottom fuller	05
8)	Top and Bottom Swages.	05
9)	Anvil	02
10)	Forging / Heating chamber	02
1)	Face shield / Hand shield	10
2)	Welder Helmet.	10

3)	Arc Welding Transformer. (Complete Welding plant)	05
4)	Rectifier Welding with D.C. Ampere and D.C. Voltmeter	02
5)	Spot Welding Machine	01
6)	TIG WELDING PLANT	01
7)	MIG WELDING PLANT	01
8)	Wire brush	08
9)	PEDESTAL GRINDER	01
10)	Cut-off of Machine	01

Sr. No.	Name of Item with Specifications	Qty. Required	Qty. Available
11)	Hand Shear	01	

WOOD WORK SHOP

Sr. No.	Name of Item with Specifications	Qty. Required	Qty. Available
1.	CIRCULAR SAW	01	
2.	JIG SAW	01	
3.	BAND SAW	01	
4.	COMBINATION PLANE (PLANER & THICKNESSER)	01	
5.	WOOD TURNING LATHE	02	
6.	COMBINE BELT AND DISC SANDER	01	
7.	MORTISING MACHINE	01	
8.	PEDESTAL GRINDER	01	
9.	PILLAR DRILL	01	
10.	CROSS CUT SAW	25	

11.	TENON SAW	25	
12.	RIP SA	10	
13.	KEY HOLE SAW	05	
14.	COPING SAW	05	
15.	MITRE BOX SAW	05	
16.	SPOKE SHAVE PLANE	05	
17.	BLOCK PLANE	15	
18.	SMOOTHING PLANE	25	
19.	JACK PLANE	25	
20.	CIRCULAR PLANE	10	
21.	RABBET PLANE	05	
22.	ROUTER PLANE	05	
23.	FIRMUR CHISEL	25	
24.	FIRM GOUGES	10	
25.	MORTISE CHISEL	10 Set	
26.	TURNING CHISEL	10	
27.	BALL PEEN HAMMER	12	
28.	CLAW HAMMER	06	
29.	WOODEN MALLET	20	
30.	RUBBER MALLET	10	
31.	MARKING GAUGE	10	
32.	BAR CLAMP	02	
33.	COMBINATION SET	05	
34.	DRILL CHUCK WITH ARBOR	02	
35.	TAPER SLEEVE	04	
36.	TRY SQUARE	25	
37.	JOINTERS TRY SQUARE	10	

Sr. No.	Name of Item with Specifications	Qty. Required
38.	MITER TRY SQUARE	10
39.	FLEXIBLE MEASURING TAPE	10
40.	TRAMMEL	06
41.	FOLDING RULE	05
42.	GLASS FIBER TAP	05
43.	WOOD WORKING VICE	24
44.	GIMLET	10
45.	SOLID CENTER AUGER BIT	05 Set
46.	CENTER BITS	5 Set
47.	DRILL BRACES	10
48.	CNC Wood Router	00
49.	Rapid prototyping Machine	0
50.	WOOD WORKING TABLE	6

Technical Drawing Lab

Drawing Hall

List of Equipment for 50 students

Sr. No.	Name of Item with Specifications	Qty. Required
1)	**Drafting Table** Portable (Taper Type) Table size 32" x 24"	51
2)	**Instruments Box** Special Compass Set	02 Set
3)	**Tee Square** (600 mm) Transparent	02 Set
4)	**Set Square** Transparent medium size (300 mm)	02 Set
5)	**Templates** Circle Square, Hexagon, Triangle (03 each)	02 Set
6)	**French Curves** Good Quality, medium size	02 Set

7)	Clutch Pencil (0. 5 mm)	5
8)	Eraser	0
9)	Sharpener Machine	05
10)	Portable Drawing Board (3'x2' with scale)	05
11)	Drafting Machine Elbow type	00
12)	Stool	50

List of Consumable Items (For 50 students)

