ANNA UNIVERSITY, CHENNAI
NON-AUTONOMOUS COLLEGES AFFILIATED TO ANNA UNIVERSITY
REGULATIONS 2021
B. TECH. TEXTILE TECHNOLOGY
CHOICE BASED CREDIT SYSTEM
I AND II SEMESTERS CURRICULA AND SYLLABUS

SEMESTER I

S. No.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	IP3151	Induction Programme	-	-	-	-	-	0
THEORY								
2.	HS3151	Professional English - I	HSMC	3	1	0	4	4
3.	MA3151	Matrices and Calculus	BSC	3	1	0	4	4
4.	PH3151	Engineering Physics	BSC	3	0	0	3	3
5.	CY3151	Engineering Chemistry	BSC	3	0	0	3	3
6.	GE3151	Problem Solving and Python Programming	ESC	3	0	0	3	3
PRACTICALS								
7.	GE3171	Problem Solving and Python Programming Laboratory	ESC	0	0	4	4	2
8.	BS3171	Physics and Chemistry Laboratory	BSC	0	0	4	4	2
			TOTAL	**15**	**2**	**8**	**25**	**21**

SEMESTER II

SI. NO.	COURSE CODE	COURSETITLE	CATE-GORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	HS3251	Professional English - II	HSMC	3	1	0	4	4
2.	MA3251	Statistics and Numerical Methods	BSC	3	1	0	4	4
3.	PH3257	Physics for Textile Technologists	BSC	3	0	0	3	3
4.	BE3252	Basic Electrical, Electronics and Instrumentation Engineering	ESC	3	0	0	3	3
5.	GE3251	Engineering Graphics	ESC	2	0	4	6	4
6.	CY3252	Chemistry for Textile Technologists	BSC	3	0	0	3	3
7.		NCC Credit Course Level 1*	-	2	0	0	2	2
PRACTICALS								
8.	GE3271	Engineering Practices Laboratory	ESC	0	0	4	4	2
9.	BE3272	Basic Electrical, Electronics and Instrumentation Engineering Laboratory	ESC	0	0	4	4	2
			TOTAL	**17**	**2**	**12**	**31**	**25**

*NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

IP3151   **INDUCTION PROGRAMME**

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed."

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. "

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

  (i) Physical Activity
This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

  (ii) Creative Arts
Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it everyday for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and
also enhance creativity which would, hopefully, grow into engineering design later.

  (iii) Universal Human Values
This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.
Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

  (iv) Literary Activity
Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

  (v) Proficiency Modules
This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi)   Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii)   Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii)   Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix)   Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering / Technology/ Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

References:
Guide to Induction program from AICTE

HS3151   **PROFESSIONAL ENGLISH - I**   **L T P C**
                                                                              3 1 0 4

COURSE OBJECTIVES:
- To improve the communicative competence of learners
- To help learners use language effectively in academic /work contexts
- To build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.
- To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.
- To use language efficiently in expressing their opinions via various media.

INTRODUCTION TO EFFECTIVE COMMUNICATION   **1**
- What is effective communication? (There are many interesting activities for this.)
- Why is communication critical for excellence during study, research and work?
- What are the seven C's of effective communication?
- What are key language skills?
- What is effective listening? What does it involve?
- What is effective speaking?
- What does it mean to be an excellent reader? What should you be able to do?
- What is effective writing?
- How does one develop language and communication skills?
- What does the course focus on? How are communication and language skills going to be enhanced during this course? What do you as a learner need to do to enhance your English language and communication skills to get the best out of this course?

UNIT I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 11

Listening –for general information-specific details- conversation: Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. **Speaking** - Self Introduction; Introducing a friend; Conversation - politeness strategies; Telephone conversation; Leave a voicemail; Leave a message with another person; asking for information to fill details in a form. **Reading** - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. **Writing** - Writing emails / letters introducing oneself. **Grammar** - Present Tense (simple and progressive); Question types: Wh/ Yes or No/ and Tags . **Vocabulary** - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).

UNIT II NARRATION AND SUMMATION 12

Listening - Listening to podcast, anecdotes / stories / event narration; documentaries and interviews with celebrities. **Speaking -** Narrating personal experiences / events; Interviewing a celebrity; Reporting / and summarizing of documentaries / podcasts/ interviews. **Reading** - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. **Writing** - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) **Grammar** –Past tense (simple); Subject-Verb Agreement; and Prepositions. **Vocabulary** - Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.

UNIT III DESCRIPTION OF A PROCESS / PRODUCT 12

Listening - Listen to a product and process descriptions; a classroom lecture; and advertisements about a products. **Speaking** – Picture description; giving instruction to use the product; Presenting a product; and summarizing a lecture**. Reading** – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. **Grammar** - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words.

UNIT IV CLASSIFICATION   AND RECOMMENDATIONS 12

Listening – Listening to TED Talks; Scientific lectures; and educational videos. **Speaking** – Small Talk; Mini presentations and making recommendations. **Reading** – Newspaper articles; Journal reports –and Non Verbal Communication (tables, pie charts etc) **Writing** – Note-making / Note-taking (*Study skills to be taught, not tested; Writing recommendations; Transferring information from non verbal (chart , graph etc, to verbal mode). **Grammar** – Articles; Pronouns - Possessive & Relative pronouns .**Vocabulary** - Collocations; Fixed / Semi fixed expressions.

UNIT V EXPRESSION 12

Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. **Speaking** –group discussions, Debates, and Expressing opinions through Simulations & Role play. **Reading** – Reading editorials; and Opinion Blogs; **Writing** – Essay Writing (Descriptive or narrative). **Grammar** – Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences. **Vocabulary** - Cause & Effect Expressions – Content vs Function words.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able

    CO1 : To listen and comprehend complex academic texts

    CO2 : To read and infer the denotative and connotative meanings of technical texts

    CO3 : To write definitions, descriptions, narrations and essays on various topics

    CO4 : To speak fluently and accurately in formal and informal communicative contexts

    CO5 : To express their opinions effectively in both oral and written medium of communication

TEXT BOOKS:

1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition)
2. English for Science & Technology Cambridge University Press, 2021.
   Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES:

1. Technical Communication – Principles And Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. A Course Book on Technical English By Lakshmi Narayanan, Scitech Publications (India) Pvt. Ltd.
3. English For Technical Communication (With CD) By Aysha Viswamohan, Mcgraw Hill Education, ISBN : 0070264244.
4. Effective Communication Skill, Kulbhusan Kumar, R S Salaria, Khanna Publishing House.Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi,2003.

MA3151	MATRICES AND CALCULUS	L T P C
		3 1 0 4

COURSE OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I   **MATRICES**   **9+3**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley - Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms – Applications : Stretching of an elastic membrane.

UNIT II   **DIFFERENTIAL CALCULUS**   **9+3**

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation - Applications : Maxima and Minima of functions of one variable.

UNIT III   FUNCTIONS OF SEVERAL VARIABLES   9+3

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Applications : Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.

UNIT IV   INTEGRAL CALCULUS   9+3

Definite and Indefinite integrals - Substitution rule - Techniques of Integration : Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals - Applications : Hydrostatic force and pressure, moments and centres of mass.

UNIT V   MULTIPLE INTEGRALS   9+3

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals – Applications : Moments and centres of mass, moment of inertia

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course the students will be able to
    CO1 : Use the matrix algebra methods for solving practical problems.
    CO2 : Apply differential calculus tools in solving various application problems.
    CO3 : Able to use differential calculus ideas on several variable functions.
    CO4 : Apply different methods of integration in solving practical problems.
    CO5 : Apply multiple integral ideas in solving areas, volumes and other practical problems.

TEXT BOOKS :
1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition , 2018.
3. James Stewart, " Calculus : Early Transcendentals ", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES :
1. Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2016
2. Bali. N., Goyal. M. and Watkins. C., " Advanced Engineering Mathematics ", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
3. Jain . R.K. and Iyengar. S.R.K., " Advanced Engineering Mathematics ", Narosa Publications, New Delhi, 5th Edition, 2016.
4. Narayanan. S. and Manicavachagom Pillai. T. K., " Calculus " Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5. Ramana. B.V., " Higher Engineering Mathematics ", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6. Srimantha Pal and Bhunia. S.C, " Engineering Mathematics " Oxford University Press, 2015.
7. Thomas. G. B., Hass. J, and Weir. M.D, " Thomas Calculus ", 14th Edition, Pearson India, 2018.

PH3151   **ENGINEERING PHYSICS**   **L T P C**
                                                                         3 0 0 3

COURSE OBJECTIVES
- To make the students effectively to achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of oscillations, optics and lasers.
- Equipping the students to be successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

UNIT I   MECHANICS   9
Multi-particle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M .I –moment of inertia of continuous bodies – M.I of a diatomic molecule - torque – rotational dynamics of rigid bodies – conservation of angular momentum – rotational energy state of a rigid diatomic molecule - gyroscope - torsional pendulum – double pendulum –Introduction to nonlinear oscillations.

UNIT II   ELECTROMAGNETIC WAVES   9
The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

UNIT III   OSCILLATIONS, OPTICS AND LASERS   9
Simple harmonic motion - resonance –analogy between electrical and mechanical oscillating systems - waves on a string - standing waves - traveling waves - Energy transfer of a wave - sound waves - Doppler effect. Reflection and refraction of light waves - total internal reflection - interference –Michelson interferometer –Theory of air wedge and experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO_2 laser, semiconductor laser –Basic applications of lasers in industry.

UNIT IV   BASIC QUANTUM MECHANICS   9
Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes-Normalization, probabilities and the correspondence principle.

UNIT V   APPLIED QUANTUM MECHANICS   9
The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)-Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.

TOTAL : 45   PERIODS

COURSE OUTCOMES
After completion of this course, the students should be able to
   CO1 : Understand the importance of mechanics.
   CO2 : Express their knowledge in electromagnetic waves.
   CO3 : Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
   CO4 : Understand the importance of quantum physics.
   CO5 : Comprehend and apply quantum mechanical principles towards the formation of energy bands.

TEXT BOOKS:
1. D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw-Hill (Indian Edition), 2017.

REFERENCES:
1. R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2. Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004.
3. K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.
4. D.Halliday, R.Resnick and J.Walker. Principles of Physics, Wiley (Indian Edition), 2015.
5. N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer-Verlag,

CY3151	ENGINEERING CHEMISTRY	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To introduce the basic concepts and applications of phase rule and composites.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

UNIT I   WATER AND ITS TREATMENT   9
Water: Sources and impurities, Water quality parameters: Definition and significance of-color, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, flouride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water: Reverse Osmosis. Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming &foaming. Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralization and zeolite process.

UNIT II   NANOCHEMISTRY   9
Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

UNIT III   PHASE RULE AND COMPOSITES   9

Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process.

Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

UNIT IV   FUELS AND COMBUSTION   9

Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; Power alcohol and biodiesel.

Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. CO_2 emission and carbon foot print.

UNIT V   ENERGY SOURCES AND STORAGE DEVICES   9

Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion-battery; Electric vehicles; working principles; Fuel cells: H_2-O_2 fuel cell, microbial fuel cell; Supercapacitors: Storage principle, types and examples.

TOTAL: 45 PERIODS

COURSE OUTCOMES

At the end of the course, the students will be able:

     CO1 :To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.

     CO2 :To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.

     CO3 :To apply the knowledge of phase rule and composites for material selection requirements.

     CO4 :To recommend suitable fuels for engineering processes and applications.

     CO5 :To recognize different forms of energy resources and apply them for suitable application in energy sectors.

TEXT BOOKS:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3. S.S. Dara, "A Text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.

REFERENCES:

1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.

4. ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
5. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.

GE3151   **PROBLEM SOLVING AND PYTHON PROGRAMMING**   **L T P C**
                                                                                   3 0 0 3

OBJECTIVES:
- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT I   **COMPUTATIONAL THINKING AND PROBLEM SOLVING**   **9**
Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II   **DATA TYPES, EXPRESSIONS, STATEMENTS**   **9**
Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III   **CONTROL FLOW, FUNCTIONS, STRINGS**   **9**
Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values,
parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV   **LISTS, TUPLES, DICTIONARIES**   **9**
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

UNIT V   **FILES, MODULES, PACKAGES**   **9**
Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

                                                          TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to
CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs using conditionals and looping for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries etc.
CO6: Read and write data from/to files in Python programs.

TEXT BOOKS:
1. Allen B. Downey, "Think Python : How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and programming", 1st Edition, BCS Learning & Development Limited, 2017.

REFERENCES:
1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press , 2021
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5. https://www.python.org/
6. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

GE3171   PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY   L T P C
0 0 4 2

OBJECTIVES:
- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

EXPERIMENTS:

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).

3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)
11. Exploring Pygame tool.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS

OUTCOMES:
On completion of the course, students will be able to:
CO1: Develop algorithmic solutions to simple computational problems
CO2: Develop and execute simple Python programs.
CO3: Implement programs in Python using conditionals and loops for solving problems..
CO4: Deploy functions to decompose a Python program.
CO5: Process compound data using Python data structures.
CO6: Utilize Python packages in developing software applications.

TEXT BOOKS:

1. Allen B. Downey, "Think Python : How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press , 2021
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5. https://www.python.org/
6. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

BS3171   **PHYSICS AND CHEMISTRY LABORATORY**   **L T P C**
                                                                0 0 4 2

PHYSICS LABORATORY : (Any Seven Experiments)

COURSE OBJECTIVES:

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To determine error in experimental measurements and techniques used to minimize such error.
- To make the student as an active participant in each part of all lab exercises.

LIST OF EXPERIMENTS

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. Non-uniform bending - Determination of Young's modulus
4. Uniform bending – Determination of Young's modulus
5. Laser- Determination of the wave length of the laser using grating
6. Air wedge - Determination of thickness of a thin sheet/wire
7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10. Post office box -Determination of Band gap of a semiconductor.
11. Photoelectric effect
12. Michelson Interferometer.
13. Melde's string experiment
14. Experiment with lattice dynamics kit.

TOTAL: 30 PERIODS

COURSE OUTCOMES:
Upon completion of the course, the students should be able to
   CO1 : Understand the functioning of various physics laboratory equipment.
   CO2 : Use graphical models to analyze laboratory data.
   CO3 : Use mathematical models as a medium for quantitative reasoning and describing physical reality.
   CO4 : Access, process and analyze scientific information.
   CO5 : Solve problems individually and collaboratively.

CHEMISTRY LABORATORY: (Any seven experiments)

OBJECTIVES:
- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and alloys.
- To demonstrate the synthesis of nanoparticles

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)
1. Preparation of Na_2CO_3 as a primary standard and estimation of acidity of a water sample using the primary standard
2. Determination of types and amount of alkalinity in water sample.
    - Split the first experiment into two
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler's method.
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of copper content of the given solution by Iodometry.
7. Estimation of TDS of a water sample by gravimetry.
8. Determination of strength of given hydrochloric acid using pH meter.
9. Determination of strength of acids in a mixture of acids using conductivity meter.
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)
11. Estimation of iron content of the given solution using potentiometer.
12. Estimation of sodium /potassium present in water using flame photometer.
13. Preparation of nanoparticles (TiO_2/ZnO/CuO) by Sol-Gel method.
14. Estimation of Nickel in steel
15. Proximate analysis of Coal

TOTAL : 30 PERIODS

OUT COMES :
- To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
- To determine the amount of metal ions through volumetric and spectroscopic techniques
- To analyse and determine the composition of alloys.
- To learn simple method of synthesis of nanoparticles
- To quantitatively analyse the impurities in solution by electroanalytical techniques

TEXT BOOKS :
1. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogel's Textbook of Quantitative Chemical Analysis (2009).

HS3251   **PROFESSIONAL ENGLISH - II**   **L T P C**
                                                                 3 1 0 4

COURSE OBJECTIVES

- To engage learners in meaningful language activities to improve their LSRW skills
- To enhance learners' awareness of general rules of writing for specific audiences
- To help learners understand the purpose, audience, contexts of different types of writing
- To develop analytical thinking skills for problem solving in communicative contexts
- To demonstrate an understanding of job applications and interviews for internship and placements

UNIT I   MAKING COMPARISONS   12

Listening – Evaluative Listening: Advertisements, Product Descriptions, -Audio / video; Listening and filling a Graphic Organiser (Choosing a product or service by comparison). **Speaking** – Marketing a product, Persuasive Speech Techniques. **Reading** - Reading advertisements, user manuals, brochures; **Writing** – Professional emails, Email etiquette - Compare and Contrast Essay; **Grammar** – Mixed Tenses, Prepositional phrases. **Vocabulary** – Contextual meaning of words

UNIT II   EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING   12

Listening - Listening to longer technical talks and completing– gap filling exercises. Listening technical information from podcasts – Listening to process/event descriptions to identify cause & effects - **Speaking** – Describing and discussing the reasons of accidents or disasters based on news reports. **Reading** - Reading longer technical texts– Cause and Effect Essays, and Letters / emails of complaint, **Writing** - Writing responses to complaints. **Grammar** - Active Passive Voice transformations, Infinitive and Gerunds **Vocabulary** – Word   Formation (Noun-Verb-Adj-Adv), Adverbs.

