

Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly West Bengal University of Technology)
Syllabus for B. Tech in Leather Technology
 (Applicable from the academic session 2018-2019)
Semester-V

HU (LT) 501	Economics of Leather Industry
Group A	
1. Business firms and the market place: Concept of organized firm and industry-managerial issues in the context of an open market set up. Impact of competition, technological change and public policy.	
2. Theory of demand: Law of demand- impacts of price and income changes. Parametric vs non-parametric shifts in the demand curve. The axiomatic approach to the theory of demand-price and income effects. Distinction between normal, inferior and Giffen goods. Demand forecasting.	
3. Theory of Firm: Technology and productivity. Law of variable proportions and returns to scale. Optimal production decision using isoquant and budget line. Mathematical derivation of optimality conditions. Cost concepts-short run and long run analysis of cost. Revenue and profit-conditions for profit maximization.	
4. Market Structure: Analysis of important market forms-competition, monopoly, monopolistic competition and oligopoly.	
Group B	
1. Introduction:	
Economic importance of leather. Antiquity of leather industry. Uses of leather in different sorts of life.	
2. Hides and Skins:	
Indian livestock population over two decades – Hides and skins availability, their sizes, marketing centres, channels and prices over two decades.	
3. Leather Industry:	
Leather production - centres, prices and marketing channels. Statistics of production of leather in organised and village sector of tanning industry. Present and past condition of indigenous leather industry of India. Obstacles in the way of development of tanning in India and their possible Remedies.	
4. Leather Products Industry:	
Leather Products manufacturing centre, prices and marketing channels. Statistics of production of leather products in organised and village sector. Present and past condition of indigenous leather products industry of India.	
5. Export Trade of Indian Leather Industry:	
Procedures involved in imports and exports. India's export trade in leather and leather products – India's share at the global level – India's competitors and their strength – International prices – Indian Government policies in the export promotion – Role of Indian and Overseas promotional institutions for export growth – Strategies for export promotion – Market constraints (Quality, image, brand name & merchandising methods).	
6. Project Identification and Preparation:	
General considerations – Engineering aspects – Cost estimates and demand forecasting for leather and leather products – Different sources of finance – Budget preparation – Annual cost, variable cost and allocation of cost.	
Suggested Books:	
Suggested books:	
1. H R. Varian. Intermediate Microeconomics: a Modern Approach. Affiliated East-West Press.	
2. R S. Pindyck, D.L. Rubinfeld and Mehta (2007). Microeconomics, 7th edition, Prentice Hall India.	
3. Indian Leather 2010 (A Technology, Industry and Trade Forecast) – Central Leather Research Institute, Madras.	
4. The Indian Leather Industry – Secretariat for industrial assistance, Ministry of Industry, Govt. of India.	
5. How To Export (Handbook on export business) – Small Industry Research Institute, Govt. of India.	
6. Kothari's Desk Book Series - The Leather Industry.	
7. Choice of technique in leather manufacture – M.M. Haq, H. Argaw – Scottish Academic Press. Edinburgh (1981)	
8. Economics of Leather Industry- B.R. Rau, Calcutta University Press (1920).	

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LT 501 Chemistry & Technology of Organic Tannage
1. Vegetable tannins and tanning
Chemistry, classification (gallotannins, ellagitannins, condensed and complex tannins) and properties of tannins; Characteristics of some important vegetable tannins (Tara, Wattle, Quebracho, Chestnut, Gambier, Myrobalan); Modified vegetable tannins (modification of mimosa); Constitution, properties and application of tan-liquor – role of tan/non-tan ratio, pH, astringency, acid and salt content, specific gravity, concentration; Chemistry of vegetable tanning, Properties of vegetable tanned leather.
2. Synthetic tannins
Chemistry and multifunctional properties of syntans; General Manufacturing Methods of Phenol–Formaldehyde, Naphthalene–Formaldehyde and Naphthol–Formaldehyde Condensates, Urea–formaldehyde and Melamine–Formaldehyde condensates – Supra Syntans –Diversified application of syntans for manufacturing different leathers to achieve various objectives. Use of lignosulfonic acids in leather processing.
3. Resin syntans
Acrylic syntans- Pre-tanning agent (acrylic acid ester co-polymer derivatives), Retanning and lubricating agents methyl methacrylate/butyl acrylate copolymer; Polyurethanes as Resin Tanning Agent – chemistry and applications.
4. Aldehyde tanning agents
Formaldehyde, glyoxal and glutaraldehyde tanning agents– chemistry, structure and general properties – Investigation of their tanning faculty. Reaction of aldehydes with different functional groups of protein. Tanning faculty at different pHs – Ewald reaction.
5. Oil Tanning, Sulfonyl Chloride Tanning
Suggested Readings:
1. Vegetable Tannage -- Tanning Extract Producers Federation Limited, England.
2. An Introduction to the Principles of Leather Manufacture – S. S. Dutta, Indian Leather Technologists Association, Calcutta, India
3. Karamali Khanbabae and Teunis van Ree, Tannins: Classification and Definition, Nat. Prod. Rep., 2001, 18, 641–649.
4. Lorenzo Tambi, Piero Frediani, Marco Frediani, Luca Rosi and Mara Camaiti, Hide Tanning with Modified Natural Tannins, Journal of Applied Polymer Science, Vol. 108, 1797–1809 (2008).
5. Quideau S. et al., Plant Polyphenols: Chemical Properties, Biological Activities, and Synthesis, Angew. Chem. Int. Ed. 2011, 50, 586 – 621.