Sr. No	EQUIPMENT / TOOLS	Quantity
	Textile Spinning Lab	
1.	Cotton, Jute, hemp, wool fibers, silk, and other natural fibers	As per requirement
2.	Polyester, Nylon, Coolmax fibers, Aramid fibers, metal fibers, HPPE, Carbon and other manmade fibers	As per requirement
3.	Different yarns, Filaments of all types	As per requirement
4.	Machine oil and lubricants (various grades)	20 liters per type
5.	Cot grinding wheels (fine/medium/coarse)	10 wheels per type
6.	Top rollers and spare cots	100 pcs
7.	Aprons and spacers for drafting systems	100+ pcs
8.	Spare clearer rollers and under casings	As required for each carding machine
9.	Card clothing and flat tops	As per machine requirement sets
10.	Lap former aprons and sliver cans	10 sets per semester
11.	Sliver and roving bobbins	100+ pcs
12.	Ring travelers (various sizes/types)	1000+ pcs
13.	Spindles and spindle tapes	50+ pcs
14.	Drafting belts and tension tapes	50+ meters per type
15.	Yarn bobbins, cops, cones (plastic and paper)	2000+ pcs
16.	Twisting and doubling spindles	20+ sets
17.	Cleaning brushes and maintenance kits	Sets for each major machine
18.	Textile waste collection bags	100+ bags
19.	Cotton, polyester, wool (raw fiber for testing)	1000 kg per semester

Sr. No	EQUIPMENT / TOOLS	Quantity
20.	Anti-static spray and humidification chemicals	As needed
21.	Dust masks, gloves, and safety gear	Enough for full class usage
22.	Calibration weights for balances	Standard certified sets
23.	Measuring tapes and precision tools	20 sets
24.	Stroboscope reflective tape	10 rolls
25.	Hardness tester calibration blocks	5 sets
26.	Compressed air filter cartridges	5 cartridges
27.	Machine spares and fasteners	Assorted box sets
28.	Data recording sheets and logbooks	As per lab usage cycle
Textile Weaving & Knitting Lab		
1.	Different fiber based fabrics	As per requirement
2.	Size materials different types	As per requirement
3.	Different types of fabrics	As per requirement
4.	Different Heald frames	As per requirement
5.	Knotters	As per requirement
6.	Knitting machine needles	As per requirement
7.	Warp and weft yarns (cotton, polyester, blends)	1000+ meters per semester
8.	Reeds and heald frames (spare sets)	30 sets
9.	Knitting needles (cylinder, dial, latch type)	200+ pcs
10.	Sinkers and cams for knitting machines	100+ pcs
11.	Lubricating oil for looms and knitting machines	15 liters per type
12.	Splicing tape and spare parts	Rolls and spare units per semester

Sr. No	EQUIPMENT / TOOLS	Quantity
13.	Jacquard cards and punching paper	500+ cards & 50 sheets paper
14.	Leno doup and leno threading tools	20+ sets
15.	Sizing ingredients (starch, binder, softeners)	As required for lab usage
16.	Knitting machine belts and timing chains	15 sets
17.	GSM cutter blades and sample pads	50+ replacement blades
18.	Glass pick counters and measuring glasses	25 units
19.	Fabric marking pens and sample tags	100 pcs
20.	Machine brushes and cleaning kits	1 set per major machine
21.	Compressed air nozzles and filters	10 sets
22.	Sensor strips and loom control tags	50+ pcs
23.	Yarn cones and bobbins (paper/plastic)	1000+ units
24.	Tension springs and weights	As needed
25.	Knitting wax and anti-static agents	Packs or bottles
26.	Sample fabric rolls for practice	500+ meters
27.	Gloves for machine handling	Class set
28.	Safety glasses and ear protection	25+ sets
29.	Logbooks and maintenance sheets	50+ bags
30.	Waste collection bags	20 kits
31.	Calibration tools for testing instruments	Standard certified sets
32.	Warp and weft yarns (cotton, polyester, blends)	1000+ meters per semester
33.	Reeds and heald frames (spare sets)	30 sets
34.	Knitting needles (cylinder, dial, latch type)	200+ pcs
35.	Sinkers and cams for knitting machines	100+ pcs
Textile Dyeing & Finishing Lab		
1	Enzyme desizer	20 kg
2	Acetic acid	20 L
3	Wetting agent	5 kg