UNIT III   PROBLEM SOLVING   12

Listening – Listening to / Watching movie scenes/ documentaries depicting a technical problem and suggesting solutions. **Speaking** – Group Discussion (based on case studies), - techniques and Strategies, **Reading** - Case Studies, excerpts from literary texts, news reports etc.,**Writing** – Letter to the Editor, Checklists, Problem solution essay / Argumentative Essay **Grammar** – Error correction; If conditional sentences. **Vocabulary** - Compound Words, Sentence Completion.

UNIT IV   REPORTING OF EVENTS AND RESEARCH   12

Listening – Listening Comprehension based on news reports – and documentaries – Precis writing, Summarising, **Speaking** –Interviewing, Presenting an oral report, Mini presentations on select topics; **Reading** –Newspaper articles; **Writing** – Recommendations, Transcoding, Accident Report, Survey Report **Grammar** – Reported Speech, Modals **Vocabulary** – Conjunctions- use of prepositions

UNIT V   THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY   12

Listening – Listening to TED Talks, Presentations, Formal job interviews, (analysis of the interview performance); **Speaking** – Participating in a Role play, (interview/telephone interview), virtual interviews, Making presentations with visual aids; **Reading** – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; **Writing** – Job / Internship application – Cover letter & Resume; **Grammar** – Numerical adjectives, Relative Clauses **Vocabulary** – Idioms.

TOTAL : 60 PERIODS

 COURSE OUTCOMES:
 At the end of the course, learners will be able
     CO1 : To compare and contrast products and ideas in technical texts.
     CO2 : To identify cause and effects in events, industrial processes through technical texts
     CO3 : To analyze problems in order to arrive at feasible solutions and communicate them
              orally and in the written format.
     CO4 : To report events and the processes of technical and industrial nature.
     CO5 : To present their opinions in a planned and logical manner, and draft effective
              resumes in context of job search.

TEXT BOOKS
   1. English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University.
   2. English for Science & Technology Cambridge University Press 2021.Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES

1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
3. Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.

MA3251	**STATISTICS AND NUMERICAL METHODS**	**L T P C**
		3 1 0 4

OBJECTIVES:

*   This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
*   To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
*   To introduce the basic concepts of solving algebraic and transcendental equations.
*   To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
*   To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I   TESTING OF HYPOTHESIS   9+3
Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

UNIT II   DESIGN OF EXPERIMENTS   9+3
One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

UNIT III   SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS   9+3
Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

**UNIT IV   INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL
                         INTEGRATION   9+3**
Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.

UNIT V   NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS   9+3

Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.

TOTAL: 60 PERIODS

OUTCOMES:

Upon successful completion of the course, students will be able to:

- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture.
- Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
- Understandthe knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXT BOOKS:

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

REFERENCES:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.
4. Gupta S.C. and Kapoor V. K., " Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
5. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4th Edition, 2012.
6. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010.

PH3257   PHYSICS FOR TEXTILE TECHNOLOGISTS   L T P C
3 0 0 3

COURSE OBJECTIVES:

- To make the students effectively to understand the basics of crystallography and crystal imperfections.
- To enable the students to get knowledge on ferrous and nonferrous alloys.
- To impart knowledge on the basics of ceramics, composites and nanomaterials.
- To learn about mechanical properties of materials.
- To introduce the concept of light - matter interactions and electro-optical effects.

UNIT I   CRYSTALLOGRAPHY   9

Crystal structures: Crystal lattice – basis - unit cell and lattice parameters – crystal systems and Bravais lattices – Structure and packing fractions of SC, BCC, FCC, diamond cubic, NaCl, ZnS structures – crystal planes, directions and Miller indices – distance between successive planes – linear and planar densities – crystalline and noncrystalline materials –Example use of Miller indices: wafer surface orientation – wafer flats and notches – pattern alignment - imperfections in crystals.

UNIT II   FERROUS AND NONFERROUS ALLOYS   9

The Fe-Fe$_3$C phase diagram: phases, invariant reactions,development of microstructure in eutectoid, hypoeutectoid and hypereutectoid alloys–influence of other alloying elements in the Fe-C system - phase transformations –isothermal transformation diagram for eutectoid iron-carbon alloy – microstructures: pearlite, bainite, spheroidite and martensite – steels, stainless steels and cast irons – copper alloys – aluminum alloys – titanium alloys.

UNIT III   CERAMICS, COMPOSITES AND NANO MATERIALS   9

Ceramics – types and applications-refractories, abrasives and cements – Composites: classification, role of matrix and reinforcement -Fiber reinforced composites – carbon-carbon composites –Nanomaterials: types, physical, chemical and mechanical properties - carbon nanotubes: properties and applications - synthesis of nanomaterials: sonochemical, molecular epitaxy, physical vapor deposition (PVD) and chemical vapor deposition (CVD). Characterization: Transmission electron microscopy - scanning electron microscopy - Atomic force microscopy - X-ray powder diffraction - Nanoparticle size calculation.

UNIT IV   MECHANICAL PROPERTIES   9

Tensile test - plastic deformation by slip – slip systems – mechanisms of strengthening in metals: strain hardening, grain size reduction, solid solution strengthening, precipitation hardening – Creep: creep curves,stress and temperature effects, mechanisms of creep, creep-resistant materials – Fracture: ductile and brittle fractures - the Griffith criterion –fracture toughness - Fatigue failure:the S-N curve – factors that affect fatigue life – Hardness: Rockwell and Brinell hardness tests, Knoop and Vickers microhardness tests.

UNIT V   OPTICAL PROPERTIES OF MATERIALS   9

Light waves in a homogeneous medium - refractive index - dispersion: refractive index-wave-length behaviour - group velocity and group index – NLO materials – phase matching - SHG, sum frequency generation, parametric oscillations – difference frequency generation (qualitative)- applications- - complex refractive index and light absorption - Luminescence, phosphors and white LEDs - polarization - optical anisotropy: uniaxial crystals, birefringence, dichroism - electro-optic effect and amplitude modulators

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students should be able to
CO1 : Understand the basics of crystallography and its importance in materials properties
CO2 : Understand the basics of crystallography and crystal imperfections.
CO3 : Get knowledge on ferrous and nonferrous alloys.
CO4 : Acquire knowledge on the basics of ceramics, composites and nano-materials
CO5 : Learn about the concept of light - matter interactions and electro-optical effects.

TEXT BOOKS:
1. R.Balasubramaniam, Callister's Materials Science and Engineering.Wiley (Indian Edition), 2014.
2. V.Raghavan. Materials Science and Engineering: A First Course, Prentice Hall India Learning Private Limited, 2015.
3. Safa O. Kasap, Optoelectronics and Photonics, Dorling Kindersley India, 2009

REFERENCES:
1. J.F.Shackelford. Introduction to Materials Science for Engineers. Pearson, 2015.
2. Wendelin Wright and Donald Askeland, Essentials of Materials Science and Engineering, CL Engineering, 2013.
3. William Smith and Javad Hashemi, Foundations of Materials Science and Engineering, Mc Graw-Hill Education, 2018.
4. Rajesh Mishra and Jiri Militky, Nanotechnology in Textiles: Theory and Application, Elsevier, 2018.
5. Mark Fox, Optical Properties of Solids, Oxford Univ. Press, 2012.

BE3252   **BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION**   **L T P C**
                   ENGINEERING   **3 0 0 3**

OBJECTIVES:
- To introduce the basics of electric circuits and analysis
- To impart knowledge in domestic wiring
- To impart knowledge in the basics of working principles and application of electrical machines
- To introduce analog devices and their characteristics
- To introduce the functional elements and working of sensors and transducers.

UNIT I   ELECTRICAL CIRCUITS   9
DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state)
Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only), Three phase supply – star and delta connection – power in three-phase systems

UNIT II   MAGNETIC CIRCUITS AND ELECTRICAL INSTALLATIONS   9
Magnetic circuits-definitions-MMF, flux, reluctance, magnetic field intensity, flux density, fringing, self and mutual inductances-simple problems.
Domestic wiring , types of wires and cables, earthing ,protective devices- switch fuse unit- Miniature circuit breaker-moulded case circuit breaker- earth leakage circuit breaker, safety precautions and First Aid
.
UNIT III   ELECTRICAL MACHINES   9
Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, Working principle and Applications of Transformer, Three phase Alternator, Synchronous motor and Three Phase Induction Motor.

UNIT IV   ANALOG ELECTRONICS   9
Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon &Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET,IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters, harmonics

UNIT V   SENSORS AND TRANSDUCERS   9
Sensors, solenoids, pneumatic controls with electrical actuator, mechatronics, types of valves and its applications, electro-pneumatic systems, proximity sensors, limit switches, piezoelectric, hall effect, photo sensors,Strain gauge, LVDT, differential pressure transducer,optical and digital transducers, Smart sensors, Thermal Imagers.

                                                                      TOTAL : 45 PERIODS

COURSE OUTCOMES :
After completing this course, the students will be able to
CO1: Compute the electric circuit parameters for simple problems
CO2: Explain the concepts of domestics wiring and protective devices
CO3: Explain the working principle and applications of electrical machines
CO4: Analyze the characteristics of analog electronic devices
CO5: Explain the types and operating principles of sensors and transducers

TEXT BOOKS:
1. D P Kothari and I.J Nagarath, "Basic Electrical and Electronics Engineering", McGraw Hill Education (India) Private Limited, Second Edition, 2020
2. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.
3. S.K. Bhattacharya, Basic Electrical Engineering, Pearson Education, 2019
4. James A Svoboda, Richard C. Dorf, Dorf's Introduction to Electric Circuits, Wiley, 2018.

REFERENCES:
1. John Bird, "Electrical Circuit theory and technology", Routledge; 2017.
2. Thomas L. Floyd, 'Electronic Devices', 10th Edition, Pearson Education, 2018.
3. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017
4. Muhammad H.Rashid, "Spice for Circuits and electronics", 4th Edition.,Cengage India,2019.
5. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

GE3251	ENGINEERING GRAPHICS	L T P C
		2 0 4 4

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
- Drawing engineering curves.
- Drawing freehand sketch of simple objects.
- Drawing orthographic projection of solids and section of solids.
- Drawing development of solids
- Drawing isometric and perspective projections of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination)
Importance of graphics in engineering applications — Use of drafting instruments — BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

UNIT I   PLANE CURVES AND FREEHAND SKETCHING   6+12
Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.

UNIT II   PROJECTION OF POINTS, LINES AND PLANE SURFACE   6+12
Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III   PROJECTION OF SOLIDS   6+12
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles —Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects.
Practicing three dimensional modeling of simple objects by CAD Software(Not for examination)

UNIT IV   PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF
**   SURFACES   6+12**
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones.
Practicing three dimensional modeling of simple objects by CAD Software(Not for examination)

UNIT V   ISOMETRIC AND PERSPECTIVE PROJECTIONS   6+12
Principles of isometric projection — isometric scale —Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.
Practicing three dimensional modeling of isometric projection of simple objects by CAD Software(Not for examination)

TOTAL: (L=30+P=60) 90 PERIODS

OUTCOMES:

On successful completion of this course, the student will be able to

- Use BIS conventions and specifications for engineering drawing.
- Construct the conic curves, involutes and cycloid.
- Solve practical problems involving projection of lines.
- Draw the orthographic, isometric and perspective projections of simple solids.
- Draw the development of simple solids.

TEXT BOOK:
1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
3. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015

REFERENCES:
1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
3. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.
6. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

Publication of Bureau of Indian Standards:
1. IS 10711 — 2001: Technical products Documentation — Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) — 2001: Technical products Documentation — Lettering.
3. IS 10714 (Part 20) — 2001 & SP 46 — 2003: Lines for technical drawings.
4. IS 11669 — 1986 & SP 46 —2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) — 2001: Technical drawings — Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:
1.   There will be five questions, each of either or type covering all units of the syllabus.
2.   All questions will carry equal marks of 20 each making a total of 100.
3.   The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4.   The examination will be conducted in appropriate sessions on the same day

CY3252	CHEMISTRY FOR TEXTILE TECHNOLOGISTS	L T P C
		3 0 0 3

OBJECTIVES :
The course aims to
- Gain proper understanding on spectroscopic and surface analytical techniques.
- Impart knowledge to students on the chemistry of surface and interfaces.
- Make students well versed on the chemical analysis of oils, fats, soaps & lubricants .
- Firmly establish a sound understanding on the student's mind about chemicals and auxiliaries.
- Familiarize students with the identification and characteristics of dyes and their applications.

UNIT I   SPECTROSCOPIC TECHNIQUES   9
Spectroscopy: Electromagnetic spectrum - absorption of radiation - electronic, vibrational and rotational transitions. Width and intensities of spectral lines. Flame photometer, Atomic absorption spectroscopy, UV- Vis, IR spectroscopy, Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM) - principles, instrumentation (Block diagram) and applications.

UNIT II   CHEMISTRY OF INTERFACES   9
Interface region-curved interfaces-thermodynamics of surfaces - Surface film on liquids- Adsorption of gases on Solids-adsorption isotherms – types. Applications of adsorption studies- detergency, wetting, foaming , de foaming, spreading, water repellency.

UNIT III   WATER TECHNOLOGY   9
Water: Sources and impurities; Significance and estimation (only mention of methods) of - turbidity, colour, pH, acidity**,** alkalinity, hardness, solids, chlorides, residual chlorine, sulphates, fluorides, phosphates, iron and manganese, DO, BOD, COD, nitrogen, grease, volatile acids.
Treatment of water: Zeolites process and ion exchange demineralization; **Desalination of water:** Reverse osmosis and Electro dialysis; **Municipal water treatment:** Primary treatment and Disinfection (UV, Ozonation, break-point chlorination).

UNIT IV   OILS, FATS, SOAPS & LUBRICANTS   9
Chemical constitution, Chemical analysis of oils and fats – acid, saponification and iodine values, Definitions, determinations and significance. Definition, mechanism of lubrication, preparation of petrolubes, desirable characteristics – viscosity, viscosity index, carbon residue, oxidation stability, flash and fire points, cloud and pour points, aniline point. Semisolid lubricant – greases, preparation of sodium, lithium, calcium and axle greases and uses, consistency test and drop point test. Solid lubricants – graphite and molybdenum disulphide.

UNIT V   CHEMICALS AND AUXILIARIES   9
Estimation of available chlorine in hypochlorite bleach liquor. Determination of strength of hydrogen peroxide. Colorants - Theory of colour and constitution: chromophore and auxochrome, bathochromic and hypsochromic shift, classification of dyes based on application and composition. Chemistry of azo dye – synthesis of Methyl red, Methyl orange, Congo red, phenolphthalein, fluorescein and eosin

                                                                 TOTAL : 45 PERIODS

COURSE OUTCOMES :
At the end of the course, the students will be able to:
CO1 : Understand and apply spectroscopic techniques for the analysis of engineering materials for their end use applications.
CO2 : Make use of the applications of adsorption in detergency, wetting, spreading, foaming, de-foaming, and water repellence and separation processes.
CO3 : Analyse and estimate oils, fats, lubricants and soap for their intended applications.
CO4 : Distinguish and demonstrate the role of different types of chemicals and auxiliaries.
CO5 : Realize the chemical structures, properties and relationships of different types of dyes and their applications

TEXT BOOKS:

1. Dhara S. S., "A Text Book of Engineering Chemistry", 12thEd., S. Chand & Co. Ltd., New Delhi, 2016.
2. Jain. P.C. and Monica Jain, "Engineering Chemistry", Dhanpet Rai & Sons, New Delhi, 17th Edition, 2018.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2019.