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LT 502 Applied Statistics and Quality Control
Definitions of Probability & Related Basic Concepts
a) Discrete and continuous probability distributions (Binomial, Poisson, Uniform, Normal, Gamma & exponential distributions), (8 hours)
b) Basic concepts of statistical population and random sampling, Mean Variance and covariance, Correlation coefficients, Moments. (6 hours)
c) Basic concepts of Testing of Hypothesis. Analysis of variance; one factor classification & two factors classification. (6 hours)
d) Design of Experiments; some basic designs of experiments; comparison of Randomised Block design (RBD) and Latin square Design (LSD). (8 hours)
2. Basic Concepts of Statistical quality Control (SQC)
a) Nature of Control limits; Type I and Type II errors; Chance variation and assignable variation (6 hours).
b) Purposes of control charts, Control charts for variables, Control charts for attributes, Cusum Control chart. (8 hours)
Suggested Books
1) Introduction to Statistical Quality Control: By D.C. Montgomery, John Wiley (student edition), 4th edition (2004)
2) Design and Analysis of Experiments: By D.C. Montgomery; John Wiley & sons (2nd edition), 1984
3) Introduction to Quality Engineering: By G. Taguchi, UNIPUB, White-Plain, N.Y.
4) Probability & Statistics for Engineering & Scientists (seventh edition), Walpole, Myers, Myers. YE., Pearson Education (Asia), 2002
5) Probability, Statistics and Random Process: By T. Veerarajan (2nd edition), Tata Mc. Graw Hill (2003)
6) M.P. Poonia & S.C. Sharma, Total Quality Management, Khanna Publishing House, New Delhi (2017)

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LT 503 Environmental Engg of Leather Processing
Wastewater characteristics
Waste water characteristics – physical, chemical & biological. Waste water characterization studies – sampling -- location & interval of sampling – sampling equipment – preservation of sample.
2. Composition & Analysis
Waste water composition – loading factors – analysis of waste water loading data, Chemistry and analysis of various characteristics of waste water viz. Total Solids, Total Dissolved Solids, Volatile Matter, Fixed Solids, BOD5, COD, ThOD, TOD, Ammon. Nitrogen, Protein content, TOC, Chlorides, Alkalinity, pH, Sulphides, Dissolved Oxygen, Total Coliform Count, Metal content.
3. Unit operations
Physical unit operations – screening – Flow Equalization – Flocculation – Settling / Sedimentation – Filtration.
Chemical Precipitation – different precipitating agents – Theoretical aspects of precipitation. Hydraulic characteristics of different Reactors – Reaction kinetics & Reactor selection. Important micro-organisms & waste water treatment – kinetics of biological growth – application of kinetics to biological treatment processes – Aerobic Suspended growth process – its microbiology – Process analysis for different reactors – Aerobic Attached growth process – different types – microbiology of the process – process analysis – mathematical designing of Activated Sludge process – its considerations.
4. Solid waste management
Sludge disposal -- Solid waste management- Solid waste characteristics- Generation rate- component- moisture content- VOC content. Density- solid waste collection and transportation- solid waste transfer and transportation. Solid waste processing and recovery- recycling processing for recovery of material- manufacture of solid waste product- electrical energy recovery- disposal of solid waste.
Suggested Books :
1. O.P. Gupta, Elements of Water Pollution Control Engineering, Khanna Publishing House (2018), New Delhi
2. S.K.Banerjee, Environmental Chemistry, 2nd edition. Prentice Hall of India (1999), New Delhi.
3. A.Mackenzie, A.S. Ball & S.R. Virdee -- Instant notes in Ecology, Viva Books Pvt. Ltd.(1999) New Delhi.
4. C.W. Sawyer, P.L.Mc Carty, Chemistry for Environmental Engineering, 3rd Edn. Mcgraw Hill Public Co. Ltd. (1978)
5. B.S.N. Raju, Water supply and waste water engineering. Tata Mc graw Hill Public Co. Ltd. (1995) New Delhi.
6. A.P.Sincero. G.A. Sincero- Environmental Engineering. A design approach. Prentice Hall of India (1999), New Delhi.
7. M.J.Hammer, M.J.Hammer Jr., Water and waste water technology, 3rd edn, Prentice Hall of India (1998), New Delhi.
8. S.L.Culter Edn. Environmental risk and hazard -- Prentice Hall of India (1999), New Delhi.
9. J.B.Enlia, S.J.Ergas, D.P.V.Chang, F.D.Schroeder -- Bioremediation Principles-WCB McGraw Hill (1998), Boston.
10. O.P. Gupta, Elements of Solid Waste Hazardous Management, Khanna Publishing House, New Delhi