Sr. No	EQUIPMENT / TOOLS	Quantity
4	Carrier	2 kg
5	NaOH	100 kg
6	$Na_2S_2O_4$	50 kg
7	Na_2S	50 kg
8	Sequestering agent	5 kg
9	Urea	50 kg
10	Na_2CO_3	40 kg
11	$NaHCO_3$	40 kg
12	H_2O_2	40 kg
13	Stabilizer	20 kg
14	$KMnO_4$	20 kg
15	H_2SO_4	30 L
16	Iodine	800 g
17	Potassium iodide	5 kg
18	Direct dyes, Reactive dyes, Vat dyes, Sulphur Dyes, Disperse dyes, Acid dyes, Basic dyes	2 kg each
19	Dispersing agent	2 kg
20	Different types of fabrics	100 m each type
21	Binder	20 kg
22	Pigments (Red, Yellow, Blue, Black)	1 kg each color
23	Screens for flat-bed Printing	5
24	Sodium alginate	20 kg
25	Liquor ammonia	20 kg
26	Softeners	20 kg
27	Resins	20 kg
28	$MgCl_2$	2 kg
29	Water repellent finishes	5 kg
30	Flame retardant finishes	5 kg
31	Soil release finish	5Kg
32	Stiff Finish	5 Kg
33	Antimicrobial finishes	500 g
34	Glass beakers 200 mL	20
35	Glass beakers 500 mL	20
36	Glass beakers 1000 mL	10
37	Graduated cylinder	10
38	Conical flask	20
39	Funnel	10
40	Burette	20

Sr. No	EQUIPMENT / TOOLS	Quantity
41	Pipette	20
42	Dropper	20
43	Plastic bottles	20
44	Spatula	10
45	Glass stirrer	20
46	Magnetic capsules 1 inch	5
47	Magnetic capsules 2 inch	5
48	Solution filtration assembly	1
49	Filter paper	2 bundles
50	Gloves	20
51	Goggles	20
52	Mask	10 packets
53	Tegewa rating scale	2
54	Gas burner	20
55	Stand for gas burner	20
56	Carrier	2 Kg
57	Thickener for pigment printing	20 Kg
58	Thickener for reactive printing	20 Kg
59	Alkali pad fabric for digital printing (Roll)	1000 m
Textile Pattern & Garments Lab		
1	Sewing threads (polyester, cotton, etc.)	Multiple cones per color
2	Bobbins and bobbin cases	10 per machine type
3	Machine oil (light and heavy)	10 liters
4	Machine needles (various sizes, DBx1, DPx5, UOx113, etc.)	As per machine specs
5	Spare presser feet (standard, zipper, roller, teflon, etc.)	10 per type
6	Spare belts for sewing machines	2 per machine type
7	Cleaning brushes	1 per machine
8	Lubrication cloths and wipes	Packs (100+)
9	Fabric shears / Scissors	50
10	Tailor chalk / Fabric marking pens	100+ pcs (various colors)
11	Measuring tapes	30 pcs

Sr. No	EQUIPMENT / TOOLS	Quantity
12	Pattern paper rolls / Kraft paper	As per batch & course requirement
13	Muslin fabric (for sample development)	1000 meters per semester
14	Drafting rulers / Grading rulers	50 sets
15	Carbon paper	50 sheets
16	Pattern notcher, awls, tracing wheels	15 sets
17	Assorted woven and knit fabrics (cotton, denim, jersey, etc.)	1000+ meters per semester
18	Interfacing / Fusible fabrics	100+ meters
19	Elastic tapes (various widths)	200+ meters
20	Zippers (different lengths/types)	100+ pcs
21	Buttons (assorted sizes)	1000+ pcs
22	Hooks, eyes, snaps	Packs
23	Ribbons, bias tape, piping cords	As per design project needs
24	Laces, sequins, trims	Packs / meters
25	Velcro strips	50+ meters
26	Labels (blank, woven)	500+ pcs
27	Ironing pads / covers	10 units
28	De-scaling chemicals for steam iron	As needed
29	Press cloths	15 pcs
30	Safety gloves (for heat press & irons)	15 pairs
31	Embroidery threads (rayon, polyester)	Color sets
32	Stabilizers/backing (tear-away, cut-away)	Rolls/packs
33	Printable fabric sheets	Packs
34	Heat transfer paper	Packs
35	Sublimation ink & maintenance kits	For digital heat press machine
36	Dress forms / Pinnable mannequins padding kits	As needed
37	Pins and pin cushions	100+ packs
38	Safety pins	100+ packs
39	Seam rippers	1 per student or per machine