REFERENCES:

1. B.K. Sharma, "Industrial chemistry", Krishna Prakashan Media (P) Ltd, Meerut, 2014.
2. Shore J., "Colourants and Auxiliaries: 2nd Edition, Volume 1 & 2, Wood head Publishing Ltd., 2002.
3. Shenai V. A., "Chemistry of Dyes and Principles of Dyeing", Sevak Publications, Mumbai, 1995.
4. Trotman E. R., "Dyeing and Chemical Technology of Textile Fibres", B.Y Publishing Pvt. Ltd., New Delhi, 1994.
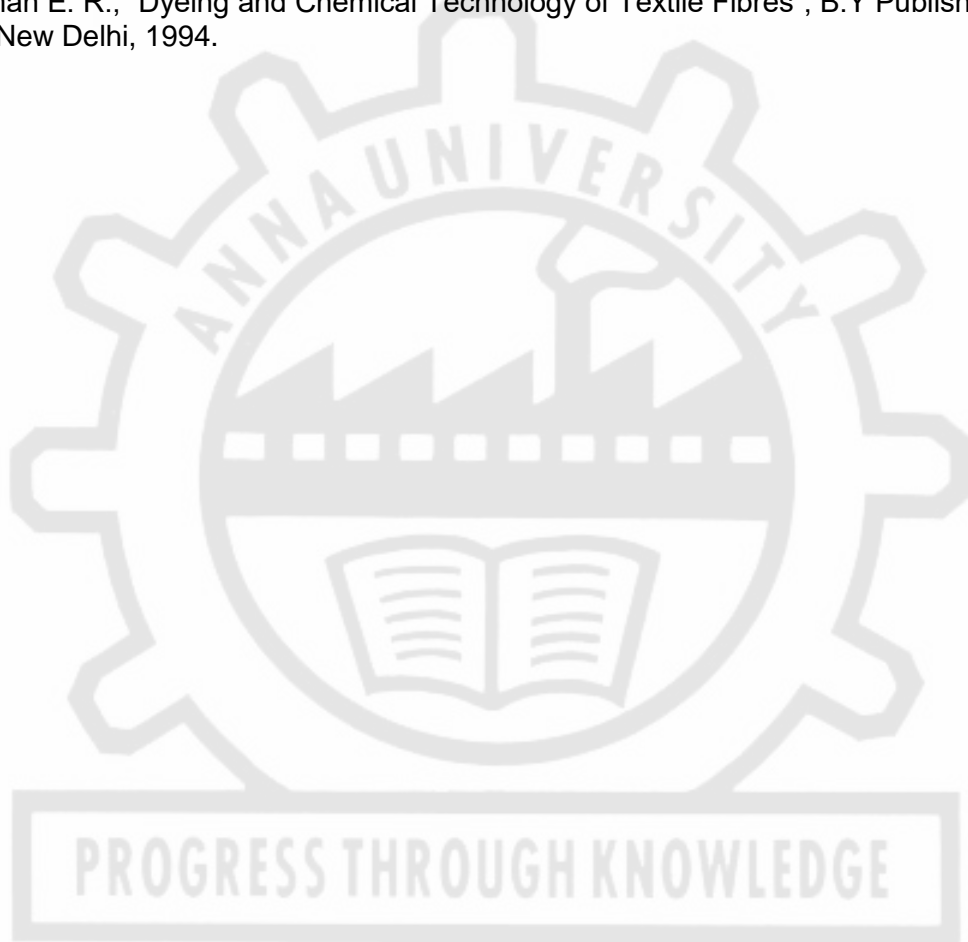
NCC Credit Course Level 1*

NX3251	(ARMY WING) NCC Credit Course Level - I	L	T	P	C
		2	0	0	2

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2

NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1

PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2

LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL: 30 PERIODS

NCC Credit Course Level 1*

NX3252	(NAVAL WING) NCC Credit Course Level - I	L T	P	C
		2 0	0	2

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2

NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1

PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2

LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL : 30 PERIODS

NCC Credit Course Level 1*

NX3253	(AIR FORCE WING) NCC Credit Course Level - I	L T	P	C
		2 0	0	2

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2

NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1

PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2

LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL : 30 PERIODS

GE3271 **ENGINEERING PRACTICES LABORATORY** **LT P C**
0 0 4 2

COURSE OBJECTIVES:

- Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in commonhousehold wood work.
- Wiring various electrical joints in common household electrical wire work.
- Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART I **CIVIL ENGINEERING PRACTICES** **15**

PLUMBING WORK:

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers,elbows and other components which are commonly used in household.
b) Preparing plumbing line sketches.
c) Laying pipe connection to the suction side of a pump
d) Laying pipe connection to the delivery side of a pump.
e) Connecting pipes of different materials: Metal, plastic and flexible pipes used inhousehold appliances.

WOOD WORK:
a) Sawing,
b) Planing and
c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:

a) Studying joints in door panels and wooden furniture
b) Studying common industrial trusses using models.

PART II **ELECTRICAL ENGINEERING PRACTICES** **15**

a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket
b) Staircase wiring
c) Fluorescent Lamp wiring with introduction to CFL and LED types.
d) Energy meter wiring and related calculations/ calibration
e) Study of Iron Box wiring and assembly
f) Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)
g) Study of emergency lamp wiring/Water heater

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III   **MECHANICAL ENGINEERING PRACTICES**   **15**

WELDING WORK:

a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
b) Practicing gas welding.

BASIC MACHINING WORK:

a) (simple)Turning.
b) (simple)Drilling.
c) (simple)Tapping.

ASSEMBLY WORK:

a) Assembling a centrifugal pump.
b) Assembling a household mixer.
c) Assembling an air conditioner.

SHEET METAL WORK:

a) Making of a square tray

FOUNDRY WORK:

a) Demonstrating basic foundry operations.

PART IV   **ELECTRONIC ENGINEERING PRACTICES**   **15**

SOLDERING WORK:

a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:
a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:

a) Study an elements of smart phone..
b) Assembly and dismantle of LED TV.
c) Assembly and dismantle of computer/ laptop

TOTAL : 60 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

CO1 : Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.

CO2 : Wire various electrical joints in common household electrical wire work.

CO3 : Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.

CO4 : Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

BE3272	BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING LABORATORY	L T P C 0 0 4 2

COURSE OBJECTIVES:

* To train the students in conducting load tests electrical machines
* To gain practical experience in experimentally obtaining the characteristics of electronic devices and rectifiers
* To train the students to measure three phase power and displacement

LIST OF EXPERIMENTS

1. Verification of ohms and Kirchhoff's Laws.
2. Three Phase Power Measurement
3. Load test on DC Shunt Motor.
4. Load test on Self Excited DC Generator
5. Load test on Single phase Transformer
6. Load Test on Induction Motor
7. Characteristics of PN and Zener Diodes
8. Characteristics of BJT, SCR and MOSFET
9. Design and analysis of Half wave and Full Wave rectifiers
10. Measurement of displacement of LVDT

.   **TOTAL: 60 PERIODS**

COURSE OUTCOMES:

After completing this course, the students will be able to

CO1: Use experimental methods to verify the Ohm's law and Kirchhoff's Law and to measure three phase power

CO2: Analyze experimentally the load characteristics of electrical machines

CO3: Analyze the characteristics of basic electronic devices

CO4: Use LVDT to measure displacement

ANNA UNIVERSITY, CHENNAI

NON-AUTONOMOUS COLLEGES AFFILIATED COLLEGES

REGULATIONS 2021

CHOICE BASED CREDIT SYSTEM (CBCS)

B. TECH. TEXTILE TECHNOLOGY

PROGRAM EDUCATIONAL OBJECTIVES:

Bachelor of Textile Technology curriculum is designed to prepare the undergraduates to

1. Have attitude and knowledge for the successful professional and technical career

2. Have strong foundation in basic sciences, engineering, management, mathematics and computational platforms

3. Have knowledge on the theory and practices in the field of textile manufacturing technology and allied areas

4. Engross in life-long learning to keep themselves abreast of new developments, and practiceand inspire high ethical values and technical standards

PROGRAM OUTCOMES:

The Textile Technology Graduates will have the ability to

1. Apply knowledge of mathematics, sciences, engineering and textile technology to get solution for the technological problems in textile industry

2. Identify, formulate, review literature and critically analyze the technological problems in the textile industry to reach substantiated conclusion

3. Design and develop the solutions to the technological and managerial problems in textile industry with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions to the technological problems in textile industry

1

5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools for managing textile manufacturing companies with an understanding of the limitations

6. Apply reasoning gained through the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the profession

7. Understand the impact of the developed solutions in societal and environmental contexts, and demonstrate the knowledge for sustainable development

8. Understand ethical and professional responsibilities

9. Function effectively as an individual, and as a member or leader in diverse teams in the profession

10. Communicate effectively on complex engineering activities with the engineering community and with society at large. Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

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

PROGRAM SPECIFIC OUTCOMES:

The Textile Technology Graduates will have the ability to

1. Understand and apply fundamental and the technical knowledge for managing textile manufacturing industry

2. Be a successful entrepreneur and designer in textile clothing.

3. Design and develop novel products and manufacturing processes in textile fields

2

PEO's – PO's & PSO's MAPPING

PEO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
I	3	3	3	1	2	2	2	3	2	3	2	1	3	3	2
II	3	3	3	3	1	1	2	1	1	2	2	1	2	2	1
III	3	3	3	2	2	1	2	2	2	2	1	1	3	3	2
IV	1	2	1	1	1	2	2	3	1	1	1	3	2	2	2

3

Year	Semester	Course Name	PO												PSO		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
		HUMANITIES AND SOCIALSCIENCES INCLUDING MANAGEMENT COURSES	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
I	I	Professional English - I															
I	II	Professional English - II															
IV	VII	Ethics and Human values															
IV	VII	Elective - Management															
		Basic Science Courses [BSC]	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
I	I	Matrices and Calculus															
I	I	Engineering Physics															
I	I	Engineering Chemistry															
I	I	Physics and Chemistry Laboratory															
I	II	Statistics and Numerical Methods															
I	II	Physics for Textile Technologists															
I	II	Chemistry for Textile Technologists															
II	III	Probability and Statistical Methods															
II	IV	Environmental Science and Sustainability *															
		ENGINEERING SCIENCE COURSE [ESC]	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
I	I	Problem Solving and Python Programming															
I	I	Problem Solving and Python Programming Laboratory															
I	II	Basic Electrical, Electronics and Instrumentation Engineering															
I	II	Engineering Graphics															
I	II	Engineering Practices Laboratory															
I	II	Basic Electrical, Electronics and Instrumentation Engineering															

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Year	Sem	Course	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
		Laboratory															
II	III	Engineering Mechanics for Textile Technologists	3	3	3	2	2	1	1	-	1	1	1	2	2	2	1
		PROFESSIONAL CORE COURSES [PCC]	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
II	III	Technology of Pre-Spinning Process	2.8	2.8	3	2	2	-	-	-	-	-	-	1	3	1	1
II	III	Preparatory process for woven Fabric Manufacture	3	3	3	2.28	2	-	-	-	2	2	2	1	3	1	2.71
II	III	Structure and Properties of Textile Fibres	3	3	2.28	3	2	-	1	-	1	2	1	1	3	1	2
II	III	Production of Textile Fibres	3	3	2	2	1	2	2	-	-	-	-	1	3	1	3
II	III	Pre Spinning Laboratory	3	3	3	3	2	-	1	-	2	2	2	1	3	1	2
II	IV	Technology of Yarn Spinning	3	3	3	2.28	2	-	1	-	2	2	2	1	3	1	1.28
II	IV	Technology of woven Fabric Manufacture	3	3	3	2	2	-	-	-	-	-	-	1	3	1	2
II	IV	Knitting Technology	3	3	3	2	2	-	-	-	-	-	-	1	3	1	2
II	IV	Chemical Processing of Textile Materials I	3	2	2	2	2	-	2	-	-	-	-	1	3	1	2
II	IV	Woven Fabric Structure and Design	1	1	1.8	-	2.8	1	1	1	2	1	1	1	2	2	2
II	IV	Fabric Manufacture Laboratory	3	3	3	3	2	-	1	-	2	2	2	1	3	2	3
II	IV	Fabric Structure Analysis Laboratory	3	3	3	1	-	-	-	-	2	2	2	2	3	3	3
III	V	Testing of Textile Materials	3	3	2	3	2	-	-	2	-	-	-	1	3	1	2
III	V	Testing of Textile Materials Laboratory	3	2.17	3	1	1	-	1	-	2	1.16	2	2	3	3	3
III	VI	Chemical Processing of Textile Material II	3	2	2	2	2	-	3	-	-	-	-	1	3	1	2
III	VI	Technology of Nonwoven	3	2	2	2	2	-	-	-	-	-	-	1	3	1	2
III	VI	Textile Chemical Processing Laboratory	3	3	3	3	-	1	1	-	2	1	1	1	3	1	2.33
III	VI	Textile Product Engineering	3	3	3	3	2	1	1	-	2	2	2	2	3	2	3
III	VI	Apparel and Home Furnishings Manufacture	3	1.57	2.28	2	1	-	-	-	2	2	2	1.28	2.28	2.28	2.28
III	VI	Financial Management for Textile Industries	3	3	1	2	2	-	-	-	-	2	2	1	3	2	1

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PROFESSIONAL ELECTIVES [PEC]															
Process and Quality Control in Spinning	3	3	3	3	2	1	1	1	-	-	-	2	3	2	2
Process and Quality Control in Fabric Manufacture	3	3	3	3	2	1	1	1	-	-	-	2	3	2	2
Theory of Drafting and Twisting	3	3	3	2	2	-	-	-	-	-	-	1	3	1	2
Long Staple Spinning Technology	3	2	3	2	1	-	-	-	-	-	-	-	3	1	2
Production and application of sewing threads	3	3	1	1	1	-	-	-	-	-	-	1	3	1	2
Mechanics of Textile Machinery	3	3	3	2	2	-	-	-	-	-	-	1	3	1	2
Textile Chemical and Auxiliaries	2.2	1.8	1.2	-	-	2	1.4	-	-	-	-	-	2	-	-
Advances in Textile Printing and Finishes	2.2	1	1	2.6	1	2.4	2.4	2	1	1	-	1.6	2	2	3
Management of Textile Effluents	2	2	2	2	-	2	2	2	-	2	2	-	2	2	2
Garment Production Machinery	2.57	2.28	1.14	1	1	1	1	1	1	2	2	1	2	3	3
Industrial Engineering in Garment Industry	1.2	2	3	3	2	1	1.2	2	2	1	2.4	2	1	1	-
Pattern Making	2	2	2	-	2	-	-	1	1	1	1	1	2	3	1
Apparel Marketing and Merchandising	-	1	2.6	2	2	1	1	2.4	2	1.2	1	-	2	2	2
Apparel Product Development Laboratory	1.33	-	-	-	-	-	1	1.33	1.33	1.33	1	3	2	1	
Enterprise Resource Planning for Garment Industry	-	-	2.25	-	3	-	-	2	2	1	2.5	1	-	2	-
Basic Sewing and Pattern Making Laboratory	-	-	-	-	1	-	-	-	-	1	1	-	1	2	1
Apparel Costing	3	2	-	-	1	-	-	-	-	-	2	1	3	2	1
Operations Research	3	2	2	3	3	-	-	-	-	1	2	1	3	3	2
Supply Chain Management	1	1	2	2	2	-	-	-	2	2	2	1	2	2	1
Textile Costing	3	3	1	2	2	-	-	-	-	2	2	1	3	2	1
Textile and Apparel EXIM Management	2	1	1	2	1	-	-	-	-	1	-	1	2	1	-
Technical Textiles	3	2	3	3	2	-	-	-	-	-	-	1	3	2	3
Medical Textiles	3	2	3	3	2	1	-	-	-	-	-	2	3	2	3
High Performance Fibres	3	2	2	2	1	-	-	-	-	-	-	1	3	2	3

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			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
		Smart Textiles	3	2	2	2	-	-	-	-	-	-	-	1	3	1	2
		Protective Textiles	3	2	2	2	-	-	-	-	-	-	-	1	3	1	2
		Coated Textiles	3	2	2	2	-	-	-	-	-	-	-	1	3	1	3
		Home Textile	3	1	2	2	-	-	-	-	-	-	-	1	2	2	2
		Characterization of Textile Polymers	3	-	-	2	1	-	-	-	-	-	-	1	3	1	1
		Clothing Comfort	3	2	2	2	1	-	-	-	-	-	-	2	3	2	3
		Textile Reinforced Composites	3	2	3	1	1	-	1	-	-	-	-	2	3	2	2
		Structure Mechanics of Yarns and Fabrics	3	3	2	2	2	1	1	-	-	-	-	1	3	1	2
		Advanced Testing of Textiles	3	2	2	3	2	-	1	-	-	-	-	1	3	1	2
		EMPLOYABILITY ENHANCEMENT COURSES (EEC)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
II	IV	Internship /Training I	3	3	2	2.6	2.8	2	2	2.1	2.1	3	2.4	2.6	2.6	2.8	2.4
III	V	Life Skills and Soft Skills															
III	V	Summer internship	3	3	2	2.6	2.8	2	2	2.1	2.1	3	2.4	2.6	2.6	2.8	2.4
IV	VII	Summer internship	3	3	2	2.6	2.8	2	2	2.1	2.1	3	2.4	2.6	2.6	2.8	2.4
IV	VIII	Project Work	3	3	3	3	1	1	1	2	2	2	2	1	3	2	3

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ANNA UNIVERSITY, CHENNAI
NON-AUTONOMOUS COLLEGES AFFILIATED COLLEGES
REGULATIONS 2021
B. TECH. TEXTILE TECHNOLOGY
CHOICE BASED CREDIT SYSTEM (CBCS)
CURRICULUM FOR SEMESTERS I TO VIII AND SYLLABI FOR SEMESTERS III AND IV
SEMESTER I