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LT 504 Studies on JAVA
INTRODUCTION TO JAVA
1.Introduction to Java programming concepts:
Programming language Types and Paradigms, Computer Programming Hierarchy, How Computer Architecture Affects a Language? , Why Java?, Flavors of Java, Features of Java Language, JVM –The heart of Java , Java’s Magic Byte code
2.The Java Environment
Installing Java, Java Program Development, Java Source File Structure, Compilation, Executions. Lexical Tokens, Identifiers, Keywords, Literals, Comments, Primitive Datatypes, Operators Assignments
3 Object Oriented Programming
Class Fundamentals , Object & Object reference, Object Life time & Garbage Collection, Creating and Operating Objects , Constructor & initialization code block, Access Control, Modifiers, methods, Abstract Class & Interfaces Defining Methods, Argument Passing Mechanism, Method Overloading, Recursion, Dealing with Static Members, Finalize() Method, Native Method.
4. Extending Classes and Inheritance
Use and Benefits of Inheritance in OOP, Types of Inheritance in Java, Inheriting Data members and Methods, Role of Constructors in inheritance, Overriding Super Class Methods, Use of “super”, Polymorphism in inheritance, Implementing interfaces
5. Package
Organizing Classes and Interfaces in Packages, Packages Access Protection, Defining Package, CLASSPATH Setting for Packages, Naming Convention For Packages.
6. Multithreading
Definition and introduction
7. GUI programming
Designing basic Graphical User Interfaces in Java, Components and Containers, Basics of Components, Using Containers,
Suggested Books:
1. Patrick Naughton, Herbert Schildt – "The complete reference-Java2" – TMH
2. E. Balagurusamy – " Programming With Java: A Primer" – 3rd Ed. – TMH
3. Rambaugh, James Michael, Blaha – "Object Oriented Modelling and Design" – Prentice Hall, India
4. R.K Das – "Core Java For Beginners" – VIKAS PUBLISHING
5. Tanweer Alam – “Core JAVA” – Khanna Publishing House, New Delhi (AICTE Recommended textbook – 2018)

LT 505 Leather Goods Design & Manufacture
1. Brief outline about different types of Leathers used for making of Leather Goods.
2. Brief outline about various materials used for Leather Goods Fabrication.
3. A glimpse of Machineries and Tools used in leather goods making.
4. The classification of leather goods.
5. Different types of constructions in leather goods manufacturing.
6. A complete understanding of the Product Making process for Leather Goods including Cutting, splitting and skiving as well as Assembly and stitching with finishing of the product.
Suggested Books:
1. Making Leather Handbags: Inspirational Designs by Ellen Goldstein- Lynch , Sarah Mullins and Nicole Malone.
2. Handbag Workshop: Design and Sew the Perfect Bag by Anna M. Mazur.
3. 46 Leatherwork Projects Anyone Can Do by Geert Schelling.

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LT 591 Tannery Practice III
Manufacture of synthetic tanned leather
Manufacture of resin tanned leather
Manufacture of Aldehyde tanned leather
Manufacture of Oil tanned leather

LT 592 Leather Goods Design Lab
Leather Assortment
Layout preparation
Preparation and cutting
Assembling and stitching operation
Process scheduling and line balancing
Bottom Stock Preparation
Practice in CAD/CAM and pattern grading using machine
Practice in classic leather goods making

LT 593 Studies on JAVA Lab
1. Assignments on class, constructor, overloading, inheritance, overriding
2. Assignments on developing interfaces- inheritance, extending interfaces
3. Assignments on creating and accessing packages
4. Assignments on multithreaded programming
5. Assignments on GUI programming
Note: Use Java for programming
Preferably download "java_ee_sdk-6u4-jdk7-windows.exe" from
http://www.oracle.com/technetwork/java/javase/downloads/java-ee-sdk-6u3-jdk-7u1-downloads-523391.html

LT 594 Analytical Chemistry of Wastewater related to Leather Processing
Determination of:
1) Total solids
2) Total dissolved solids
3) Total suspended solids
4) Total volatile solids
5) Total non -volatile solids content in wastewater.
2) Determination of the Acidity / Alkalinity of the given sample of wastewater
3) Determination of the Salinity of wastewater
4) Determination of the lime content in terms of Calcium content in spent lime liquor
5) Determination of the total chromium content in spent chrome liquor by perchloric acid oxidation method
6) Detection and Determination of the hexavalent chromium present, if any, in spent chrome liquor
7) Determination of the Dissolved Oxygen content in a given sample of water
8) Determination of the Sulphide content in spent lime liquor
9) Determination of the Ammoniacal Nitrogen present (NH ₃ —N) in tannery effluent
10) Determination of the Biochemical Oxygen Demand (BOD ₅) of a given waste water
11) Determination of the Chemical Oxygen Demand of given waste water
12) Determination of the Total Iron Content in given waste water
13) Determination of the Ferrous Iron content in given waste water
14) Determination of the Proteinous substance in given waste water