Sr. No	EQUIPMENT / TOOLS	Quantity
40	Sketching pads and fashion drawing sheets	1 per student
	Textile Testing and Quality Control Lab	
1	Mix CONSUMABLE ITEMS	As per requirement
2	Different type of fibers	As per requirement
3	Different type of yarns	As per requirement
4	Different type of fabrics	As per requirement
5	Glass breakers 200 mL	As per requirement
6	Glass beakers 500 mL	As per requirement
7	Glass beakers 1000 mL	As per requirement
8	Graduated cylinder	As per requirement
9	Conical flask	As per requirement
10	Test tubes	As per requirement
11	Funnel	As per requirement
12	Burette	As per requirement
13	Pipette	As per requirement
14	Dropper	As per requirement
15	Plastic bottles	As per requirement
16	Spatula	As per requirement
17	Glass stirrer	As per requirement
18	Magnetic capsules 1 inch	As per requirement

Sr. No	EQUIPMENT / TOOLS	Quantity
19	Magnetic capsules 2 inch	As per requirement
20	Filter papers	As per requirement
21	Plastic jars	As per requirement
22	Rubber sucker	As per requirement
23	Gas burners	As per requirement
24	Electric stoves	As per requirement
25	Stand for burners	As per requirement
26	Distillation unit	As per requirement
27	Graduated cylinders	As per requirement
28	H2SO4	As per requirement
29	Acetone	As per requirement
30	Dimethyl formamide	As per requirement
31	Formic acid	As per requirement
32	HNO3	As per requirement
33	Different solvents	As per requirement
Computer/IT Lab		
1	Printing Paper	As per requirement
2	Printer Toner	As per requirement
3	Connectors	As per requirements

Sr. No	EQUIPMENT / TOOLS	Quantity
4	Mouse, Keyboard, Mouse pads, Electric cables, etc	As per requirements
5	Extension wires, connection boards	As per requirements
6	Textile and other software licenses	As per requirements

EMPLOYABILITY DESIGNATIONS and UPWARD MOBILITY OF GRADUATES

The graduate will be able to get a job in the following designations;

- Management Trainee > Assistant Manager > Deputy Manager > Manager
- Supervisor production > Production Incharge > Manager production
- Supervisor quality > Lab Incharge > Manager QC > QA manager
- Jr. Instructor > Instructor > Sr. Instructor > Chief Instructor > Principal

The graduates will be able to work in the following streams;

- Business & Entrepreneurship
- Consultant/Broker
- Multiple type of Industries
- Government sector Trainer
- Technology Research & Development
- Job Abroad

OPPORTUNITIES NATIONAL & INTERNATIONAL

- Woolen products spinner/weaver/processor/garment engineer
- Semi worsted products engineer
- Junior Instructor / Trainer
- Quality assurance personnel
- Fiber Manager
- Working as a production Associate engineer/supervisor in any textile industry
- Marketing representative
- Textile Businessman/Trader

JOB OFFERING COUNTRIES

- New Zealand
- Pakistan
- United Arab Emirates (UAE)
- United States (US)
- Australia
- Turkey
- United Kingdom (UK)
- Canada
- Germany
- France
- China
- Vietnam
- Bangladesh
- Germany
- Bahrain
- Nepal

QUALIFICATION OF TEACHER/INSTRUCTOR

Post	Qualification	Experience
Jr. Instructor	DAE 1. Textile Spinning Technology 2. Textile Weaving Technology 3. Textile Dyeing & Printing Technology 4. Garments Technology 5. Textile Technology (Specialization in Wool)	4 -Years
Instructor	BSc./BS/BE/BTech Textile/Clothing/Garments (Engineering/Technology)	2- Years
Instructor	MSc./MS/M.Tech/Technology/Clothing/Clothing & Textile/Garments (Engineering/Technology)	NIL

CURRICULUM DEVELOPMENT COMMITTEE

1.	**Dr. M. Bilal Qadir** Associate Professor, National Textile University (NTU) Faisalabad.	**Convener**
2.	**Dr. Amjed Javid** Assistant Professor, National Textile University (NTU) Faisalabad.	**Member**
3.	**Muhammad Amjad Mushtaq** Executive Spinning, Dawood Lawrencepur Woolen and Textile Mills.	**Member**
4.	**Engr. Rana Ahmad Ali** Principal, GCT, Rajanpur	**Member**
5.	**Engr. Muhammad Ali** Project Director, Govt. Institute of Textile Technology Faisalabad.	**Member**