S. No.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	IP3151	Induction Programme	-	-	-	-	-	0
THEORY								
2.	HS3151	Professional English - I	HSMC	3	0	0	3	3
3.	MA3151	Matrices and Calculus	BSC	3	1	0	4	4
4.	PH3151	Engineering Physics	BSC	3	0	0	3	3
5.	CY3151	Engineering Chemistry	BSC	3	0	0	3	3
6.	GE3151	Problem Solving and Python Programming	ESC	3	0	0	3	3
7.	GE3172	அறிவியல் தமிழ் / **Scientific Thoughts in Tamil**	HSMC	1	0	0	1	1
PRACTICALS								
8.	GE3171	Problem Solving and Python Programming	ESC	0	0	4	4	2
9.	BS3171	Physics and Chemistry Laboratory	BSC	0	0	4	4	2
10.	GE3172	English Laboratory $	EEC	0	0	2	2	1
			TOTAL	**16**	**1**	**10**	**27**	**22**

$ Skill Based Course

SEMESTER II

SI. NO.	COURSE CODE	COURSETITLE	CATE-GORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	HS3251	Professional English - II	HSMC	2	0	0	2	2
2.	MA3251	Statistics and Numerical Methods	BSC	3	1	0	4	4
3.	PH3257	Physics for Textile Technologists	BSC	3	0	0	3	3
4.	BE3252	Basic Electrical, Electronics and Instrumentation Engineering	ESC	3	0	0	3	3
5.	GE3251	Engineering Graphics	ESC	2	0	4	6	4
6.	CY3252	Chemistry for Textile Technologists	BSC	3	0	0	3	3
7.	GE3252	தமிழர் மரபு / Heritage of Tamils	HSMC	1	0	0	1	1
8.		NCC Credit Course Level 1#	-	2	0	0	2	2
PRACTICALS								
9.	GE3271	Engineering Practices Laboratory	ESC	0	0	4	4	2
10.	BE3272	Basic Electrical, Electronics and Instrumentation Engineering Laboratory	ESC	0	0	4	4	2
11.	GE3272	Communication Laboratory / Foreign Language $	EEC	0	0	4	4	2
			TOTAL	17	1	16	34	26

NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

$ Skill Based Course

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SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA3357	Probability and Statistical Methods	BSC	3	1	0	4	4
2.	TT3301	Engineering Mechanics for Textile Technologists	ESC	3	1	0	4	4
3.	TT3354	Technology of Pre-Spinning Process	PCC	3	0	0	3	3
4.	TT3351	Preparatory process for woven Fabric Manufacture	PCC	3	0	2	5	4
5.	TT3353	Structure and Properties of Textile Fibres	PCC	3	0	2	5	4
6.	TT3352	Production of Textile Fibres	PCC	3	0	0	3	3
PRACTICALS								
7.	TT3361	Pre Spinning Laboratory	PCC	0	0	3	3	1.5
8.	GE33361	Professional Development$	EEC	0	0	2	2	1
			TOTAL	18	2	9	29	24.5

$ Skill Based Course

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	TT3454	Technology of Yarn Spinning	PCC	3	0	2	5	4
2.	TT3453	Technology of woven Fabric Manufacture	PCC	3	0	0	3	3
3.	TT3452	Knitting Technology	PCC	3	0	0	3	3
4.	TT3451	Chemical Processing of Textile Materials I	PCC	3	0	0	3	3
5.	TT3401	Woven Fabric Structure and Design	PCC	3	0	0	3	3
6.	GE3451	Environmental Sciences and Sustainability	BSC	2	0	0	2	2
7.		NCC Credit Course Level 2#		3	0	0	3	3 #
PRACTICALS								
8.	TT3461	Fabric Manufacture Laboratory	PCC	0	0	3	3	1.5
9.	TT3462	Fabric Structure Analysis Laboratory	PCC	0	0	3	3	1.5
10.	TT3511	Industrial Training/Internship I*	EEC	-	-	-	-	-
			TOTAL	17	0	8	25	21

NCC Credit Course level 2 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

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*Four weeks industrial training/internship carries two credits. Industrial training/internship during IV Semester Summer Vacation will be evaluated in V semester

SEMESTER V

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	TT3591	Testing of Textile Materials	PCC	3	0	0	3	3
2.		Professional Elective I	PEC	3	0	0	3	3
3.		Professional Elective II	PEC	3	0	0	3	3
4.		Professional Elective III	PEC	3	0	0	3	3
5.		Professional Elective IV	PEC	3	0	0	3	3
6.		Mandatory Course-I**&**	MC	3	0	0	3	0
PRACTICALS								
7.	TT3511	Industrial Training/Internship I**	EEC	0	0	0	0	2
8.	TT3581	Testing of Textile Materials Laboratory	PCC	0	0	3	3	1.5
			TOTAL	**15**	**0**	**3**	**18**	**18.5**

& Mandatory Course-I is a Non-credit Course (Student shall select one course from the list given under MC-I)

**Four weeks industrial training/internship carries two credits. Industrial training/internship during IV Semester Summer Vacation will be evaluated in V semester

SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	TT3651	Chemical Processing of Textile Material II	PCC	3	0	0	3	3
2.	TT3691	Technology of Nonwoven	PCC	3	0	0	3	3
3.	TT3601	Mechanics of Textile Machinery	PCC	3	0	0	3	3
4.		Open Elective – I*	OEC	3	0	0	3	3
5.		Professional Elective V	PEC	3	0	0	3	3
6.		Professional Elective VI	PEC	3	0	0	3	3
7.		Mandatory Course-II**&**	MC	3	0	0	3	0
8.		NCC Credit Course Level 3#		3	0	0	3	3 #
PRACTICALS								
9.	TT3661	Textile Chemical Processing Laboratory	PCC	0	0	3	3	1.5
10.	TT3611	Textile Product Engineering	PCC	0	0	3	3	1.5
11.	TT3711	Industrial Training/Internship II**	EEC	-	-	-	-	-
			TOTAL	**21**	**0**	**6**	**27**	**21**

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*Open Elective – I shall be chosen from the emerging technologies.

**Two weeks industrial training/internship carries one credit. Industrial training/Internship during VI Semester Summer Vacation will be evaluated in VII semester

ᵃ Mandatory Course-II is a Non-credit Course (Student shall select one course from the list given under MC- II)
 # NCC Credit Course level 3 is offered for NCC students only. The grades earned by the students will be recorded
 in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

SEMESTER VII/VIII[*]

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	TT3751	Apparel and Home Furnishings Manufacture	PCC	3	0	2	5	4
2.	TT3752	Financial Management for Textile Industries	PCC	3	0	0	3	3
3.	GE3791	Human values and Ethics	HSMC	2	0	0	2	2
4.		Elective- Management #	HSMC	3	0	0	3	3
5.		Open Elective – II**	OEC	3	0	0	3	3
6.		Open Elective – III***	OEC	3	0	0	3	3
7.		Open Elective – IV***	OEC	3	0	0	3	3
PRACTICALS								
8.	TT3711	Industrial Training/ Internship II##	EEC	-	-	-	-	2
			TOTAL	**20**	**0**	**2**	**22**	**23**

*If students undergo internship in Semester VII, then the courses offered during semester VII will be offered during semester VIII.
**Open Elective – II shall be chosen from the emerging technologies.
***Open Elective III and IV (Shall be chosen from the list of open electives offered by other Programmes
Elective- Management shall be chosen from the Elective Management courses
##Two weeks industrial training/internship carries one credit. Industrial training/Internship during VI Semester Summer Vacation will be evaluated in VII semester

SEMESTER VIII/VII[*]

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	TT3811	Internship#/ Project Work	EEC	0	0	20	20	10
			TOTAL	**0**	**0**	**20**	**20**	**10**

*If students undergo internship in Semester VII, then the courses offered during semester VII will be offered during semester VIII.
#15 weeks of continuous Internship in an organization carries 10 credits.

TOTAL CREDITS: 166

ELECTIVE – MANAGEMENT COURSES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	GE3751	Principles of Management	HSMC	3	0	0	3	3
2.	GE3752	Total Quality Management	HSMC	3	0	0	3	3
3.	GE3753	Engineering Economics and Financial Accounting	HSMC	3	0	0	3	3
4.	GE3754	Human Resource Management	HSMC	3	0	0	3	3
5.	GE3755	Knowledge Management	HSMC	3	0	0	3	3
6.	GE3792	Industrial Management	HSMC	3	0	0	3	3

MANDATORY COURSES I

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MX3081	Introduction to Women and Gender Studies	MC	3	0	0	3	0
2.	MX3082	Elements of Literature	MC	3	0	0	3	0
3.	MX3083	Film Appreciation	MC	3	0	0	3	0
4.	MX3084	Disaster Management	MC	3	0	0	3	0

MANDATORY COURSES II

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MX3085	Well Being with traditional practices (Yoga, Ayurveda and Siddha)	MC	3	0	0	3	0
2.	MX3086	History of Science and Technology in India	MC	3	0	0	3	0
3.	MX3087	Political and Economic Thought for a Humane Society	MC	3	0	0	3	0
4.	MX3088	State, Nation Building and Politics in India	MC	3	0	0	3	0
5.	MX3089	Industrial Safety	MC	3	0	0	3	0

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PROFESSIONAL ELECTIVE COURSES : VERTICALS

Vertical I Spinning, Weaving and chemical processing	Vertical II Garment Manufacturing	Vertical III Management of Textile Industries	Vertical IV Technical Textiles	Vertical V Advancements in textiles
Process and Quality Control in Spinning	Garment Production Machinery	Operations Research in Textile Industry	Technical Textiles	Characterization of Textile Polymers
Process and Quality Control in Fabric Manufacture	Industrial Engineering in Garment Industry	Supply Chain Management	Medical Textiles	Clothing Comfort
Theory of Drafting and Twisting	Pattern Making	Apparel Costing	Home Textiles	Textile Reinforced Composites
Production and application of sewing threads	Apparel Marketing and Merchandising	Textile and Apparel EXIM Management	Smart Textiles	High Performance Fibres
Structural Mechanics of Yarns and Fabrics	Apparel Product Development Laboratory	Enterprise Resource Planning for Garment Industry	Protective Textiles	Advanced Testing of Textiles
Textile Chemicals and Auxiliaries	Basic Sewing and Pattern Making Laboratory	Management of Textile Effluents	Coated Textiles	Advances in Textile Printing and Finishes

Registration of Professional Elective Courses from Verticals:
Professional Elective Courses will be registered in Semesters V and VI. These courses are listed in groups called verticals that represent a particular area of specialisation. Students are permitted to choose all Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI.

The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E/B.Tech (Honours) or Minor degree also. For more details on B.E./B.Tech (Honours) or Minor degree refer to Regulations 2021 Clause 4.10.
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PROFESSIONAL ELECTIVE COURSES : VERTICALS

VERTICAL I: SPINNING, WEAVING AND CHEMICAL PROCESSING

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CTT344	Process and Quality Control in Spinning	PEC	3	0	0	3	3
2.	CTT343	Process and Quality Control in Fabric Manufacture	PEC	3	0	0	3	3
3.	CTT353	Theory of Drafting and Twisting	PEC	3	0	0	3	3
4.	CTT345	Production and application of sewing threads	PEC	3	0	0	3	3
5.	CTT357	Structure Mechanics of Yarns and Fabrics	PEC	3	0	0	3	3
6.	CTT351	Textile Chemicals and Auxiliaries	PEC	3	0	0	3	3

VERTICAL II: GARMENT MANUFACTURING

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CTT337	Garment Production Machinery	PEC	3	0	0	3	3
2.	CFT331	Industrial Engineering in Garment Industry	PEC	3	0	0	3	3
3.	CTT342	Pattern Making	PEC	3	0	0	3	3
4.	FT3691	Apparel Marketing and Merchandising	PEC	3	0	0	3	3
5.	CTT361	Apparel Product Development Laboratory	PEC	0	0	6	3	3
6.	CTT362	Basic Sewing and Pattern Making Laboratory	PEC	0	0	6	3	3

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VERTICAL III: MANAGEMENT OF TEXTILE INDUSTRIES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CTT341	Operations Research in Textile Industry	PEC	3	0	0	3	3
2.	CTT348	Supply Chain Management	PEC	3	0	0	3	3
3.	CTT336	Enterprise Resource Planning for Apparel Industry	PEC	3	0	0	3	3
4.	CTT354	Apparel Costing	PEC	3	0	0	3	3
5.	CTT355	Management of Textile Effluents	PEC	0	0	6	6	3
6.	CTT356	Textile and Apparel EXIM Management	PEC	3	0	0	3	3

VERTICAL IV: TECHNICAL TEXTILES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CTT349	Technical Textiles	PEC	3	0	0	3	3
2.	CTT340	Medical Textiles	PEC	3	0	0	3	3
3.	CTT339	Home Textiles	PEC	3	0	0	3	3
4.	CTT347	Smart Textiles	PEC	3	0	0	3	3
5.	CTT346	Protective Textiles	PEC	3	0	0	3	3
6.	CTT335	Coated Textiles	PEC	3	0	0	3	3

VERTICAL V: ADVANCEMENTS IN TEXTILES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CTT333	Characterization of Textile Polymers	PEC	3	0	0	3	3
2.	CTT334	Clothing Comfort	PEC	3	0	0	3	3
3.	CTT352	Textile Reinforced Composites	PEC	3	0	0	3	3
4.	CTT338	High Performance Fibres	PEC	3	0	0	3	3
5.	CTT331	Advanced Testing of Textiles	PEC	3	0	0	3	3
6.	CTT332	Advances in Textile Printing and Finishes	PEC	3	0	0	3	3

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OPEN ELECTIVES

(Students shall choose the open elective courses, such that the course contents are not similar to any other course contents/title under other course categories.

OPEN ELECTIVE I AND II
(EMERGING TECHNOLOGIES)

To be offered other than Faculty of Information and Communication Engineering

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	OCS351	Artificial Intelligence and Machine Learning Fundamentals	OEC	2	0	2	4	3
2.	OCS352	IoT Concepts and Applications	OEC	2	0	2	4	3
3.	OCS353	Data Science Fundamentals	OEC	2	0	2	4	3
4.	OCS354	Augmented and Virtual Reality	OEC	2	0	2	4	3

OPEN ELECTIVES – III

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	OHS351	English for Competitive Examinations	OEC	3	0	0	3	3
2.	OCE353	Lean Concepts, Tools And Practices	OEC	3	0	0	3	3
3.	OMG352	NGOs and Sustainable Development	OEC	3	0	0	3	3
4.	OMG353	Democracy and Good Governance	OEC	3	0	0	3	3
5.	OME353	Renewable Energy Technologies	OEC	3	0	0	3	3
6.	OME354	Applied Design Thinking	OEC	2	0	2	4	3
7.	OMF351	Reverse Engineering	OEC	3	0	0	3	3
8.	OMF353	Sustainable Manufacturing	OEC	3	0	0	3	3
9.	OAU351	Electric and Hybrid Vehicle	OEC	3	0	0	3	3
10.	OAS352	Space Engineering	OEC	3	0	0	3	3
11.	OIM351	Industrial Management	OEC	3	0	0	3	3
12.	OIE354	Quality Engineering	OEC	3	0	0	3	3
13.	OSF351	Fire Safety	OEC	3	0	0	3	3

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		Engineering						
14.	OML351	Introduction to non-destructive testing	OEC	3	0	0	3	3
15.	OMR351	Mechatronics	OEC	3	0	0	3	3
16.	ORA351	Foundation of Robotics	OEC	3	0	0	3	3
17.	OAE352	Fundamentals of Aeronautical engineering	OEC	3	0	0	3	3
18.	OGI351	Remote Sensing Concepts	OEC	3	0	0	3	3
19.	OAI351	Urban Agriculture	OEC	3	0	0	3	3
20.	OEN351	Drinking Water Supply and Treatment	OEC	3	0	0	3	3
21.	OEE352	Electric Vehicle technology	OEC	3	0	0	3	3
22.	OEI353	Introduction to PLC Programming	OEC	3	0	0	3	3
23.	OBT352	Biomedical Instrumentation	OEC	3	0	0	3	3
24.	OFD352	Traditional Indian Foods	OEC	3	0	0	3	3
25.	OFD353	Introduction to food processing	OEC	3	0	0	3	3
26.	OPY352	IPR for Pharma Industry	OEC	3	0	0	3	3
27.	OCH351	Nano Technology	OEC	3	0	0	3	3
28.	OCH352	Functional Materials	OEC	3	0	0	3	3
29.	OPE351	Introduction to Petroleum Refining and Petrochemicals	OEC	3	0	0	3	3
30.	OPE352	Energy Conservation and Management	OEC	3	0	0	3	3
31.	OPT351	Basics of Plastics Processing	OEC	3	0	0	3	3
32.	OEC351	Signals and Systems	OEC	3	0	0	3	3
33.	OEC352	Fundamentals of Electronic Devices and Circuits	OEC	3	0	0	3	3
34.	OBM351	Foundation Skills in integrated product Development	OEC	3	0	0	3	3
35.	OBM352	Assistive Technology	OEC	3	0	0	3	3
36.	OMA352	Operations Research	OEC	3	0	0	3	3
37.	OMA353	Algebra and Number Theory	OEC	3	0	0	3	3
38.	OMA354	Linear Algebra	OEC	3	0	0	3	3

OPEN ELECTIVES – IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	OHS352	Project Report Writing	OEC	3	0	0	3	3
2.	OCE354	Basics of Integrated Water Resources Management	OEC	3	0	0	3	3
3.	OMA355	Advanced Numerical Methods	OEC	3	0	0	3	3
4.	OMA356	Random Processes	OEC	3	0	0	3	3
5.	OMA357	Queuing and Reliability Modelling	OEC	3	0	0	3	3
6.	OMG354	Production and Operations Management for Entrepreneurs	OEC	3	0	0	3	3
7.	OMG355	Multivariate Data Analysis	OEC	3	0	0	3	3
8.	OME352	Additive Manufacturing	OEC	3	0	0	3	3
9.	OME353	New Product Development	OEC	3	0	0	3	3
10.	OME355	Industrial Design & Rapid Prototyping Techniques	OEC	2	0	2	4	3
11.	OMF352	Micro and Precision Engineering	OEC	3	0	0	3	3
12.	OMF354	Cost Management of Engineering Projects	OEC	3	0	0	3	3
13.	OAU352	Batteries and Management system	OEC	3	0	0	3	3
14.	OAU353	Sensors and Actuators	OEC	3	0	0	3	3
15.	OAS353	Space Vehicles	OEC	3	0	0	3	3
16.	OIM352	Management Science	OEC	3	0	0	3	3
17.	OIM353	Production Planning and Control	OEC	3	0	0	3	3
18.	OIE353	Operations Management	OEC	3	0	0	3	3
19.	OSF352	Industrial Hygiene	OEC	3	0	0	3	3
20.	OSF353	Chemical Process Safety	OEC	3	0	0	3	3
21.	OML352	Electrical, Electronic and Magnetic materials	OEC	3	0	0	3	3
22.	OML353	Nanomaterials and applications	OEC	3	0	0	3	3
23.	OMR352	Hydraulics and Pneumatics	OEC	3	0	0	3	3

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24.	OMR353	Sensors	OEC	3	0	0	3	3
25.	ORA352	Foundation of Automation	OEC	3	0	0	3	3
26.	ORA353	Concepts in Mobile Robotics	OEC	3	0	0	3	3
27.	OMV351	Marine Propulsion	OEC	3	0	0	3	3
28.	OMV352	Marine Merchant Vehicles	OEC	3	0	0	3	3
29.	OMV353	Elements of Marine Engineering	OEC	3	0	0	3	3
30.	OAE353	Drone Technologies	OEC	3	0	0	3	3
31.	OGI352	Geographical Information System	OEC	3	0	0	3	3
32.	OAI352	Agriculture Entrepreneurship Development	OEC	3	0	0	3	3
33.	OEN352	Biodiversity Conservation	OEC	3	0	0	3	3
34.	OEE353	Introduction to control systems	OEC	3	0	0	3	3
35.	OEI354	Introduction to Industrial Automation Systems	OEC	3	0	0	3	3
36.	OBT353	Environment and Agriculture	OEC	3	0	0	3	3
37.	OFD354	Fundamentals of Food Engineering	OEC	3	0	0	3	3
38.	OFD355	Food safety and Quality Regulations	OEC	3	0	0	3	3
39.	OPY353	Nutraceuticals	OEC	3	0	0	3	3
40.	OCH353	Energy Technology	OEC	3	0	0	3	3
41.	OCH354	Surface Science	OEC	3	0	0	3	3
42.	OPE353	Industrial safety	OEC	3	0	0	3	3
43.	OPE354	Unit Operations in Petro Chemical Industries	OEC	3	0	0	3	3
44.	OPT352	Plastic Materials for Engineers	OEC	3	0	0	3	3
45.	OPT353	Properties and Testing of Plastics	OEC	3	0	0	3	3
46.	OEC353	VLSI Design	OEC	3	0	0	3	3
47.	OEC354	Industrial IoT and Industry 4.0	OEC	2	0	2	4	3
48.	OBM353	Wearable devices	OEC	3	0	0	3	3
49.	OBM354	Medical Informatics	OEC	3	0	0	3	3

SUMMARY

S.No	Subject Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII/VIII	VIII/VII	
1	HSMC	4	3					5		12
2	BSC	12	10	4	2					28
3	ESC	5	11	4						20
4	PCC			15.5	19	4.5	12	7		58
5	PEC					12	6			18
6	OEC						3	9		12
7	EEC	1	2	1		2		2	10	18
8	Non-Credit /(Mandatory)					√	√			
	Total	22	26	24.5	21	18.5	21	23	10	166

(Name of the Programme)

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Enrollment for B.E. / B. Tech. (Honours) / Minor degree (Optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E./B.Tech. (Honours) Minor degree.

For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.

For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes, Moreover, for minor degree the student can register for courses from any one of the following verticals also.

Complete details are available in clause 4.10 of Regulations 2021.

VERTICALS FOR MINOR DEGREE (IN ADDITIONS TO ALL THE VERTICALS OF OTHER PROGRAMMES)

Vertical I Fintech and Block Chain	Vertical II Entrepreneurship	Vertical III Public Administration	Vertical IV Business Data Analytics	Vertical V Environment and Sustainability
Financial Management	Foundations of Entreprenership	Principles of Public Administration	Statistics For Management	Sustainable infrastructure Development
Fundamentals of Investment	Team Building & Leadership Management for Business	Constitution of India	Datamining For Business Intelligence	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity & Innovation in Entrepreneurship	Public Personnel Administration	Human Resource Analytics	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Principles of Marketing Management For Business	Administrative Theories	Marketing And Social Media Web Analytics	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Indian Administrative System	Operation And Supply Chain Analytics	Green Technology
Introduction to Fintech	Financing New Business Ventures	Public Policy Administration	Financial Analytics	Environmental Quality Monitoring and Analysis
-	-	-	-	Integrated Energy Planning for Sustainable Development
-	-	-	-	Energy Efficiency for Sustainable Development

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(Choice of courses for Minor degree is to be made from any one vertical of other programmes or from anyone of the following verticals)

VERTICAL 1: FINTECH AND BLOCK CHAIN

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CMG331	Financial Management	PEC	3	0	0	3	3
2.	CMG332	Fundamentals of Investment	PEC	3	0	0	3	3
3.	CMG333	Banking, Financial Services and Insurance	PEC	3	0	0	3	3
4.	CMG334	Introduction to Blockchain and its Applications	PEC	3	0	0	3	3
5.	CMG335	Fintech Personal Finance and Payments	PEC	3	0	0	3	3
6.	CMG336	Introduction to Fintech	PEC	3	0	0	3	3

VERTICAL 2: ENTREPRENEURSHIP

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CMG337	Foundations of Entrepreneruship	PEC	3	0	0	3	3
2.	CMG338	Team Building & Leadership Management for Business	PEC	3	0	0	3	3
3.	CMG339	Creativity & Innovation in Entrepreneurship	PEC	3	0	0	3	3
4.	CMG340	Principles of Marketing Management For Business	PEC	3	0	0	3	3
5.	CMG341	Human Resource Management for Entrepreneurs	PEC	3	0	0	3	3
6.	CMG342	Financing New Business Ventures	PEC	3	0	0	3	3

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VERTICAL 3: PUBLIC ADMINISTRATION

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CMG343	Principles of Public Administration	PEC	3	0	0	3	3
2.	CMG344	Constitution of India	PEC	3	0	0	3	3
3.	CMG345	Public Personnel Administration	PEC	3	0	0	3	3
4.	CMG346	Administrative Theories	PEC	3	0	0	3	3
5.	CMG347	Indian Administrative System	PEC	3	0	0	3	3
6.	CMG348	Public Policy Administration	PEC	3	0	0	3	3

VERTICAL 4: BUSINESS DATA ANALYTICS

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CMG349	Statistics For Management	PEC	3	0	0	3	3
2.	CMG350	Datamining For Business Intelligence	PEC	3	0	0	3	3
3.	CMG351	Human Resource Analytics	PEC	3	0	0	3	3
4.	CMG352	Marketing And Social Media Web Analytics	PEC	3	0	0	3	3
5.	CMG353	Operation And Supply Chain Analytics	PEC	3	0	0	3	3
6.	CMG354	Financial Analytics	PEC	3	0	0	3	3

VERTICAL 5: ENVIRONMENT AND SUSTAINABILITY

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CES331	Sustainable infrastructure Development	PEC	3	0	0	3	3
2.	CES332	Sustainable Agriculture and Environmental Management	PEC	3	0	0	3	3
3.	CES333	Sustainable Bio Materials	PEC	3	0	0	3	3
4.	CES334	Materials for Energy Sustainability	PEC	3	0	0	3	3
5.	CES335	Green Technology	PEC	3	0	0	3	3
6.	CES336	Environmental Quality Monitoring and Analysis	PEC	3	0	0	3	3
7.	CES337	Integrated Energy Planning for Sustainable Development	PEC	3	0	0	3	3
8.	CES338	Energy Efficiency for Sustainable Development	PEC	3	0	0	3	3

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MA3357   **PROBABILITY AND STATISTICAL METHODS**   **L T P C**
                                                                           3 1 0 4

COURSE OBJECTIVES:
- To develop Probability techniques in manufacturing and quality evaluation process.
- To familiarize the students with two dimensional random variables.
- To familiarize the student with Differential Equations.
- To make the students to understand various techniques of Correlation and Time series Analysis.
- To acquaint the student with mathematical tools needed in evaluating Statistical quality control and to apply in the textile manufacturing industry.

UNIT – I: PROBABILITY AND RANDOM VARIABLES   **9 + 3**
Probability – axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables – Moments – Moment Generating functions – Binomial, Poisson, Geometric, Uniform , Exponential , Gamma and Normal distributions.

UNIT – II: TWO DIMENSIONAL RANDOM VARIABLES   **9 + 3**
Join distributions – Marginal distributions and conditional distributions –Moments - Covariance - Transforms of random variables – Central limit theorem.

UNIT – III: DIFFERENTIAL EQUATIONS   **9 + 3**
Higher order linear differential equations with constant coefficients – Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients – Method of undermined coefficients.

UNIT – IV: CORRELATION, REGRESSION, INDEX NUMBERS AND TIMES
                  SERIES ANALYSIS   **9 + 3**
Correlation analysis, estimation of regression line. Time series analysis: Variations in time series, trend analysis , cyclical variations , seasonal variations and irregular variations. Index Numbers – Lasperyre's, Paasche's and Fisher's Ideal Index.

UNIT – V: STATISTICAL QUALITY CONTROL   **9 + 3**
Control charts for measurements (X and R chart) – Control charts for attributes (p ,C and np) charts – Tolerance limits – acceptance Sampling.

                                                         TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course the students will be able to
CO1: Use the Probability techniques for solving practical problems.
CO2: Apply two dimensional random variable tools in solving various problems.
CO3: Able to solve differential Equations by applying various techniques.
CO4: Apply different methods of Correlation, Regression, Index Numbers and Times series analysis in solving practical problems.
CO5: Apply statistical techniques in solving manufacturing and management related problems

TEXT BOOKS:
1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.

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3. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10 th Edition, New Delhi, 2016.
4. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44 th Edition , 2018.
5. Richard I. Levin, David S. Rubin, Sanjay Rastogi Masood Husain Siddiqui, Statistics for Management, Pearson Education, 7th Edition, 2016.

REFERENCES:
1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
3. Jain . R.K. and Iyengar. S.R.K., " Advanced Engineering Mathematics ", Narosa Publications, New Delhi, 5 th Edition, 2016.
4. Ramana. B.V., " Higher Engineering Mathematics ", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
5. Prem.S.Mann, "Introductory Statistics" 7th Edition, Wiley India, 2016.
6. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, "An Introduction to Statistical Learning with Applications in R", Springer, 2016.
7. Aczel A.D. and Sounderpandian J., "Complete Business Statistics", 6th edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2012.

TT3301   ENGINEERING MECHANICS FOR TEXTILE TECHNOLOGISTS   L T P C
3 1 0 4

COURSE OBJECTIVES: The main learning objective of this course is to prepare the students for:

1. Applying the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
2. Applying the concept of reaction forces (non-concurrent coplanar and noncoplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.
3. Applying the concepts of locating centroids/center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.
4. Applying the concepts of frictional forces at the contact surfaces of various engineering systems.
5. Applying the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjectedto concurrent coplanar forces.

UNIT I STATICS OF PARTICLES   (9+3)
Fundamental concepts and principles, systems of units, method of problem solutions, statics of particles -forces in a plane, resultant of forces, resolution of a force into components, rectangular components of a force, unit vectors. equilibrium of a particle- newton's first law of motion, space and free-body diagrams, forces in space, equilibrium of a particle in space.

UNITII EQUILIBRIUM OF RIGID BODIES   (9+3)
Principle of transmissibility, equivalent forces, vector product of two vectors, moment of a force about a point, varignon's theorem, rectangular components of the moment of a force, scalar product of two vectors, mixed triple product of three vectors, moment of a force about an axis,

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couple - moment of a couple, equivalent couples, addition of couples, resolution of a given force into a force -couple system, further reduction of a system of forces, equilibrium in two and three dimensions - reactions at supports and connections.

UNITIII   DISTRIBUTED FORCES   (9+3)

Centroids of lines and areas — symmetrical and unsymmetrical shapes, determination of centroids by integration, theorems of pappus-guldinus, distributed loads on beams, centre of gravity of a three-dimensional body, centroid of a volume, composite bodies, determination of centroids of volumes by integration.

Moments of inertia of areas and mass - determination of the moment of inertia of an area by integration , polar moment of inertia , radius of gyration of an area , parallel-axis theorem , moments of inertia of composite areas, moments of inertia of a mass - moments of inertia of thin plates , determination of the moment of inertia of a three-dimensional body by integration

UNIT IV   FRICTION   (9+3)

The Laws of Dry Friction.Coefficients of Friction, Angles of Friction, Wedges, Wheel Friction.Rolling Resistance, Ladder friction.

UNIT V   DYNAMICS OF PARTICLES   (9+3)

Kinematics - rectilinear motion and curvilinear motion of particles. kinetics- newton's second law of motion - equations of motions, dynamic equilibrium, energy and momentum methods - work of a force , kinetic energy of a particle, principle of work and energy, principle of impulse and momentum, impact, method of virtual work - work of a force, potential energy, potential energy and equilibrium.

TOTAL (L: 45 + T: 15) = 60 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

CO1. Apply the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.

CO2. Apply the concept of reaction forces (non-concurrent coplanar and non-coplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.

CO3. Apply the concepts of locating centroids / center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass momentof inertia of solids.

CO4. Apply the concepts of frictional forces at the contact surfaces of various engineering systems.

CO5. Apply the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

TEXT BOOKS:

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, SanjeevSanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 11thEdition, 2017.

2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

REFERENCES:

1. Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.

2. Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition,Prentice Hall, 2013.

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3. Irving H. Shames, Krishna Mohana Rao G, Engineering Mechanics – Statics and Dynamics, 4thEdition,Pearson Education Asia Pvt. Ltd., 2005.
4. Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 7thedition, Wiley student edition, 2013.
5. Timoshenko S, Young D H, Rao J V and Sukumar Pati, Engineering Mechanics 5thEdition, McGraw HillHigher Education, 2013.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Apply the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D	3	3	3	2	2	1	1	-	1	1	1	2	2	2	1
CO2	Apply the concept of reaction forces (non-concurrent coplanar and noncoplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D 3D	3	3	3	2	2	1	1	-	1	1	1	2	2	2	1
CO3	Apply the concepts of locating centroids / center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass momentof inertia of solids.	3	3	3	2	2	1	1	-	1	1	1	2	2	2	1
CO4	Apply the concepts of frictional forces at the contact surfaces of various engineering systems.	3	3	3	1	1	1	1	-	1	1	1	2	2	2	1
CO5	Apply the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces	3	3	3	3	3	1	1	-	1	1	1	2	2	2	1
Overall CO		3	3	3	2	2	1	1	-	1	1	1	2	2	2	1

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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TT3354   **TECHNOLOGY OF PRE SPINNING PROCESS**   **L T P C**
                                                         3 0 0 3

OBJECTIVES:
- To expose the students to the yarn numbering system used to specify textile yarns.
- To enable the students to understand the processes involved in the production of yarn from fibres.
- To enable the students to understand the machinery used for the production of yarns using short staple spinning system.

UNIT I   INTRODUCTION TO SPINNING   9
Sequence of spinning machinery for producing carded, combed and blended yarns in short staple and long staple spinning system; yarn numbering systems- direct, indirect and conversions; influence of characteristics of raw material – fibre fineness, length, strength, elongation, stiffness, fibre friction, cleanliness on spinning performance; spinnability

UNIT II   GINNING AND BLOWROOM   9
Description and working of different types of gins; selection of right type of gins; ginning performance on yarn quality; objectives, principle and description of opening, cleaning and blending machines used in blowroom; chute feed; cleaning efficiency, production calculations.

UNIT III   CARDING   9
Objectives and principle of carding; detailed study of flat card; autolevelling; card clothing and its maintenance; drives and production calculation

UNIT IV   COMBING   9
Objectives of comber preparatory; detailed study of sliver lap, ribbon lap and super lap formers; objectives and principle of combing; sequence of combing operation; combing efficiency and production calculation.

UNIT V   DRAWING AND ROVING   9
Tasks of drawing machine; drafting systems used in modern drawing machines; autolevelling; draft and production calculation; objectives of roving machine; working of roving machine; bobbin builder mechanism – mechanical and electro-mechanical; draft, twist and production calculations.

TOTAL: 45 PERIODS

OUTCOMES:
Upon the completion of this course the student will be able to,
CO1: Explain the staple yarn spinning and fibre characteristics.
CO2: Explain the ginning and blow room process and calculations.
CO3: Describe the objective, principle and production calculation of carding.
CO4: Explain the different combing process and production calculation.
CO5: Explain the process of drawing, roving and draft, twist and production calculations.

TEXT BOOKS:
1. Klein W., Vol. 1-3, "The Technology of Short Staple Spinning", "A Practical Guide to Opening & Carding" and "A Practical Guide to Combing, Drawing, and Roving frame", The Textile Institute, Manchester, U.K., 1998.

2. Chattopadhyay R. (Ed), Advances in Technology of Yarn Production, NCUTE, IIT Delhi, 2002.

3. Klein W., Vol.4 -5, "A Practical Guide to Ring Spinning, 1987" and "New Spinning Systems, 1993" The Textile Institute, Manchester, 1987.

4. Gowda R.V.M, "New Spinning Systems", NCUTE, IIT Delhi, 2003.

REFERENCES:

1. Oxtoby E., "Spun Yarn Technology ", Butterworth, London, 1987

2. Klein W., "The Technology of Short-staple Spinning ", The Textile Institute, Manchester, 1998

3. Klein W., "A Practical Guide to Opening and Carding ", The Textile Institute, Manchester, 1999

4. Klein W., "A Practical Guide to Combing, Drawing and Roving Frame ", The Textile Institute, Manchester, 1999

5. Lord P.R., "Yarn Production: Science, Technology and Economics ", The Textile Institute, Manchester, 1999

6. Salhotra K.R. and Chattopadhyay R., "Book of papers on Blowroom and Card ", Indian Institute of Technology, Delhi, 1998 41

7. Iredale J., "Yarn Preparation: A Handbook ", Intermediate Technology, 1992

8. Doraiswamy I., Chellamani P. and Pavendhan A., "Cotton Ginning, Textile Progress", The Textile Institute, Manchester, 1993.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO3
CO1	Explain the staple yarn spinning and fibre characteristics.	2	2	3	2	2	-	-	-	-	-	-	1	3	1	1
CO2	Explain the ginning and blow room process and calculations.	3	3	3	2	2	-	-	-	-	-	-	1	3	1	1
CO3	Describe the objective, principle and production calculation of carding.	3	3	3	2	2	-	-	-	-	-	-	1	3	1	1
CO4	Explain the different combing process and production calculation.	3	3	3	2	2	-	-	-	-	-	-	1	3	1	1
CO5	Explain the process of drawing, roving and draft, twist and production calculations.	3	3	3	2	2	-	-	-	-	-	-	1	3	1	1
Overall CO		2.8	2.8	3	2	2	-	-	-	-	-	-	1	3	1	1

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

TT3351   **PREPARATORY PROCESS FOR WOVEN FABRIC MANUFACTURE**   **L T P C**
                                                                                 3 0 2 4

OBJECTIVES:
- The main objective of this course is to enable the students to understand the preparatory processes involved in the production of fabrics.

UNIT I   WINDING   13
Objects of winding; principles of cheese and cone winding machines; drum and precision winding; uniform build of yarn package; types of drums – half accelerated and fully accelerated drums; control of balloons; Classification of yarn faults and its removal; concepts in yarn clearing – mechanical, optical and electronic clearers; knotters and splicers, weft winding; study of modern automatic winders.

UNIT II   PROCESS CONTROL IN WINDING   5
Faults in wound packages, their causes and remedies; winding synthetic and blended yarns; winding for colouration; quality of knots and splices; winding performance; productivity; maintenance; quality control; material handling.

UNIT III   WARPING AND SIZING   18
Objectives of warping, material flow in beam warping and creels used in warping machines; sectional warping machines. Sizing objectives of sizing; sizing materials and recipe used for different types of fibers; size preparation equipment; sizing machines; sizing filament yarns; concept of single end sizing, combined dyeing and sizing. Control concepts in modern sizing; energy conservation in sizing; Sizing defects and production calculations.

UNIT IV   PROCESS CONTROL IN WARPING AND SIZING   5
Process control in warping (production calculation, machine and labor productivity, control of end breaks, quality and hard waste in warping); Control systems used in sizing machine.

UNIT V   DRAWING- IN   4
Need for drawing-in operation; manual and automatic drawing- in, leasing, knotting and pinning machines; selection and care of reeds, healds and drop pins, control of cross ends and extra ends and calculations.

                                          TOTAL: 75 PERIODS (45L + 30P)

LIST OF EXPERIMENTS:
1. Analysis of Yarn faults
2. Control of production, package density, yarn faults in cone / cheese winding machine
3. Study of pirn winding
4. Study of warping machine
5. Study of sectional warping machine
6. Study of drawing – in, denting and tying

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
- Cone / Cheese winding machine – 1 No.
- Warping machine – 1 No
- Pirn winding machine – 1 No.
- Loom - 1 No.

OUTCOMES:

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Upon completion of the course, the students will be able to

CO1: Explain the types of winding, yarn faults and automatic winding

CO2: Elucidate winding package faults and winding performance

CO3: Discuss the types of warping and sizing process

CO4: Describe the process control in warping and sizing

CO5: Explain the manual and automatic drawing in process

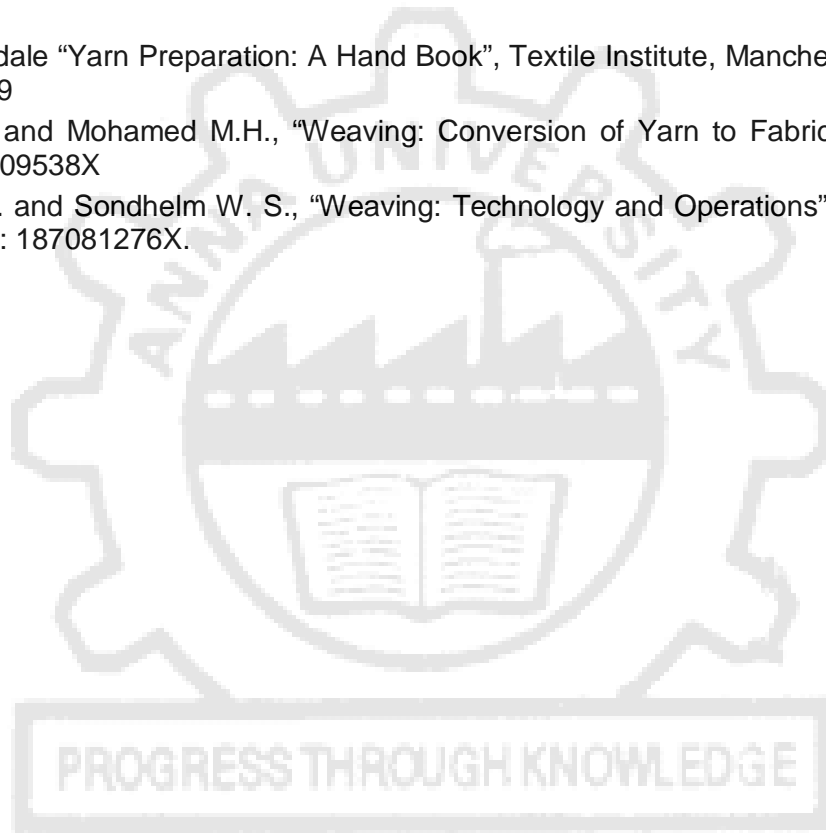CO6: Analyse yarn faults and control of faults in cone / cheese finding

CO7: Discuss the preparatory process of fabric manufacturing

TEXT BOOKS:
1. Sriramlu P.K., Ajgaonkar D.B. & Talukdar M.K., "Weaving Machines: Mechanisms, Management", Mahajan Publishers, Ahmedabad, 1998.
2. Lord P.R. and Mohammed M.H., "Weaving – Conversion of Yarn to Fabric", Merrow Publication, 1992.

REFERENCES:
1. John A. Iredale "Yarn Preparation: A Hand Book", Textile Institute, Manchester, 1992, ISBN: 1853390429
2. Lord P. R. and Mohamed M.H., "Weaving: Conversion of Yarn to Fabric", Merrow, 1992, ISBN: 090409538X
3. Ormerod A. and Sondhelm W. S., "Weaving: Technology and Operations", Textile Institute, 1995, ISBN: 187081276X.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Explain the types of winding, yarn faults and automatic winding	3	3	3	2	2	-	-	-	-	-	-	1	3	1	3
CO2	Elucidate winding package faults and winding performance	3	3	3	2	2	-	-	-	-	-	-	1	3	1	3
CO3	Discuss the types of warping and sizing process	3	3	3	2	2	-	-	-	-	-	-	1	3	1	3
CO4	Describe the process control in warping and sizing	3	3	3	2	2	-	-	-	-	-	-	1	3	1	3
CO5	Explain the manual and automatic drawing in process	3	3	3	2	2	-	-	-	-	-	-	1	3	1	3
CO6	Analyse yarn faults and control of faults in cone / cheese Winding	3	3	3	3	2	-	-	-	2	2	2	1	3	1	2
CO7	Discuss the preparatory process of fabric manufacturing	3	3	3	3	2	-	-	-	2	2	2	1	3	1	2
Overall CO		3	3	3	2.28	2	-	-	-	2	2	2	1	3	1	2.71

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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TT3353   **STRUCTURE AND PROPERTIES OF TEXTILE FIBRES**

L T P C
3 0 2 4

OBJECTIVES:
The main objective of this course is to enable the students to understand the
- Structure and morphology of textile fibres
- Structure investigation techniques
- Physical characteristics textile fibres

UNIT I   STRUCTURE OF FIBRES   9
Classification of fibres; study of morphological structures of fibers; physical properties of fibres; order and disorder in fibre structure; molecular conformations – planar zig-zag, helical, lamellar, and sperulite conformations

UNIT II   STRUCTURE INVESTIGATION TECHNIQUES   9
Transmission and Scanning electron microscopes - principle; construction and working; X-ray diffraction techniques – estimation of crystallinity; Infrared radiation and dichroism techniques; chemical element and group identification by transmittance and optical density methods, molecular orientation estimation

UNIT III   MOISTURE ABSORPTION CHARACTERISTICS   9
Theories of moisture sorption; moisture absorption behaviour of natural and man-made fibres; influence of fibre structure, humidity and temperature on the moisture absorption; conditioning of fibres – mechanism of conditioning and factors influencing conditioning. Moisture diffusion in fibres; heat of sorption – integral and differential, their relation; factors influencing heat of sorption - measurement of heat of sorption

UNIT IV MECHANICAL PROPERTIES OF FIBRES   9
Tensile characteristics –study of strength, elongation, work of rupture, initial modulus, work factor and yield point – determination of yield point. Stress-strain relations of natural and manmade fibres - influence of fibre structure, humidity and temperature on tensile characteristics. Time effect study of creep phenomena. Elastic recovery and its relation to stress and strain of fibres; mechanical conditioning of fibres and its influence on elastic recovery. Load cycling and extension cycling-their effect on elastic recovery. Introduction about torsional and flexural rigidity of fibers

UNIT V OPTICAL, FRICTIONAL AND THERMAL CHARACTERISTICS   9
Reflexion and lustre-objective and subjective methods of measurement - refractive index and its measurement - birefringence, factors influencing birefringence - absorption and dichroism friction – static, limiting and kinetic friction, its measurement, comparison of fibres, directional friction in wool – friction. thermal transitions of fibres - thermal conductivity, thermal expansion and contraction, Tg and Tm; static electricity in textile fibres

TOTAL: 75 (45 L+30 P)

LIST OF EXPERIMENTS
1. Identification of natural, regenerated and synthetic fibres
2. Determination of denier of synthetic fibres
3. Determination of moisture regain and moisture content of fibres
4. Determination of wax content and spin finish of natural and synthetic fibres
5. Identification of fibres and determination of the blend proportion of
   a. Cotton/ regenerated cellulose
   b. Polyester/ protein fibres
   c. Cellulose/polyester fibres
   d. Cotton/ viscose/polyester

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LIST OF EQUIPMENTS

1. Microscope – 1 No.
2. Weighing balance – 1 No.
3. Conditioning Chamber – 1 No.
4. Soxhlet appratus- 2 No.

OUTCOME:

Upon completion of this course, the student shall be able to
 CO1: Explain the structure and properties of fibres
 CO2: Identify the method of investigation of structure of fibres
 CO3: Compare and understand moisture absorption behaviour of various fibres
 CO4: Demonstrate the tensile and elongation properties of fibres
 CO5: Interpret the optical, thermal and frictional characteristics of fibres
 CO6: Identify the fibres using, solubility, burning and microscopic test.
 CO7: Determination of linear density and moisture properties of fibres

TEXTBOOKS
1. Morton W.E., and Hearle J.W.S.,"Physical Properties of Textile Fibres", The Textile Institute, Washington D.C., 2008, ISBN978-1-84569-220-95
2. Hearle J.W.S.,Lomas B.,and CookeW.D., "Atlas of Fibre Fracture and Damage to Textiles",The Textile Institute, 2nd Edition, 1998, ISBN:1855733196

REFERENCES
1. Meredith R., and Hearle J. W. S., "Physical Methods of Investigation of Textiles", Wiley Publication, New York, 1989, ISBN: B00JCV6ZWU ISBN-13:
2. MukhopadhyayS. K., "Advances in Fibre Science", The Textile Institute,1992, ISBN: 1870812379
3. MeredithR.,"MechanicalPropertiesofTextileFibres",NorthHolland,Amsterdam,1986,ISBN: 1114790699, ISBN-13:9781114790698
4. RaheelM. (ed.)., "Modern Textile Characterization Methods", Marcel Dekker, 1995, ISBN:0824794737
5. Mukhopadhyay. S. K., "The Structure and Properties of Typical Melt Spun Fibres", Textile Progress, Vol. 18, No. 4, Textile Institute, 1989, ISBN:1870812115
6. Hearle J.W.S., "Polymers and Their Properties : Fundamentals of Structures and Mechanics Vol1",EllisHorwood,England,1982,ISBN:047027302X|ISBN13:9780470273029
7. Greaves. P. H., and Saville B.P., "Microscopy of Textile Fibres", Bios Scientific, U.K., 1995, ISBN: 1872748244 | ISBN-13:9781872748245
8. Seville. B. P., "Physical Testing of Textiles", Woodhead Publishing, 1999,ISBN: 1855733676 | ISBN-13:9781855733671
9. Hearle J. W. S., and Peters. R. H., "Fibre structure", Elsevier Ltd, 1963, ISBN: 1483212211 | ISBN-13:9781483212210

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Explain the structure and properties of fibres	3	3	2	3	-	-	1	-	-	-	-	1	3	1	2
CO2	Identify the Method of investigation of structure of fibres	3	3	2	3	-	-	1	-	-	-	-	1	3	1	2
CO3	Compare and understand moisture absorption behaviour of various fibres	3	3	2	3	-	-	1	-	-	-	-	1	3	1	2
CO4	Demonstrate the tensile and elongation properties of fibres	3	3	2	3	-	-	1	-	-	-	-	1	3	1	2
CO5	Interpret the optical, thermal and frictional characteristics of fibres	3	3	2	3	-	-	1	-	-	-	-	1	3	1	2
CO6	Identify the fibres using, solubility, burning and microscopic test.	3	3	3	3	2	-	1	-	1	2	1	1	3	1	2
CO7	Determination of linear density and moisture properties of fibres	3	3	3	3	2	-	1	-	1	2	1	1	3	1	2
Overall CO		3	3	2.28	3	2	-	1	-	1	2	1	1	3	1	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

TT3352   **PRODUCTION OF TEXTILE FIBRES**   **L T P C**
                                                                                 3 0 0 3

OBJECTIVES:

- To enable the students to learn about the natural fibre production, polymer rheology and the laws, and various spinning techniques of manufactured fibre production
- To expose the students to post spinning and advance development in the spinning process

UNIT I   NATURAL FIBERS   12
Natural Fibers- production, properties and applications- Evolution of cotton varieties & Cultivation and harvesting; Bast Fibers: cultivation – Retting – Fibre Extraction; Wool: Types – Rearing – Shearing – Chemical Composition; Silk: life cycle of silk worm, Types – Reeling – Throwing

UNIT II   MELT SPINNING   9
Newtonian and non-newtonian fluids, Melt instabilities; Melt Spinning- Polymer Selection and Preparation, equipment, properties and applications of polyester, polyamide and polypropylene fibers.

UNIT III   SOLUTION SPINNING   9
Solution spinning- Polymer Selection and Preparation, equipment, properties and applications of acrylic, polyurethane and regenerated cellulose fibres.

UNIT IV   POST SPINNING OPERATIONS   9
Neck drawing, drawing systems, influence of drawing on structure and properties of fibres; Types of heat setting, influencing parameters on heat setting, influence of heat setting on fibre behavior; Spin finish composition and application; texturising.

UNIT V   DEVELOPMENTS IN FIBER SPINNING   6
Liquid crystal spinning; Gel spinning; Profile fibres and hollow fibres; Speciality fibres: polylactic acid and chitosan fibres preparation properties and applications.

                                                                  TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of this course, the student shall be able to
CO1: Recognize the cultivation and production of natural fibres
CO2: Explain the polymer rheology and polymer process parameters involved in melt spinning.
CO3: Demonstrate the various spinning techniques of polymers parameter involved in spinning synthetic yarn
CO4: Infer the need of various post spinning operations
CO5: Describe the advances in the spinning process

TEXT BOOKS:
1.   Kothari V. K., "Textile Fibres: Development and Innovations", Vol. 2, Progress in Textiles, IAFL Publications, New Delhi, 2000
2.   Vaidya A. A., "Production of Synthetic Fibres", Prentice Hall of India Pvt. Ltd., New Delhi, 1988
3.   Nakasjima (English edition, edited by Kajiwara K. and McIntyre J. E.), "Advanced Fibre Spinning Technology", Wood head Publication Ltd., England, 1994.

REFERENCES:
1.   Gupta V. B. and Kothari V. K. (Editors), "Manufactured Fibre Technology", Kluwer Academic Publishers, 1997.
2.   Cook J. G., "Handbook of Textile Fibres: Vol. 2: Man Made Fibres", The Textile Inst., 5th Ed. 1984.
3.   Srinivasa Murthy H. V., "Introduction to Textile Fibres", Textile Association, India, 1987.
4.   Cook J.G., "Handbook of Textile Fibres: Vol. 1: Natural Fibres" The Textile Inst., 2001

Course Articulation Matrix:

Course Outcomes	Statement	Program outcome														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Recognize the cultivation and production of natural fibres	3	3	2	2	1	2	2	-	-	-	-	1	3	1	3
CO2	Explain the polymer rheology and polymer process parameters involved in melt spinning	3	3	2	2	1	2	2	-	-	-	-	1	3	1	3
CO3	Demonstrate the various spinning techniques of polymers parameter involved in spinning synthetic yarn	3	3	2	2	1	2	2	-	-	-	-	1	3	1	3
CO4	Infer the need of various post spinning operations	3	3	2	2	1	2	2	-	-	-	-	1	3	1	3
CO5	Describe the advances in the spinning process	3	3	2	2	1	2	2	-	-	-	-	1	3	1	3
Overall CO		3	3	2	2	1	2	2	-	-	-	-	1	3	1	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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TT3361   **PRE-SPINNING LABORATORY**   **L T P C**
                                                                      0 0 3 1.5

OBJECTIVES:
- To enable the students to learn passage of materials for ginning, cleaning machines and carding.
- To enable the students to learn passage of materials for drawing and roving machines.
- To enable the students to learn bobbin building and process parameters roving bobbins.

LIST OF EXPERIMENTS:
1. Construction details of Ginning machine, material passage and ginning out turn calculations
2. Construction details of blowroom machines material passage and production calculations
3. Determine the process parameters of 100% cotton material, running of blowroom machines to produce lap and running of carding machines to produce sliver
4. Construction details of carding machine, material passage and production calculations
5. Wire point specifications and various settings in a carding machine
6. Construction details of drawing machine, material passage, draft and production calculations
7. Study of construction details of comber preparatory machines, draft, and production calculations of those machines
8. Study of construction details of comber machines, combing cycle and production calculations
9. Construction details of roving machine, material passage, draft and production calculations
10. Study of bobbin builder mechanism in roving machine.
11. Study of roving frame bobbin stretch variation and to determine the count variation within bobbin, between bobbin and between front and back row bobbins.
12. Determine process parameters of drawing and roving machines to produce roving bobbins.
13. Handling of accessories – Tachometer, top roller load measuring devices, pressure gauge, roller eccentricity measuring gauge, leaf gauge, vernier caliber for roller settings, shore hardness tester etc.,

TOTAL: 45 PERIODS

OUTCOMES:
Upon the completion of this course the student will be able to
CO1: Discuss the ginning, cleaning machine's material passage and production calculations.
CO2: Explain the carding, drawing and roving machine's material passage and production calculations.
CO3: Determine the process parameters of blowroom lap, carding sliver and drawing and simplex machines

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
Ginning machine – 1 No.
Blowroom line – 1 No.
Carding machine – 1 No.
Drawframe – 1 No.
Comber – 1 No. (including preparatory process)
Speedframe – 1 No.
(Note: Commercial or Miniature models of above machines can be installed)

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Discuss the ginning, cleaning machine's material passage and production calculations.	3	3	3	3	2	-	1	-	2	2	2	1	3	1	2
CO2.	Explain the carding, drawing and roving machine's material passage and production calculations.	3	3	3	3	2	-	1	-	2	2	2	1	3	1	2
CO3.	Determine the process parameters of blowroom lap, carding sliver and drawing and simplex machines	3	3	3	3	2	-	1	-	2	2	2	1	3	1	2
	Overall CO	3	3	3	3	2	-	1	-	2	2	2	1	3	1	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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TT3454   **TECHNOLOGY OF YARN SPINNING**   **L T P C**
                                                                3 0 2 4

OBJECTIVES:
- To enable the students to learn ring spinning and condensed spinning process.
- To enable the students to understand the yarn plying, twisting, types fancy yarn and method of production.
- To enable the students to learn rotor, friction, air jet, vortex, core and wrap spun yarn production methods.
- To enable the students to learn material passage, draft and production calculation of ring and rotor spinning.
- To enable the students to learn process parameters and production of ring and rotor spun yarn

UNIT I RING SPINNING   **13**
Principle of yarn formation in ring spinning machines; working of ring spinning machine; cop building; design features of important elements used in ring spinning machine; draft, twist and production calculations in ring spinning machine; end breakage rate – causes and remedies

UNIT II CONDENSED YARN SPINNING   **5**
Condensed yarn spinning – principle, different methods, properties; comparison with ring spun yarn

UNIT III YARN PLYING   **9**
Merits of plying of yarns; methods followed for plying – TFO, ring twisting; selection of twist level for plying; calculation of resultant count of plied yarns; types of fancy yarns, method of production

UNIT IV ROTOR SPINNING   **9**
Principle of open-end spinning; principle of yarn production by rotor spinning system; design features of important elements used in rotor spinning; structure and properties of rotor yarn

UNIT V OTHER SPINNING SYSTEMS   **9**
Friction, air jet and air vortex spinning methods – principle of yarn production, raw material used, structure, properties and applications; principle of yarn production by self-twist, core, wrap, integrated compound spinning systems.

TOTAL: 75 PERIODS (45L + 30P)

LIST OF EXPERIMENTS:
1. Construction details of Ring spinning machine, material passage, draft and production calculations
2. Study of bobbin builder mechanism in ring spinning machine
3. Study of ring spinning machine and to calculate draft and twist. To determine yarn twist variation when the yarn wind at minimum and maximum diameter as bobbin
3. Construction details of rotor spinning machine, material passage, draft and production calculations.
4. Production of yarn in ring spinning machine
5. Production of yarn in rotor spinning machine
6. Study and analysis of MIS report of spinning Mill.
7. Study and analysis of spectrogram, V-L curve.

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OUTCOMES:

Upon the completion of this course, the student will be able to

CO1: Discuss the yarn formation, draft, twist and production calculation in ring spinning.

CO2: Explain the principle, properties and different methods of condensed yarn spinning.

CO3: Describe the yarn plying and production methods of fancy yarn.

CO4: Explain the principle, properties and different methods of rotor spinning.

CO5: Explain the spinning methods of rotor, friction, air jet, vortex, core and wrap spun yarn production methods.

CO6: Describe the material passage, draft and production calculation of ring and rotor spinning.

CO7: Determine the process parameters of ring and rotor spinning machines.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Ring frame – 1 No.

Rotor spinning machine – 1 No.

(Note: Commercial or Miniature models of above machines can be installed)

TEXT BOOKS:

1. Klein W., Vol. 1-3, "The Technology of Short Staple Spinning", "A Practical Guide to Opening & Carding" and "A Practical Guide to Combing, Drawing, and Roving frame", The Textile Institute, Manchester, U.K., 1998.

2. Chattopadhyay R. (Ed), Advances in Technology of Yarn Production, NCUTE, IIT Delhi, 2002.

3. Klein W., Vol.4 - 5, "A Practical Guide to Ring Spinning", 1987, and "New Spinning Systems", 1993, The Textile Institute, Manchester, 1987.

4. Gowda R.V.M, "New Spinning Systems", NCUTE, IIT Delhi, 2003.

REFERENCES:

1. Oxtoby E., "Spun Yarn Technology ", Butterworth Publications, London, 1987

2. Lord P.R., "Yarn Production: Science, Technology and Economics", The Textile Institute, Manchester, 1999

3. Shaw J., "Short-staple Ring Spinning, Textile Progress", The Textile Institute, Manchester, 982

4. Iredale J., "Yarn Preparation: A Handbook ", Intermediate Technology, 1992.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Discuss the yarn formation, draft, twist and production calculation in ring spinning.	3	3	3	2	2	-	-	-	-	-	-	1	3	1	1
CO2	Explain the principle, properties and different methods of condensed yarn spinning.	3	3	3	2	2	-	-	-	-	-	-	1	3	1	1
CO3	Describe the yarn plying and production methods of fancy yarn.	3	3	3	2	2	-	-	-	-	-	-	1	3	1	1
CO4	Explain the principle, properties and different methods of rotor spinning.	3	3	3	2	2	-	-	-	-	-	-	1	3	1	1
CO5	Explain the spinning methods of rotor, friction, air jet, vortex, core and wrap spun yarn production methods.	3	3	3	2	2	-	-	-	-	-	-	1	3	1	1
CO6	Describe the material passage, draft and production calculation of ring and rotor spinning.	3	3	3	3	2	-	1	-	2	2	2	1	3	1	2
CO7	Determine the process parameters of ring and rotor spinning machines.	3	3	3	3	2	-	1	-	2	2	2	1	3	1	2
	Overall CO	3	3	3	2.28	2	-	1	-	2	2	2	1	3	1	1.28

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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TT3453   **TECHNOLOGY OF WOVEN FABRIC MANUFACTURE**   **L T P C**
                                                                            3 0 0 3

OBJECTIVE:
* To enable the students to understand the preparation for weaving and various functions of weaving machine

UNIT I INTRODUCTION TO WEAVING   **6**
Yarns quality requirements for high speed automatic shuttle looms and shuttle less loom; warp and weft preparation for high speed looms; Principle of weaving, passage of material, motions in loom – primary, secondary and auxiliary motions, plain power loom driving, timing of motions.

UNIT II SHEDDING MOTIONS   **9**
Shed geometry and shedding requirement. Types of shed. Shedding mechanisms - positive and negative. Principles of tappet, dobby and jacquard shedding mechanisms, reversing mechanisms-limitations of various shedding mechanisms; Conventional and modern dobby and jacquard mechanism.

UNIT III WEFT INSERTION AND BEAT UP   **9**
Shuttle picking and checking mechanisms, shuttle flight and timing; Weft feeder – types, Principles of weft insertions in shuttle less looms; mechanism of weft insertion by projectile, rapier loom and jet – air and water. Multi-Phase weaving systems; Kinematics of sley, sley eccentricity; beat up mechanism in modern looms;

UNIT IV SECONDARY AND AUXILARY MOTIONS   **12**
Take up and let - off motions used in plain power looms; cloth formation, weaving condition - factors and control; warp protector and warp and weft stop motion; plain power loom accessories. Automatic weft replenishment in shuttle looms – pirn changing and shuttle changing looms; mechanisms involved in automatic pirn changing – feelers, cutters, design of shuttle, three try motions; multi shuttle looms- box changing principle, Automatic pirn changing in multi shuttle loom. Weft arrival control and automation in shuttle less looms; selvedges in shuttle less looms; quick style change;

UNIT V PROCESS CONTROL & SPECIAL WEAVING PROCESSES   **9**
Techno economics of shuttle less loom weft insertion systems; loom monitoring and control Loom stoppages and efficiency; fabric defects and value loss; fabric shrinkage in the loom - causes and control; fabric engineering. Filament weaving – Silk & Texturised yarns. Principles and mechanisms in weaving Pile fabrics, tapes and triaxial fabrics

                                                TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course the student will be,
CO1: Explain the primary, secondary and auxiliary motions
CO2: Discuss the types of shedding mechanism
CO3: Explain the types of weft insertion and beat up mechanism
CO4: Describe the let – off, take – up and shuttle changing mechanism
CO5: Discuss the process control and special weaving processes

TEXT BOOKS:
1. Talukdar, M.K., "An Introduction to Winding and Warping", Textile Trade Press, Mumbai.
2. Talukdar M.K., Sriramulu P.K. and Ajgaonkar D.B., "Weaving: Machines, Mechanisms, Management", Mahajan Publishers, Ahmedabad, 1998, ISBN: 81-85401-16-0
3. Marks R. and Robinson T.C., "Principles of Weaving", The Textile Institute, Manchester, 1989, ISBN: 0 900739 258

REFERENCES:
1. Ajgaonkar, D.B., "Sizing, Materials, Methods and Machines", Textile Trade Press, Mumbai, 1982.
2. "Weaving: The knowledge in Technology", Papers Presented at the Textile Institute Weaving Conference 1998, Textile Institute, ISBN: 18770372182
3. Booth J.E., "Textile Mathematics Volume 3", The Textile Institute, Manchester, 1977, ISBN: 090073924X
4. Lord P.R. and Mohamed M.H., "Weaving: Conversion of Yarn to Fabric", Merrow, 1992, ISBN: 090409538X
5. Ormerod A. and Sondhelm W.S., "Weaving: Technology and operations", Textile Institute, 1995, ISBN: 187081276X
6. Sabit Adanur, "Handbook of Weaving", Technomic Publishing Co. Inc., 2001

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Explain the primary, secondary and auxiliary motions	3	3	3	2	2	-	-	-	-	-	-	1	3	1	2
CO2	Discuss the types of shedding mechanism	3	3	3	2	2	-	-	-	-	-	-	1	3	1	2
CO3	Explain the types of weft insertion and beat up mechanism	3	3	3	2	2	-	-	-	-	-	-	1	3	1	2
CO4	Describe the let – off, take – up and shuttle changing mechanism	3	3	3	2	2	-	-	-	-	-	-	1	3	1	2
CO5	Discuss the process control and special weaving processes	3	3	3	2	2	-	-	-	-	-	-	1	3	1	2
	Overall CO	3	3	3	2	2	-	-	-	-	-	-	1	3	1	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

TT3452   **KNITTING TECHNOLOGY**   **L T P C**
                                                              3 0 0 3

OBJECTIVES:
- To make the students to understand fundamentals of knitting, types of knitting processes in detail, the functioning of components of knitting machine and knitted fabric structures.

UNIT I   INTRODUCTION   5
Reasons for the growth of the knitting industry; comparison of fabric properties - woven, knits and bonded fabrics; classification of knitting processes – weft knit & warp knit; yarn quality requirements for knitting; preparation of staple yarns for weft and warp knitting

UNIT II   FUNDAMENTALS OF KNITTING   9
General definitions and principles of knitting; types of knitting needles – Bearded, Latch & Compound needle; elements of knitted loop structure

UNIT III   WEFT KNITTING   13
Basic weft knitted structures and their production - plain, rib, interlock and purl; fundamentals of formation of knit, tuck and float stitches; factors affecting the formation of loop; effect of loop length and shape on fabric properties; analysis of various types of weft knitted structures; weft knitted fabric geometry; basic principles and elements of flat knitting machines; different types of flat knitting machines- manual, mechanical and computer controlled; production of various weft knitted structures using flat knitting machines;

UNIT IV   WEFT KNITTING MACHINE   9
Construction, characteristics and working of circular knitting machines used for the production of basic structures; production of derivatives of weft knitted structures; needle control in circular knitting machines; quality control in knitted fabric production; production calculation; safety measures to be taken at knitting industry; process control in weft knitting

UNIT V   WARP KNITTING   9
Basic principles; elements of warp knitted loop – open loop, closed loop; warp knitting elements chain link, chain links for simple patterns, guide bar movement mechanism; Tricot and Rachel warp knitting machines; principles of double needle bar patterning, terry pile fabric production; let off system; run in value based on the lapping diagram; take up system; theoretical concepts of warp knitted loop configuration; uses of warp knitted fabrics in technical applications.

**   TOTAL: 45 PERIODS**
OUTCOMES:
 Upon completion of this course the student will be able to
CO1: Classify the knitting process
CO2: Explain the types of knitting needle and elements of knitting
CO3: Discuss the weft knit structures
CO4: Explain the working of weft knitting and its types
CO5: Discuss the principle, elements and types of warp knitting machine

TEXTBOOKS
1. Chandrasekhar Iyer, Bernd Mammel and Wolfgang Schach., "Circular Knitting", Meisenbach GmbH, Bamberg, 1995, ISBN: 3-87525-066-4.
2. Spencer D.J., "Knitting Technology", III Ed., Textile Institute, Manchester, 2001, ISBN: 185573 333 1.

REFERENCES
1. Ajgaonkar D.B., "Knitting Technology", Universal Publishing Corporation, Mumbai, 1998, ISBN: 81-85027-34-X.

2. Samuel Raz., "Flat Knitting: The new generation", Meisenbach GmbH, Bamberg, 1997, ISBN: 3-87525-054-0.
3. Samuel Raz., "Warp Knitting production", MelliandTextilberichte, GmbH, Rohrbacher, 1987, ISBN: 3-87529-022.
4. Baneerjee.P.K., "Principles of Fabric Formation", CRC Press, London, 2014, ISBN Number:13:978-1-4665-5445-0
5. Ray.S.C., "Fundamentals and advances in Knitting Technology", Woodhead Publishing India Pvt., Ltd, New Delhi. 2011, ISBN: 978-93-80308-16-6.
6. Abhijit Majumdar, Apurba Das, R.Alagirusamy and V.K.Kothari., "Process Control in Textile Manufacturing", Wood Head Publishing Limited, Oxford, 2013, ISBN: 978-0-85709-027-0.
7. Gajjap B.J., "Handbook of warp Knitting Technology", Textile Institute, Manchester, 2004, ISBN: 1 85573 7701.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO3
CO1	Classify the knitting process	3	3	3	2	2	-	-	-	-	-	-	1	3	1	2
CO2	Explain the types of knitting needle and elements of knitting	3	3	3	2	2	-	-	-	-	-	-	1	3	1	2
CO3	Discuss the weft knit structures	3	3	3	2	2	-	-	-	-	-	-	1	3	1	2
CO4	Explain the working of weft knitting and its types	3	3	3	2	2	-	-	-	-	-	-	1	3	1	2
CO5	Discuss the principle, elements and types of warp knitting machine	3	3	3	2	2	-	-	-	-	-	-	1	3	1	2
Overall CO		3	3	3	2	2	-	-	-	-	-	-	1	3	1	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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TT3451   **CHEMICAL PROCESSING OF TEXTILE MATERIALS I**   **L T P C**
                                                                          3 0 0 3

OBJECTIVE:

- To enable the students to learn about chemical structure of fibres, pre-treatments and machineries involved in the wet processing and dyeing of textiles fabrics.

UNIT I   PREPARATORY PROCESS   9

Pretreatments-process Sequences; singeing and desizing of natural and synthetic fibres and its blends; heat setting; Scouring, bleaching and mercerization of cotton, bio-scouring of cotton; carbonization, scouring and bleaching of wool; degumming and bleaching of silk

UNIT II   PROCESSING MACHINERIES   9

Loose stock machine; hank and package processing machines; singeing machines; stretching devices; shearing and raising machines; kiers; mangles; jigger; winch; jet and soft flow machines J – Box ; yarn mercerizer, chain and chainless mercerizes; washing ranges, hydro extractors; detwisters; dryers; stenters

UNIT III   THEORY OF DYEING   9

Dyeing equilibrium; dye-fibre interaction; adsorption isotherm; dye affinity; heat of dyeing; half dyeing time. Basic characteristics of dyes and pigments; classification of dyes and principle of application of dyes.

UNIT IV   DYEING   9

Technology of application of direct, reactive, vat, disperse, acid and basic dyes.

UNIT V   COLOUR SCIENCE   9

Theories of colour measurement, Beer–Lambert's law and Kubelka-Munk theory and their application in colour assessment and colour matching; whiteness and yellowness indices.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course the student will be able to
CO1: Demonstrate the scouring and bleaching of textile fabrics
CO2: Describe the functions of chemical processing machineries
CO3: Explain the theory, classification and application of dyes
CO4: Differentiate the application of dyeing for various fibre
CO5: Identify the theory and measurement of color concepts

TEXT BOOKS

1.   Trotman E. R., "Dyeing and Chemical Technology of Textile Fibres", B.I Publishing Pvt.Ltd. New Delhi, 1994 , ISBN: 0471809101 | ISBN-13: 9780471809104
2.   Menachem Lewin and Eli M. Pearce, "Handbook of Fibre Chemistry: Second Edition, Revised and Expanded, Marcel Dekker, Inc., 1998.
3.   Menachem Lewin and Stephen B. Sello., "Handbook of Fibre Science and Technology: Volume I: Chemical Processing of Fibres and Fabrics-Fundamentals and Preparation Part A", Marcel Dekker, Inc., 1983.
4.   Karmakar S. R., "Chemical Technology in the Pre-treatment Process of Textiles", Elsevier sciences B.V., 1999.
5.   Shenai V.A., "Chemistry of Dyes and Principles of Dyeing", Sevak Publications, Mumbai, 1995.

REFERENCES

1. Choudhury A. K. R., "Textile Preparation and Dyeing", SDC India Region, 2011.
2. Bhagwat R. S., "Handbook of Textile Processing", Colour Publication, Mumbai. 1999.
3. Cavaco-Paulo A. and Gubitz G. M., "Textile Processing with enzymes", Woodhead Publication Ltd., 2003.
4. Chakraborty J.N., "Fundamentals and practice in Colouration of Textiles", Wood head Publishing India Pvt Ltd, India, 2010, ISBN: 184569788X | ISBN-13: 9781845697884.
5. Mittal R.M., and Trivedi S.S., "Chemical Processing of Polyester/Cellulosic Blends", 2nd ed., Tata McGraw Hill, 2000.
6. Burkinshaw S. M., "Chemical Principles of Synthetic Fibre Dyeing", Springer-Science + Business Media, B.V., 2012, ISBN: 9401042632 | ISBN-13: 9789401042635.

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Demonstrate the scouring and bleaching of textile fabrics	3	2	2	2	2	-	2	-	-	-	-	1	3	1	2
CO2	Describe the functions of chemical processing machineries	3	2	2	2	2	-	2	-	-	-	-	1	3	1	2
CO3	Explain the theory, classification and application of dyes	3	2	2	2	2	-	2	-	-	-	-	1	3	1	2
CO4	Differentiate the application of dyeing for various fibre	3	2	2	2	2	-	2	-	-	-	-	1	3	1	2
CO5	Identify the theory and measurement of color concepts	3	2	2	2	2	-	2	-	-	-	-	1	3	1	2
Overall CO		3	2	2	2	2	-	2	-	-	-	-	1	3	1	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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TT3401   **WOVEN FABRIC STRUCTURE AND DESIGN**   **L T P C**
                                                                3 0 0 3

OBJECTIVES:

* To enable the students to learn about different structures of woven fabric and design the structure for differentapplications

UNIT I   **9**
Introduction – methods of representing weave in point paper, construction of design, draft and lifting plan, types of draft, heald calculation, order of denting; elementary weaves – plain, twill, satin, sateen and their derivatives –loom requirements

UNIT II   **9**
Ordinary and brighten honey comb; huck-a-back and its modifications; mock Leno; crepe weaves; colour theory– light and pigment theory; modification of colour; colour and weave effects; loom requirements

UNIT III   **9**
Bedford cords - plain and twill faced, wadded; welts and piques, wadded piques; backed fabrics warp and weft, reversible and non-reversible fabrics; extra warp and extra weft figuring - single and double colour — loom requirements

UNIT IV   **9**
Pile fabrics; warp pile - wire pile, terry pile, loose backed; weft pile – plain back and twill back velveteen, lashedpile, corduroy, and weft plush — loom requirements

UNIT V   **9**
Double cloth, types of stitches; Damasks; Gauze and Leno principles – loom requirements; trade name ofpopular structures

TOTAL: 45 PERIODS

OUTCOMES:
Upon the completion of this course the student will be able to construct design, draft and peg plan and loomrequirements for producing fabrics with
CO1: Plain, twill, satin and derivatives structures
CO2: Honey comb, crepe structures
CO3: Bedford cords, piques, backed fabrics, extra warp/weft figuring
CO4: Warp and weft pile structures
CO5: Double, damask, gauze and leno structures

TEXTBOOKS
1. Grosicki Z. J., "Watson's Textile Design and Colour", Vol.1, Wood head Publications, Cambridge England,2004, ISBN: 1 85573 7701 24.
2. Grosicki Z. J., "Watson's Advanced Textile Design and Colour", Vol. II, Butterworths, London, 1989,ISBN-9781855739963

REFERENCES
1. Wilson J., "Handbook of Textile Design", Textile Institute, Manchester, 2001, ISBN: 1 85573 5733.
2. Horne C.E., "Geometric Symmetry in Patterns and Tilings", Textile Institute, Manchester, 2000, ISBN: 185573 4923.
3. Seyam A. M., "Structural Design of Woven Fabrics, Theory and Practice", Textile Institute, Manchester,2002, ISBN: 1 87037 2395.
4. GeornerD., "Woven Structure and Design, part 1: Single Cloth Construction", WIRA, U.K., 1986, ISBN:0900820179 | ISBN-13: 9780900820175
5. GeornerD., "Woven Structure and Design, Part 2: Compound Structures", WIRA, U.K., 1989, ISBN:090366951X | ISBN-13: 9780903669511
6. Jan Shenton., "Woven Textile Design", Laurence King Publishing, 2014, ISBN: 178067337X   ISBN-13:   9781780673370.

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Plain, twill, satin and derivatives structures	1	1	1	-	2	1	1	1	2	1	1	1	2	2	2
CO2	Honey comb, crepe structures	1	1	2	-	3	1	1	1	2	1	1	1	2	2	2
CO3	Bedford cords, piques, backed fabrics, extra warp/weft figuring	1	1	2	-	3	1	1	1	2	1	1	1	2	2	2
CO4	Warp and weft pile structures	1	1	2	-	3	1	1	1	2	1	1	1	2	2	2
CO5	Double, damask, gauze and leno structures	1	1	2	-	3	1	1	1	2	1	1	1	2	2	2
Overall CO		1	1	1.8	-	2.8	1	1	1	2	1	1	1	2	2	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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GE3451   **ENVIRONMENTAL SCIENCES AND SUSTAINABILITY**   **L T P C**
                                                                                   2 0 0 2

UNIT - I : ENVIRONMENT AND BIODIVERSITY   6

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

UNIT – II: ENVIRONMENTAL   POLLUTION   6

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.

UNIT – III: RENEWABLE SOURCES OF ENERGY   6

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

UNIT - IV: SUSTAINABILITY AND MANAGEMENT   6

Development , GDP ,Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols-Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

UNIT - V: SUSTAINABILITY   PRACTICES   6

Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports.   Sustainable energy: Non-conventional Sources, Energy Cycles-carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization-Socio-economic and technological change.

                                                                    TOTAL: 30 PERIODS

TEXT BOOKS:
   1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
   2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
   3. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
   4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
   5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.
   6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
   7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

REFERENCE BOOKS:
   1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38 .
   2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.

3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.
5. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

TT3461	FABRIC MANUFACTURE LABORATORY	L T P C
		0 0 3 1.5

OBJECTIVE:
To train the students on different mechanisms of plain loom

LIST OF EXPERIMENTS
1. Determination of depth of shed and heald shaft movements in tappet shedding mechanism
2. Preparation of pattern card for dobby shedding mechanism and way in which adjust the depth of shed
3. Study of dobby shedding mechanism
4. Study of jacquard shedding mechanism
5. Study of picking mechanisms in looms
6. Determination of sley eccentricity in shuttle loom
7. Study of let-off mechanisms
8. Determination of pick space through 5 and 7 wheel take-up mechanisms
9. Study of weft replenishment mechanism in shuttle looms
10. Method of achieving the required colour patterns in 4 X 1 drop box motion
11. Study of warp protector mechanism
12. Understanding of the loom requirements from the given sample

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to
CO1: Discuss the shedding and picking mechanism
CO2: Explain the let- off and take – up mechanism
CO3: Achieve the colour pattern in weaving machine

**LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS**
- Loom with tappet shedding – 1 No.
- Loom with dobby shedding – 1 No.
- Loom with jacquard – 1 No.
- Loom with dropbox – 1 No.

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	Discuss the shedding and picking mechanism	3	3	3	3	2	-	1	-	2	2	2	1	3	2	3
CO2	Explain the let- off and take – up mechanism	3	3	3	3	2	-	1	-	2	2	2	1	3	2	3
CO3	Achieve the colour pattern in weaving machine	3	3	3	3	2	-	1	-	2	2	2	1	3	2	3
Overall CO		3	3	3	3	2	-	1	-	2	2	2	1	3	2	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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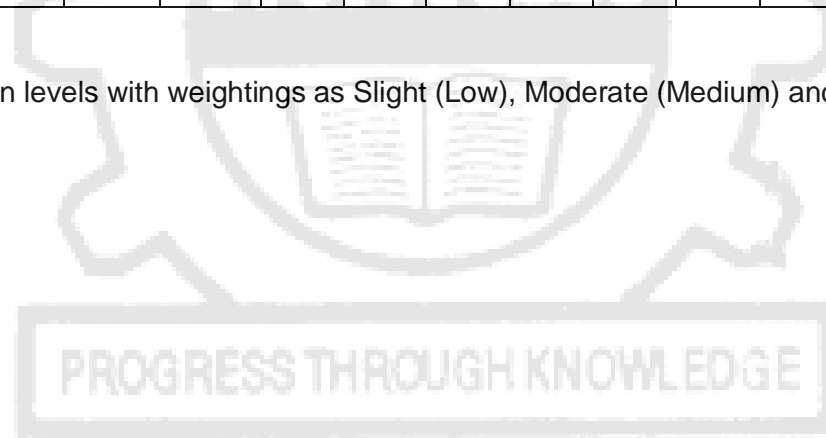
TT3462   **FABRIC STRUCTURE ANALYSIS LABORATORY**   **L T P C**
                                                              0 0 3 1.5

OBJECTIVES:
- To enable the student to analyse the construction details of plain, rib and twill weave and its derivatives fabrics.
- To enable the student to analyse the construction details of satin, sateen, crepe, honey comb and huck a back weaves.
- To enable the student to analyse the construction details of double cloth, terry weave and Bedford cord weaves.
- To enable the students to determine the cost of woven fabrics.

LIST OF EXPERIMENTS

1. Analysis of weave and construction details of fabrics with plain weave
2. Analysis of weave and construction details of fabrics with rib/mat weaves
3. Analysis of weave and construction details of fabrics with twill/wavy twill weaves
4. Analysis of weave and construction details of fabrics with herringbone/diamond/diaper
5. Analysis of weave and construction details of fabrics with sateen and satin weaves
6. Analysis of weave and construction details of fabrics with crepe weaves
7. Analysis of weave and construction details of fabrics with honeycomb, huck-a-back and mock-leno weaves
8. Analysis of weave and construction details of fabrics with double cloth
9. Analysis of weave and construction details of fabrics with terry weaves
10. Analysis of weave and construction details of fabrics with bedford cord weaves
11. Determination of weave plan for manufacturing 100 meter of different woven fabrics

TOTAL: 45 PERIODS

OUTCOMES:
Upon the completion of this course the student will be able to
CO1: Draw the structure of woven fabrics with different weaves.
CO2 Extract the weave from the given sample and draw the weave, draft and peg- plan for re-production.
CO3: Develop the weave plan for production of woven fabrics

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
1. Lab Desks - 20 Nos.
2. Beesley's balance - 5 Nos.
3. Crimp tester - 5 Nos.
4. Electronic balance - 2 Nos.
5. GSM Cutter - 2 Nos.

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Draw the structure of woven fabrics with different weaves	3	3	3	1	-	-	-	-	2	2	2	2	3	3	3
CO2	Extract the weave from the given sample and draw the weave, draft and peg- plan for re-production	3	3	3	1	-	-	-	-	2	2	2	2	3	3	3
CO3	Develop the weave plan for production of woven fabrics	3	3	3	1	-	-	-	-	2	2	2	2	3	3	3
	Overall CO	3	3	3	1	-	-	-	-	2	2	2	2	3	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively