

Syllabus for B.Tech (Leather Technology) Up to Fourth Year

Revised Syllabus of B.Tech LT (for the students who were admitted in Academic Session 2010-2011)



3A. THEORETICAL PAPERS						
<i>COURSE NO.</i>	<i>COURSE TITLE</i>	<i>L</i>	<i>T</i>	<i>P</i>	<i>Total</i>	<i>Cr.</i>
HU 301	Values and Ethics in Profession	3	0	0	3	3
CH(LT) 301	Wastewater Engineering	3	0	0	3	3
CH (LT)302	Biochemistry of Proteins	3	1	0	4	4
LT 301	Chemical Engineering	3	1	0	4	4
LT 302	Chemistry & Technology of Preservation & Pretannage	3	1	0	4	4
LT 303	Fundamentals of Digital Computer	3	0	0	3	3
<i>Total of Theoretical Papers</i>			0	0	21	21

3B. PRACTICAL PAPERS						
CH (LT)391	Analytical Chemistry of Wastewater	0	0	3	3	2
LT 391	Chemical Engineering Lab	0	0	3	3	2
LT 392	Tannery Practice I	0	0	3	3	2
LT 393	Applied Information Technology Lab	0	0	3	3	2
<i>Total of Practical Papers</i>		0	0	0	12	8
<i>Total of Semester</i>				0	33	29

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4A. THEORETICAL PAPERS						
<i>COURSE NO.</i>	<i>COURSE TITLE</i>	<i>L</i>	<i>T</i>	<i>P</i>	<i>Total</i>	<i>Cr.</i>
M(CS) 401	Numerical Methods	2	1	0	3	2
LT 401	Science & Technology of Polymer & Synthetics as Leather Substitute	3	0	0	3	3
LT 402	Chemistry & Technology of Inorganic Tannage	3	1	0	4	4
LT 403	Analytical Chemistry of Leather Auxiliaries	3	1	0	4	4
LT 404	Microbiological Sciences	3	1	0	4	4
<i>Total of Theoretical Papers</i>			0	0	18	17

4B. PRACTICAL PAPERS						
HU 481	Communication skill & Report Writing	0	0	3	3	2
M(CS)491	Numerical Methods with C Programming	0	0	2	2	1
LT 491	Tannery Practice II	0	0	3	3	2
LT 492	Analytical Chemistry of Leather Auxiliaries Lab	0	0	3	3	2
LT 493	Microbiology of Leather Manufacture	0	0	3	3	2
<i>Total of Practical Papers</i>		0	0	0	14	9
<i>Total of Semester</i>		0	0	0	32	26

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5A. THEORETICAL PAPERS						
<i>COURSE NO.</i>	<i>COURSE TITLE</i>	<i>L</i>	<i>T</i>	<i>P</i>	<i>Total</i>	<i>Cr.</i>
HU (LT) 501	Economics of Leather Industry	3	0	0	3	3
LT 501	Chemistry & Technology of Organic Tannage	3	1	0	4	4
LT 502	Leather Footwear Design & Manufacture	3	1	0	4	4
LT 503	Thermodynamics	3	0	0	3	3
LT 504	Data Structure & Analysis of Algorithm	3/3	0/1	0	3/4	3/4
<i>Total of Theoretical Papers</i>		0	0	0	17/18	17/18

5B. PRACTICAL PAPERS						
LT 591	Tannery Practice III	0	0	3	3	2
LT 592	Footwear Design Lab	0	0	3	3	2
LT 593	Data Structure & Analysis of Algorithm Lab	0	0	3	3	2
LT 581	Seminar on Current Topics	0	0	3	3	2
<i>Total of Practical Papers</i>		0	0	0	12	8
<i>Total of Semester</i>		0	0	0	29/30	25/26

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Third Year - Sixth Semester

<i>COURSE NO.</i>	<i>COURSE TITLE</i>	<i>L</i>	<i>T</i>	<i>P</i>	<i>Total</i>	<i>Cr.</i>
HU601	Principles of Management	3	0	0	3	2
LT601	Chemistry & Technology of post Tanning Operations	3	0	0	3	3
LT602	Physical Testing of Leather	3	0	0	3	3
LT603	Mechanics of Leather Machines	3	0	0	3	3
LT604A LT604B LT604C	Chemistry and Technology of Dyes and Fatliquor Safety & Occupational Health of Leather industry Industrial Sociology	3	0	0	3	3
LT605A LT605B LT605C	DATA BASE Management System Industrial Psychology & Organisational Behaviour Ecological Engineering and Ecoaudit	3/3	0/1	0/0	¾	¾
<i>Total of Theoretical Papers</i>					18/19	18-19

5B. PRACTICAL PAPERS

LT691	Physical Testing Lab	0	0	3	3	2
LT692	Mechanics of Leather Machines	0	0	3	3	2
LT693	Computer Aided Design for Leather Products	0	0	3	3	2
LT694	DATA BASE Management Lab	0	0	3	3	2
<i>Total of Practical Papers</i>					12	8
<i>Total of Semester</i>		0	0	0	30/31	26-27

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7A. THEORETICAL PAPERS						
COURSE NO.	COURSE TITLE	L	T	P	Total	Cr.
LT 701	Chemistry & Technology of Leather Finishing Operations	3	0	0	3	3
LT 702	Eco-Friendly Process Technology	3	1	0	4	4
LT 703	Applied Statistics and Quality Control	3	1	0	4	4
LT 704	Theory of Accountancy and Costing	3	0	0	3	3
LT 705	Computer Networks	3/3	0/1	0	3/4	3/4
Total of Theoretical Papers		0	0	0	17/18	17/18

5B. PRACTICAL PAPERS						
HU 791	Group Discussion	0	0	3	3	2
LT 791	Tannery Practice IV	0	0	3	3	2
LT 792	Leather Goods Design Lab	0	0	3	3	2
LT 793	Computer Network Lab	0	0	3	3	2
Total of Practical Papers		0	0	0	12	8
Total of Semester		0	0	0	29/30	25/26

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8th Semester

8A. THEORETICAL PAPERS						
<i>COURSE NO.</i>	<i>COURSE TITLE</i>	<i>L</i>	<i>T</i>	<i>P</i>	<i>Total</i>	<i>Cr.</i>
HU 801A HU801B	Organisational Behaviour / Project Management	2	0	0	2	2
LT 801	Plant Layout and Project Formulation of Tannery	3	0	0	3	3
LT 802	Technology of Animal and Tannery Byproducts Utilization	3	0	0	3	3
<i>Total of Theoretical Papers</i>		8	0	0	8	8

7B. PRACTICAL PAPERS						
HU 891	Design Lab	0	0	6	6	4
LT 892	Project	0	0	12	12	6
LT 893	Grand Viva					3
<i>Total of Practical Papers</i>		0	0	21	18	13
<i>Total of Semester</i>		0	0	0	26	21

HU 301 Values and Ethics in Profession

3-0-0-3

Science, Technology and Engineering as knowledge and as Social and Professional Activities

Effects of Technological Growth:

Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development

Energy Crisis: Renewable Energy Resources

Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations,

Environmental Ethics

Appropriate Technology Movement of Schumacher; later developments

Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis.

Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology.

Ethics of Profession:

Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle

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blowing and beyond, Case studies.

Profession and Human Values:

Values Crisis in contemporary society

Nature of values: Value Spectrum of a good life

Psychological values: Integrated personality; mental health

Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution.

Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity.

Moral and ethical values: Nature of moral judgments; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

Suggested Books:

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Ed)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.
3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

❖ CH(LT) 301 WASTEWATER ENGINEERING

3 – 0 – 0 – 3

AIM

To impart knowledge on various environmental pollution aspects and issues related to tannery wastes generated and their management

OBJECTIVES

To create an awareness on the various environmental pollution aspects and issues of leather processing industries. To give a comprehensive insight into natural resources, ecosystem and biodiversity. To educate the ways and means to protect the environment from various types of pollution for the leather sector. To impart some fundamental knowledge on human welfare measure also. At the end of the course, the students would understand

- Rules and regulations for tanning sectors for its discharge norms
- Source of pollution and physico-chemical characterization of solid and liquid tannery wastes
- Various treatment systems and disposal methods for liquid and solid wastes
- Recovery and reuse of wastes generated during various processes.
- Inplant management and reduction of pollution load

1. Wastewater characteristics: (4 hours)

Waste water characteristics – physical, chemical & biological. Waste water characterization studies – sampling -- location & interval of sampling – sampling equipment – preservation of sample.

2. Composition & Analysis: (10 hours)

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: (8 hours)

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: (6 hours)

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.S.K.Banerjee, Environmental Chemistry, 2nd edition. Prentice Hall of India (1999), New Delhi.
- 2.A.Mackenzie, A.S. Ball & S.R. Virdee -- Instant notes in Ecology, Viva Books Pvt. Ltd.(1999) New Delhi.
- 3.C.W. Sawyer, P.L.Mc Carty, Chemistry for Environmental Engineering, 3rd Edn. Mcgraw Hill Public Co. Ltd. (1978)
- 4.B.S.N. Raju, Water supply and waste water engineering. Tata Mc graw Hill Public Co. Ltd. (1995) New Delhi.
- 5.A.P.Sincero. G.A. Sincero- Environmental Engineering. A design approach. Prentice Hall of India (1999), New Delhi.
- 6.M.J.Hammer, M.J.Hammer Jr., Water and waste water technology, 3rd edn, Prentice Hall of India (1998), New Delhi.
- 7.S.L.Culter Edn. Environmental risk and hazard -- Prentice Hall of India (1999), New Delhi.
- 8.J.B.Enlia, S.J.Ergas, D.P.V.Chang, F.D.Schroeder -- Bioremediation Principles-WCB McGraw Hill (1998), Boston.

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9.G.M. Masters, Introduction to Environmental Engineering & Science. Prentice Hall of India (1994), New Delhi.



❖ CH(LT)302 BIOCHEMISTRY OF PROTEINS

3 - 1 - 0 - 4

AIM

To understand the basic structure and function of skin and its components

OBJECTIVES

- To study the structure and properties of various biomolecules present in skin
- To study the basic characteristics of enzymes and proteins involved in the maintenance of skin integrity
- To study the nature, biosynthesis, characteristics, structure and functions of collagen and the role of temperature in the stability of collagen and collagen degradation

01. Fundamentals of Biochemistry: (4 hours)

The molecular logic of life, strong and weak interactions, introductory concept of cell, bio-molecules and water.

02. Chemistry of Bio-molecules: (5 hours)

Chemical composition and bonding, 3-D structure – configuration and conformation, chemical reactivity, macromolecules and their monomeric subunits, prebiotic evaluation.

03. Water: (2 hours)

Electronic structure, weak interactions in aqueous system, ionisation of water – weak acid – weak bases, Buffering against pH changes.

04. Amino acids, peptides and proteins: (4 hours)

Chemistry, classification, determination of amino acids, qualitative test and quantitative determination, structure of various amino acids, formation of polypeptides, purification and separation of proteins, covalent structure of proteins.

05. Three dimensional structure of proteins: (4 hours)

Fundamentals of protein structure, amino acid sequencing of protein, hierarchy in protein structure, primary, secondary, super-secondary, tertiary, quaternary and domain structure of protein, protein folding and denaturation.

06. Types of proteins: (4 hours)

Functional role of various proteins, structure of fibrous and globular proteins of connective tissues like keratin, reticulin and elastin; albumin, globulin, mucine etc.

07. Biosynthesis of protein: (2 hours)

Central dogma, structure of DNA, RNA, DNA replication, transcription and translation (elementary introduction only).

08. Molecular Biology of Collagen: (5 hours)

Introduction of collagen, proteoglycan network, level of orders in collagen, primary, secondary, tertiary and quaternary structure of collagen, genes of collagen, collagen biosynthesis, physiological disorders for inappropriate biosynthesis, reactivity of collagen, cursory look on the interaction of collagen network with leather auxiliary.

09. Origin of cutaneous structure: (4 hours)

Origin of epidermal cells, cutaneous appendages, epithelial – mesenchymal interaction.

Suggested Books:

- Nelson, D.L. and Cox, M.M. (2000), *Lehninger principles of biochemistry*, 3rd Edn. Worth Publishers, N.Y.
- Gilbert, F.G. (1997) *Development Biology*, 5th Edn. Sinauer Associates, Massachusetts.
- Kleinsmith, L.J. and Kish, V.M. (1998), *Principles of cell biology*, Harpar & Row publishers, N.Y.
- Gustavson, K.H. (1956), *The chemistry and reactivity of collagen*, Academic press, N.Y.
- Hames, B.D., Hooper, N.M. and Houghton, J.D. (1999), *Instant notes on Biochemistry*, Viva Books Pvt. Ltd. N.D.
- Turner, P.C., McLennan, A.G., Bates, A.D. and White, M.R.H. (1999), *Instant notes on Molecular Biology*, Viva Books Pvt. Ltd. N.D.
- Elden, H.R. *Biophysical properties of skins*, vol.1 of treatise of skin, Wiley Interscience a divn. of John Wiley & sons. N.Y.
- Dutta, S.S. (2000), *An introduction to the principles of leather manufacture*, 4th Edn. Indian Leather Technologists Association, Calcutt

LT 301 CHEMICAL ENGINEERING

3 – 1 – 0 – 4

AIM

To impart knowledge on basic concepts of chemical engineering unit operations and processes

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OBJECTIVES

At the end of the course, the student would understand the basic concepts of unit operations, material and energy balances, fluid dynamics mass and heat transfer in various unit operations such as distillation, extraction, drying and humidification, size reduction and separation and mixing techniques technology of organic and inorganic chemicals involved in the processing of leather chemicals

1. Introduction (2 hours) :

The basics of Chemical Engineering Operations and Chemical Engineering Processes. Fundamentals of Momentum , Heat and Mass Transfer. . The two basic approaches to the study of Momentum , Heat and Mass Transport - The Unit Operation Approach and the Transport Phenomena Approach. The physical and transport properties. Units and dimensions. Dimensional Analysis.

2.Mechanical Operations (8 hours):

Size reduction and size classification-principles and equipments. Application in leather and chemical processing . liquid - liquid and gas - liquid separations. . Principles and operation of solid-solid, solid-liquid and liquid-liquid Mixing systems.

3. Transportation and Metering of Fluids (8 hours):

Fluids Statics and Dynamics.. Compressible and incompressible fluids, Newtonian and Non- Newtonian fluids, Friction and pressure drop . Mechanical Energy Balance in a flowing fluid. Pump; Compressors Blowers. Measurement of pressure drop and fluid velocity, Primary and secondary flow measuring devices. Calibration of flow meters.

4.Heat Transfer (7 hours):

Fundamental Modes of Heat Transfer. Individual and overall heat transfer coefficient. The LMTD and effectiveness - NTU method of Heat exchanger design and analysis. , Evaluation of individual film heat transfer coefficients. Radiation heat transfer and its application .classification of Heat exchangers, Evaporations and Condensers .Simple design calculations.

5. Mass Transfer (5 lectures):

Concept of diffusion, gas-liquid/ vapor liquid equilibrium . Continuous contact and stage-wise contact equipment. Basics of absorption, Distillation, extraction and leaching.

leather/Extraction equipments and their design principles with specific application in leather manufacturing and leather chemical processing.

Theory and mechanism of drying, estimation of drying rate,, design and performance of industrial dryers for leather and leather chemicals.

6. Humidification and Dehumidification:- (5 hours)

Humidity charts, methods of humidification dehumidification; Equipments and their design aspects; Humidity control in leather processing.

7. Adsorption:- (3 hours)

Theory of gas adsorption; absorption equipment for leather and chemical processing. Theory of adsorption, industrial adsorbents, adsorption equipments, Decolourization of chemicals. Ion - exchange:- Theory , different exchange resins and ion- exchange equipment; Water purification.

8. Crystallization:- (2 hours)

Basics of crystallization and its application

Suggested Books:-

1. W.L.McCabe and J.C.Smith, 'Unit Operations in Chemical Engineering McGraw Hill, Kogakusha, 1976.
2. R.E.Trebal, 'Mass Transfer Operations' McGraw Hill, 1972.
3. J.H.Perry, 'Chemical Engineering Handbook' McGraw Hill, 1984.
4. " Sreves Chemical Process Industries
5. Riegel Industrial Chemistry
6. Pandey, G.N. " A text book of Chemical Technology 2.
7. Any other book on Industrial engineering or Chemical Process Technology

LT 302 CHEMISTRY AND TECHNOLOGY OF PRESERVATION AND PRE-TANNAGE

3-1-0-4

AIM

This course will be dealing with basic principles and technology of various pretanning processes and operations.

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OBJECTIVES

- To impart knowledge on principles and practices of long and short term preservation
- To make the students appreciate the principles involved in various pretanning processes and operations
- To impart knowledge on various technologies involved in pretanning.

Curing agents: (2 hours)

Name of different Curing agents, their Manufacturing Methods and use in curing,

Curing:- (2 hours)

Definition; necessity; principles and different state of cured hides and skins.

Soaking agents:- (3 hours)

Theory of wetting and its application to soaking agents chemistry. Nature and classification of soaking agents ---action of different types of soaking agents on a polar substrate like collagen- HLB value as a determinant of surface active Phenomenon - Method of preparation of different soaking agents and uses. Function and uses of preservatives in soaking.

Soaking:- (3 hours)

Physico-Chemical explanation of wetting; objectives and different controls in soaking operation .

Lime:- (3 hours)

Classification and manufacture of lime—Chemical composition of Indian limes and their suitability.

Liming:- (6 hours)

Chemistry of unhairing; unhairing by different methods; objectives of liming; effects of liming on collagen; controls in liming operation to achieve different physical properties of leather.

Depilants:-Manufacture and properties of sodium sulphide, unhairing mechanism of sodium sulphide. Other unhairing agents—sodium sulphydrate, Arsenic sulphides, Cyanides. etc.

Organic Depilating Agents:-Their unhairing chemistry. Enzyme depilants, Oxidative depilants.

Chemistry of Deliming Agents:- (4 hours)

Boric acid, Ammonium salts, Sodium bisulfite. Organic deliming agents. Proprietary deliming agents. Merits of proprietary deliming agents over conventional deliming chemicals.

Deliming:- (4 hours)

Objectives, principles and controls of deliming.

Bating Agents:- (4 hours)

Manufacture, properties and uses of Bating agents. Functions of different components in synthetic bates in bating operation. Acid bates vs alkaline bates.

Bating:- Chemistry of Proteolytic enzymes used for bating; necessity of bating ; its preparation and controls for desired properties of leather.

Pickling Agents:- (5 hours)

Pickle liquor materials and composition—effect of different pickle acids and salts on leather quality. Use of acidic syntans in pickling. Their difference with inorganic acid as pickling agent. Pickling without salt.

Pickling:- Acid binding capacity of collagen; use of organic acids or salts in pickling; its necessity and controls; concept of Depickling.

Suggested Books:

- 1) Introduction to the principles of Leather Manufacture by Prof. S . S. Dutta 4th Edition, I.L.T.A. Publication.
- 2) Theory and Practice of Leather Manufacture by K.T. Sarkar, Latest Edition Published by Ajoy Sorcar, Chennai-41.
- 3) The Chemistry and Technology of Leather (Vol-1,2) by Fred O'Flaherty William T. Roddy and Robert M. Lollar. Published by Robert E. Krieger Publishing Company Huntington, New York (1978)
- 4) Fundamentals of Leather Manufacture – Eckhart Hidemann.
- 5) Theory and Practice of Leather Manufacture –K. T. Sarkar, Macmillan India Press, Madras.
- 6) Leather Technician's Handbook –J. H. Sharpouse, Vernon Lock Ltd., 125 High Holborn, London W-C1.

LT 303 FUNDAMENTALS OF DIGITAL COMPUTER

3-0-0-3

AIM:

This course will give you in brief what you need to know in Computer Science and Technology. At the end of the course you will be an expert of some sort in Computer Science and Technology.

OBJECTIVES:

At the end of this unit, you should be able to:

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- identify the main hardware elements of a computer
- identify some computer peripherals.

1. Introduction: (2 hours)

Historical background- Computer generations, idea of operating systems their developments, concept of machine, assembly and high level languages and assemblers and compilers – the basic functions and objectives

2. Number systems: (3 hours)

Idea of positional number systems, decimal, binary, octal and hexadecimal numbers and inter conversion amongst them. Arithmetic with binary numbers. Representation of numbers in digital computers – concept of radix mantissa form.

3. Digital logic: (8 hours)

AND, OR, NOT and EXOR gates with truth tables. Universal gates. Introductory idea of Boolean algebra, De Morgan's Theorem without proof. Simplification of Boolean functions with up to four variables using K-maps. Half and full adders. Introduction to Latches and flip-flops, concept of clock – S-R, J-K, D, T truth tables only. Use of F-F for construction of various registers memories circuits and simple explanations only; no analysis and timing diagrams needed.

4. Introduction to Digital computers: (7 hours)

CPU – ALU and Control units and their functions, Memory unit – brief description and use of magnetic memories, RAM, ROM and Cache, idea of virtual memory. Input and out put units – description of Display and keyboard, mouse, printers- interfacing concept of serial and parallel ports taking printer port, RS232 and USB port.

5. Introduction to Operating systems: (8 hours)

Idea of hardware and software as scarce resources. Functions of OS, Processor management – processes creation and termination, processor environment, idea of threads; memory management – paging and segmentation basic concepts use of page and segment tables, scheduling methods- FIFO, LIFO, LRU algorithms. Deadlocks - conditions for deadlocks, Concurrency control - idea of critical section semaphores and locks.

6. Problem Solving Techniques: (12 hours)

Concept of program as data structure plus algorithm. Data types and data structures – arrays, trees, linked list, stacks and queues. Inorder, preorder and postorder traversal of trees with examples. Concept of algorithms., termination condition. Concepts of iteration and recursion with simple examples; sorting and searching techniques without proof and analysis – bubble sort, insertion sort and binary sort, linear search. Idea of complexity of computation – Big Oh notation with simple examples.

Suggested Books:

1. Hayes-- Computer Architecture & Organization,3/e ,MH
2. Carter—Computer Architecture (Schaum Series), TMH
3. Chaudhury P. Pal—“ Computer Organization & Design” , PHI
4. Tanenbaum A.S., “Operating System Design & Implementation”, Practice Hall NJ.
5. Silberschatz A. and Peterson J. L., “Operating System Concepts”, Wiley.
6. Dhamdhare: Operating System TMH
7. Horowitz Ellis & Sartaj Sahni, “Fundamentals of Data Structures”, Galgotria Pub.

CH(LT)391

ANALYTICAL CHEMISTRY OF WASTE WATER

0 - 0 - 3 – 3

AIM

To impart knowledge on analytical methods for the analysis of process liquor generated during processing of leathers

OBJECTIVES

At the end of the course, the student would understand

- the analytical chemistry in testing of leather chemicals
- the principle used in instrumental techniques
- various methods of analysis of leather chemicals, spent process liquors

1) 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.

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- 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 ($\text{NH}_3\text{-N}$) 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 a given waste water.
- 12) Determination of the Total Iron Content in a given waste water.
- 13) Determination of the Ferrous Iron content in a given waste water.
- 14) Determination of the Proteinous substance in a given waste water.

LT 391 CHEMICAL ENGINEERING LAB

0 – 0 – 3 – 3

AIM:

This course aims to help students improve their experimentation skills using experiments that are designed to elucidate various principles of chemical engineering.

OBJECTIVE:

The pedagogical objectives are a) to inculcate the ability to observe and systematically record practical phenomena b) to develop the skill of writing clear technical reports describing experiments and c) to teach methods for analysis and interpretation of experimental data.

Mechanical Features of Different Types of Pumps & Valves, Pipe Fittings – Characteristics of Pumps – Resistances Across Fittings, Valves etc. Calibration of Different Flow Meters for Gases & Liquids – Pressure Drop for Flow Through Packed & Fluidized Bed – Viscosity – Gas Analysis.

Operating Characteristics for Various Crushers & Grinders like Jaw Crusher, Rill Crushers, Ball Mill Disc Crushers etc. Size Analysis by Screen & Sedimentation Method.

Experiment on Filtration – Froth Flotation Cell – Determination of Specific Surfaces by Water Permeability & Air Permeability Methods.

Determination of Different Heat Transfer Co-efficients -- Unsteady State Heating in Jacketted Vessels – Heat Balance in Evaporators – Determination of Thermal Conductivity of Insulating Materials – Calorific Value of a Fuel – Calibration of a Thermo Couple.

Estimation of Diffusion Co-efficient -- Rayleigh Distillation – Othmer Still Mass Transfer in Packed Bed & Wetted Well Column – Experiment on Drying & Determination Of Drying Characteristics Curve.

Suggested Books :

1. Unit Operations – McCabe & Smith – McGraw Hill in Chemical Engineering.
 2. Chemical Engineering – Coulson & Richardson – Pergamon Press.
 3. Heat Transmission – McAdams, W.H. – McGraw Hill.
- Chemical Engineering Handbook -- Perry.

LT 392 TANNERY PRACTICE – I

0 0 3 3

❖ INTRODUCTION TO LEATHER PROCESSING



AIM

To provide practical training in making of chrome and vegetable tanned finished leathers from raw hides and skins.

OBJECTIVES

To train the students gain practical experience in

- various unit processes and operations in leather making from raw to finish
 - brief functions of various machineries used in leather manufacture
- Assortment of hides and skins
 - Processing of wet-blue from hides and skins
 - Introduction to various post tanning and finishing processes for the manufacture of upper and garment leathers
 - Introduction to various mechanical operations.

LT393 APPLIED INFORMATION TECHNOLOGY LAB

Syllabus for B.Tech (Leather Technology) Up to Fourth Year

Revised Syllabus of B.Tech LT (for the students who were admitted in Academic Session 2010-2011)



0 - 0 - 3 - 3

AIM

To impart the computer knowledge and skills to the students to make use of the currently available softwares in design and development of leather and leather products

OBJECTIVES

At the end of the course, the students would understand

- computer hardware
- operating systems
- networking
- programming languages like C++
- data base management systems

1) Overview of Computer Parts and its Application.

Introduction to JAVA as Oops

2 hours

An overview of Java

4 hours

Data Types – variables and arrays

2 hours

Operators, Control statements

4 hours

Classes and objects, Inheritance, String and string buffer, Packages, Interfaces, Exception handling, Multithreaded Programming, Applets,

Event handling 8 hours

Abstract Window Toolkit

2 hours

2) *Project (mini) software on process cost. E.g. finishing chemicals- stock inventory, identification of the course while admission to an institution-three/four disciplines.*

Suggested Books :

Operating systems – William Stallings (TMH)

DOS guide – Peter Norton (PHI)

Windows Operating System – Teach yourself Windows 98 (Techmedia)

UNIX concepts & applications – S.DAS (TMH)

----- x -----

LT401 POLYMER SCIENCE AND TECHNOLOGY OF SYNTHETICS AS LEATHER SUBSTITUTES

3 - 0 - 0 - 3

AIM

This module focuses on the properties and applications of polymeric materials, particularly those relevant to materials science applications. It will include structure-property relationships, the major polymer synthesis routes, polymer design and applications of specialised polymeric materials in films, special coatings, dense bodies and foams.

OBJECTIVE:

1. Basic and advanced modern polymer synthesis.
2. The relationships between composition, structure and physical properties of polymers.
3. Modern methods of polymer characterisation.
4. The link between physical properties of polymers and their end applications.
5. The industrial and social importance of polymer technology through case studies of the applications of three classes of polymer.

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01. Science of Macromolecules: (2 hours)

Basic concepts, molecular forces and chemical bonding in polymers, molecular weight and its distribution.

02. Step Reaction Polymerisation: (4 hours)

Classification of polymers and polymerisation mechanisms, mechanisms of step growth polymerisation, kinetics, polyfunctional step growth polymerisation.

03. Radical Chain polymerisation: (3 hours)

Mechanism of vinyl polymerisation, kinetics of chain growth polymerisation, molecular weight and its distribution,

04. Ionic and Co-ordination Chain Polymerisation: (3 hours)

Similarity and contrasts in ionic polymerisation, mechanisms and kinetics of anionic, cationic and co-ordination polymerisations.

05. Copolymerisation: (4 hours)

Kinetics of copolymerisation, composition of copolymers, mechanism of copolymerisation, blocks and graft polymers.

06. Polymerisation Conditions and polymer Reactions: (4 hours)

Polymerisation in homogeneous and heterogeneous systems, polymerisation engineering, chemical reaction of polymers.

07. Polymer Solutions: (4 hours)

Criteria for polymer solution, conformation of dissolved polymer chains, thermodynamics of polymer solution.

08. Measurement of Molecular Weight and Size: (4 hours)

End group analysis, colligative properties measurement.

09. Structure–Property Relationship: (4 hours)

Polymer folding, thermodynamic and kinetic flexibility, Crystallisation and melting of polymers and the factors responsible, glass transition and phase transition of polymers.

10. Determination of Thermal Behaviour of Polymers: (4 hours)

Principles of DSC, DTA, TGA analyses.

11. Plasticization and Crosslinking of polymers: (4 hours)

Theory and mechanisms of plasticization, kinds of plasticizers, crosslinking of polymers and its effect in the physical property of polymer network.

TECHNOLOGY OF SYNTHETICS

12. Technology of the most common polymeric materials used in leather industry as supplements. Polymer and Rubber industries in india. 6
13. Manufacture of industrially important polymer for plastics, fibres and elastomer - Polyethylene, polypropylene, polyvinyl chloride, polyvinyl alcohol, polyacrylonitrile, polystyrene, polyurethane, fluoro-carbon polymers, epoxy resins, polyamides, polyesters, alkyd resins, silicone polymers, cellulose. 16
14. Fabrication of polymeric material, compounding and mixing, casting, extrusion, fibre spinning, molding, coating, foam fabrication. 6
15. Testing of polymers. Mechanical and thermal testing. 8
16. Manufacture of rubber and elastomers. Natural rubber processing & vulcanizing Synthetic elastomers; butadiene copolymer, polyisoprene polybutadiene - processing and vulcanizing. 10

Suggested Books: -

1. Textbook of Polymer Science-Billmeyer, F.W. Jr. (1994), 3rd Edn. Wiley Interscience Publication N.Y.
2. Polymer Science and Technology of Plastics and Rubbers -Ghosh, P.M. (1990), 2nd Edn.Tata McGraw-Hill Publishing Co. N.D.
3. The Chemistry and Physics of Polymers -Kuleznev, V.N. and Shershnev, V.A. (1990) Mir Publishers, Moscow.
4. Williams, D.J., " Polymer Science & Engineering ", Prentice Hall, New York, 1971.
5. Austin, G.T., Shrer's " Chemical Process Industries ", 5th Edition, McGraw-Hill International Book Co., Singapore, 1984.
6. Elrich F.R. " Science & Technology of Rubber ", Academic Press, New York, 1978.
7. Lubin, " Handbook of composites ", Van Nostand Reinhold Co., New York.

LT 402 CHEMISTRY AND TECHNOLOGY OF INORGANIC TANNAGE

3-1-0-4

AIM

To impart knowledge on the chemistry of various inorganic tanning materials and systems

Syllabus for B.Tech (Leather Technology) Up to Fourth Year

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OBJECTIVES

Chemistry of inorganic tanning materials giving more thrust to chrome tanning material and system and a glimpse of other inorganic tanning systems based on Al, Zr, Ti etc.

1. Tanning:- (12 hours)

Theory, chemistry, factors and objectives of following Inorganic

Tanning operations:

- (A) Chrome Tannage,
- (B) Aluminium Tannage,
- (C) Iron Tannage,
- (D) Zirconium Tannage,
- (E) Titanium Tannage,

2. Ligands available in Collagen – (12 hours)

Their suitability in practical conditions – Stability of Metal-Ligand Bonds in Collagen – Characteristics of a Tanning Agent -- Specificity of a metal Tanning agent in Tanning of leather – Cross linking and Tanning – Helix Coil transition – Shrinkage phenomenon – Degree of Tannage, the most important phenomena for leather properties – Background of Chrome tanning -- Aqueous Chemistry and Ligand Substitution reactions of Transition and non-transition metal Complexes – Protolysis and Formation of Basic Chrome Complexes – Tanning Processes & Principles – Effect of Neutral salts like sodium chloride and sodium sulfate on chrome liquor and on chrome tanning – Effect of Alkalies on the Basicity of chrome complexes – Effect of Complexing Agents on Tanning Faculty of Chromium. Factors governing Tanning effect – Nature of anion – basicity of chromium salt – concentration of chromium salt – effect of pH – effect of temperature – influence of tan liquor volume -- influence of Previous History of collagen viz. effect of lyotropic agents – effect of weak acids – effect of liming – effect of swelling pretreatments – effect of detergents. Isoelectric point of chrome tanned leather.

3.Masking agents – (6 hours)

their requirements for use in chrome tanning – effect of masking on chrome tanned leather & on chrome liquor – evaluation of masking agent in practical tanning – recycling of chrome tan liquor – detanning of chrome tanned leather.

4.Classical theories of Metal-Ligand Complexes – (5 hours)

Their Limitations – Crystal Field & Ligand field Theories of the Co-ordination Complexes – Magnetic Properties of complexes – Ligand Field Stabilization Energy & Stereochemistry of Complexes – Thermodynamic & Kinetic Effects on Stability of Complexes – Ligand Substitution Reaction of Octahedral Complexes & their Mechanisms of Substitution – Factors Affecting Rate of Reactions – Trans Effect Theories of Ligand substitution reactions -- Manufacturing Principles & Methods of Basic Chrome Sulfate for Leather Tanning.

Stability of complexes and their quantitative evaluation – (5 hours)

Stability correlations – Chelate effect – Theory of Hard and Soft Acids and Bases – Valence Shell Electron Pair Repulsion model for structural aspects of compound.

Ionization potential – Electron Affinity – Electronegativity – Lattice Energy and Solvation Energy – Variable valency – structure of complex ionic crystals – Absorption spectra of complexes.

Suggested Books :

1. Introduction to the Principles of Leather Manufacture- S. S. Dutta, 4th Edn. I. L. T. A., Calcutta.
 2. Chemistry & Technology of Leather-Roddy, O' Flaherty & Lollar, Vol. 3. Robert E. Kreiger Publishing Co., N. Y.
 3. Chemistry of Tanning Processes – K. H. Gustavson, Academic Press N. Y.
 4. Fundamentals of Leather Manufacture – Eckhart Hidemann
 5. Leather Technician's Handbook –J. H. Sharphouse, Vernon Lock Ltd., 125 High Holborn, London W-C1.
 6. Theory and Practice of Leather Manufacture – K. T . Sarkar , Macmillan India Press , Madras.
 7. Practical Leather Technology – Thomas C. Thorstenson , Robert E. Krieger Publishing Co. INC. N.Y.
 8. Advanced Inorganic chemistry -- F A Cotton & G Wilkinson Wiley – Interscience
- Fundamental principles of inorganic chemistry -- D. Banerjee. Sultan Chand & Co., New Publication.

LT403 ANALYTICAL CHEMISTRY OF LEATHER AUXILIARIES

3 0 0 3

AIM

To impart knowledge on analytical methods for the analysis of leather, leather chemicals and process liquor generated during processing of leathers

OBJECTIVES

At the end of the course, the student would understand

- the analytical chemistry in testing of leather chemicals and leathers
- the principle used in instrumental techniques
- various methods of analysis of leather chemicals, spent process liquors and pelts/ leathers
- Standard and quality control measures of leather chemicals

ANALYSIS OF PRETANNING LEATHER CHEMICALS

6

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Principles of analytical methods employed in analysis of pretanning chemicals - water, salt, lime, sodium sulphide, ammonium salts, delimiting acids, bates etc.

ANALYSIS OF TANNING AGENTS

7

Principles of analytical methods employed in analysis of vegetable tanning materials and extracts; Aldehydes and dialdehydes; chrome extracts and liquors; zirconium, titanium, aluminium and THPS tanning agents.

ANALYSIS OF POST TANNING AND FINISHING CHEMICALS

8

Principles of analytical methods employed in analysis of post tanning and finishing chemicals - neutralising agents, syntans, dyes, oils and fats, sulphated oils, fatliquors, post tanning auxiliaries, pigments, resin binders, wax emulsions, fillers, lacquer and lacquer emulsions, pigmented lacquers, finishing auxiliaries etc.

CHEMICAL TESTING OF LEATHERS

2

Chemical characteristics and specifications

of various leather chemicals and eco-sensitive chemicals present in leather chemicals and finished leathers.

Total Number of Periods = 45

REFERENCES

1. Sarkar, P.K., 'Analytical Chemistry of Leather Manufacture', Indian Leather Technologists Association, Calcutta, 1982.
2. 'Official methods of Analysis', Society of Leather Technologists and Chemists, U.K., 1981.
3. Sale, A.J., 'Fundamental Principles of Bacteriology', McGraw Hill Book Company, Inc., New York, Toronto, London.
4. Mackie and McCartneys, 'Hand Book of Bacteriology', Edited by Robert Cruickshank, E & S Livingstone Ltd. Edinburgh and London.
5. Tanner, F.W., 'Practical Bacteriology', John Wiley & Sons Inc. Chapman & Hall Ltd., New York, London.

LT404

MICROBIOLOGICAL SCIENCES

3—0—0—3

AIM

To impart knowledge on analytical methods for physical testing of leathers and related microscopic and bacteriological tests of leather and leather chemicals

OBJECTIVES

At the end of the course, the student would understand the

- principle in microscopic and bacteriological testing related to leather processes
- mould and pest growth and control in leather
- the analytical methods/principles and instrumental techniques used in testing

1. Histological characteristics of different hides and skins – (4 hours)

Buffalo, Cow, Goat and Sheep. Histological characteristics of Hair
Histological processes for preparation of hides and Skins for observation under microscope.
Photomicrography and its utility in leather science.

Microbiology:

Bacteria -

2. Morphology & fine structure of bacteria- (4 hours)

The size, shape & arrangement of bacterial cells, Bacterial structures-structures external to the cell wall- flagella & motility, pili, capsules, sheaths, prosthecae & stalks.

3. The cell wall – (3 hours)

structure & chemical composition, Structures internal to the cell wall- the cytoplasmic membranes, protoplasts, spheroplasts, membranous intrusions & intracellular membrane system, the cytoplasmic inclusion & vacuoles, nuclear material, spores & cysts.

4. The cultivation, reproduction & growth – (4 hours)

Nutritional requirements, nutritional types of bacteria – Phototrophs, chemotrophs autotrophs & heterotrophs, obligate parasites.

5. Bacteriological media – (4 hours)

types of media, preparation of media. Physical conditions required for growth.

6. Reproduction – (3 hours)

modes of cell division, new cell formation.

7. Growth – (4 hours)

normal growth cycle (growth curve), transitional periods between growth phases, synchronous growth, continuous culture.

8. Quantitative measurement of bacterial growth- (4 hours)

Direct microscopic count, electronic enumeration of cell numbers, the plate count method, membrane filter count, turbidimetric methods, determination of nitrogen content, determination of dry weight of cells, measurements of a specific chemical change produced on a constituent of a medium.

Importance of quantitative measurement of growth.

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9. Methods of isolating pure cultures- (4 hours)

the streak plate technique, the pour plate and spread techniques, micro manipulator techniques, the maintenance & preservation of pure cultures. Culture collections, cultural characteristics, colony characteristics, characteristics of broth culture.

10. Characteristics, classification of Mold:- (6 hours)

Role of bacteria & mold in leather. Uses of Bactericides and Fungicides in Leather.
Role of enzymes in different stages of leather processing (with a regular provision of upgradation).

Suggested Books:

- 1) Microbiology- Michel J. Pelczar, JR, E.C.S. Chan, Noel R. Krieg (Fifth Edition)
- 2) Molecular Biology of the gene-walson, Hopkins, Roberts, Steitz Weiner (Fourth Edition)
- 3) Standard Methods –Examination of water and wastewater-20th Edition Lenove S. Clesceri, Arnold E. Greenberg, Andrew D. Eaton
- 4) The Science of Ecology- Second Edition-Richard Brew

LT 491

TANNERY PRACTICE II

0-0-3-3

AIM

To carry out the practical leather processing for chrome tanning of raw hides and skins.

OBJECTIVES

At the end of the course students will gain confidence in processing of chrome tanning for various types of leathers

Manufacture of chrome tanned leather by normal tannage

Manufacture of leathers by masked chrome tannage

LT 492 ANALYTICAL CHEMISTRY OF LEATHER AUXILIARIES LAB

0-0-3-3

AIM: To provide practical knowledge and the skill on chemical analysis of various leather chemicals, process liquors, effluent and pelts/ leathers at various stages of processing and eco-sensitive chemicals present in leather.

OBJECTIVES

At the end of the course, the students will have practical experience and understanding on the analysis of various leather chemicals, pelts/leathers and eco-sensitive by means of qualitative and quantitative methods of analysis

Analysis of Salt

- a. Sodium Chloride content

Analysis of Lime

- a. Purity of lime
- b. Total bases

Analysis of Sodium Sulphide

Analysis of Deliming Agents

- a. Analysis of ammonium salts
- b. Analysis of boric acid

Analysis of Bate

Analysis of Vegetable Tanning Materials

- a. Qualitative analysis
- b. Quantitative analysis
- c. Acids and Salts in Vegetable Tannin Extracts by Different Methods

Analysis of Chrome tanning agents

- a. Moisture
- b. Cr₂O₃ content
- c. Acid combined with chromium
- d. Basicity: Proctor and Lehigh basicities

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- e. Distribution of acid groups combined with chromium
- f. Degree of oxidation

Analysis of Syntans

- a. Qualitative analysis
- b. Quantitative analysis

Analysis of fatliquors

- a. Moisture
- b. Acid value
- c. Saponification value
- d. Iodine value
- e. Free fatty acids
- f. Unsaponifiables
- g. Total alkalinity
- h. Stability
- i. Organically combined - OSO₃ Na & SO₃ Na groups
- j. pH

Analysis of dyes

Analysis of finishing chemicals

Analysis of pretanned pelts and tanned leathers

LT 493 Microbiology of Leather Manufacture

0-0-3-3

AIM

To provide practical knowledge on microscopic and microbiological characteristics of collagen matrix.

OBJECTIVES

At the end of the course the students would have practical experience and understanding on

- Microscopical analysis/identification of collagen sheet
- Microbiological Characteristics of leathers and leather chemicals

MICROSCOPY LAB

- a. Setting up of a compound microscope
- b. Preparation of microscopic slides by paraffin embedding method and By freezing method
- c. Identification of hides and skins from their histological structures and from their grain pattern- Buffalo, Cow, Sheep and Goat
- d. Microscopic assessment of fibre structure during the process - Soaking, liming, pickling and tanning of finished leather - sole leather.

MICROBIOLOGICAL SCIENCE LAB

- i. Preparation of various culture media
- ii. Staining of bacteria
- iii. Enumeration of bacteria in hides and skins and in tan liquors
- iv. Isolation and identification of fungi in raw proteinous matrix, leathers and tan liquors
- v. Isolation and identification of fungi in leathers
- vi. Mildew resistance test for leathers
- vii. Identification of insect and parasitic damages

HU 501

ECONOMICS OF LEATHER INDUSTRY

3 - 0 - 0 - 3

1. Introduction: (3 hours)

Economic importance of leather. Antiquity of leather industry. Uses of leather in different sorts of life.

2. Hides and Skins: (6 hours)

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Indian livestock population over two decades – Hides and skins availability, their sizes, marketing centres, channels and prices over two decades.

3. Leather Industry: (6 hours)

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: (6 hours)

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: (5 hours)

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: (4 hours)

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:

Indian Leather 2010 (A Technology, Industry and Trade Forecast) – Central Leather Research Institute, Madras.

The Indian Leather Industry – Secretariat for industrial assistance, Ministry of Industry, Govt. of India.

How To Export (Handbook on export business) – Small Industry Research Institute, Govt. of India.

Kothari's Desk Book Series - The Leather Industry.

Choice of technique in leather manufacture – M.M. Haq, H.Argaw – Scottish Academic Press. Edinburgh (1981)

Economics of Leather Industry- B.R.Rau, Calcutta University Press (1920).

LT 501 CHEMISTRY & TECHNOLOGY OF SYNTHETIC TANNAGE

3 – 0 – 0 – 3

1. Synthetic tannins: (8 hours)

Chemistry and Multifunctional Properties of Syntans – Non Tans in Synthetic Tannins – General Manufacturing Methods of Phenol – Formaldehyde, Naphthalene – Formaldehyde and Naphthol – Formaldehyde Condensates – Supra Syntans – Use of Syntans For the Manufacture of Various Leathers and for Various Objectives. Use of Lignosulfonic acids in Leather processing.

2. Resin syntans: (6 hours)

Urea – formaldehyde and Melamine – Formaldehyde condensates as Tanning Agents for Leather – Their Chemistry and structure, property, relationship – Polyacrylates and Polyurethanes as Resin Tanning Agent – Principles of their Use.

3. Aldehydes as tannins: (6 hours)

Formaldehyde and other mono and difunctional aldehydes – their 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.

4. Oil Tanning, Sulfonyl Chloride Tanning. (6 Hours)

Suggested Books :

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

LT 502 LEATHER FOOTWEAR DESIGN & MANUFACTURE

3 – 1 – 0 – 4

1. Introduction: (4 hours)

History of footwear evolution . Nomenclature of different types of footwear. Different parts of footwear.

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2. Anatomy of human foot: (6 hours)

Bones, joints, muscles, ligaments, arches of skin of human foot. Common foot defects and their remedies. Internal & External changes of human feet from infant to adult stage. Functions of human foot. Analysis of human locomotion. Foot measurement. Foot comfort and Foot-care.

3. Last: (5 hours)

Definition, classification of last, different parts of last, methodology of seasoning of wood for wooden last; Last measurement; Comparison of last with human foot.

4. Designing and 'shoe sizes & fittings': (5 hours)

Introduction to Designing. Elements of Design. Elements of Fashion. Functions of a Designer. Design procedure related to footwear & other leather products. design documentation. Limitations imposed by purpose, material and technical considerations. Concept of inside form, outside form and mean form. Different techniques to get these three forms. Concept of Bio-mechanical designing of shoe. Relation between foot 'sizes & fittings' and shoe 'sizes & fittings'. English, American, French, Continental and Mondopoint shoe sizes and fittings system.

5. Pre-closing & closing operation: (5 hours)

Principle of clicking operation, different size & stitch marking system; skiving operation – its objectives & different types ;different types of edge –treatment ; lock-stitch & chain-stitch; different types of seam;

6. Construction : (4 hours)

Material selection, flow chart, methodology, advantages & disadvantages of Cemented construction, Good-year wetted construction, Veldtschoen construction, D.V.P. construction, D.I.P(PVC) construction & D.T.P(PU) construction.

7. Footwear materials: (5 hours)

Upper & Lining Materials : Different natural & synthetic materials; comparison between natural & synthetic materials

Adhesive: Definition; different types of adhesion; different types of adhesive used in footwear industry-and their relative advantages & disadvantages.

Sole, Insole, Toe-puff, Shank, Stiffener, Heel, Thread and Needle: Required properties of these materials, different types of these material and their relatives advantages & disadvantages.

Suggested Books :

1. Manual of Shoe Making - Clark.
2. Text book of Footwear Manufacture- J.H.Thronton.
3. Footwear Materials – Harvey.
4. Leather Work - I.P.Roseman ; The Manual Arts Press.

LT 503

THERMODYNAMICS

3 - 0 - 0 - 3

1. Concept of thermodynamics: (6 hours)

Concept of thermodynamics, system, surrounding, closed system, open system, isolated system. Properties of system, isothermal process, adiabatic process, isochoric process, isobaric process, quasistatic process, internal energy, state of a system, 1st law of thermodynamics, reversible, irreversible process, work done in isothermal reversible process for ideal real gases, enthalpy and its physical significance, relation between internal energy and enthalpy, C_p and C_v and its relation, Kirchoff's equation, adiabatic changes. (6 hours)

2. Second law of thermodynamics: (10 hours)

Second law of thermodynamics, Carnot cycle, Carnot theorem, Joule- Thomson and throttling process and its application for vander Waals gases, Clausius inequality, entropy and its characteristic and expression, entropy change, in reversible and irreversible cyclic process, entropy relation with internal energy and enthalpy. Temperature dependence of entropy, entropy of an ideal gas and mixture of gases. (10 hours)

3. Gibb's free energy: (20 hours)

Gibb's free energy and Helmholtz free energy, mathematical expression for ideal and real gases, standard and free energy, Gibbs-Helmholtz equation, Maxwell relations. Condition of spontaneity and equilibrium, Nernst heat theorem, the third law of thermodynamics, partial molal quantities, chemical potential, Gibbs-Duham relation, effect of pressure and temperature on chemical potential. Partial heat capacity, partial molal volume, activity and activity coefficient, fugacity, Nernst distribution law, Raoult's law. (20 hours)

4. Clapeyron equation: (4 hours)

Clapeyron equation, clausius-clapeyron equation, relation between the entropy and the chemical constant. (4 hours)

Suggested Books :

1. Engineering Thermodynamics – P.K. Nag

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2. Thermodynamics for chemists- S. Glasstone.
3. Thermodynamics – P.C. Rakshit.
4. Thermodynamics- Zeemansky.

LT 504 DATA STRUCTURE & ANALYSIS OF ALGORITHM

3-0-0-3

Module – I

Introduction to Data Structures & Design and analysis of algorithms, Growth of Functions (Asymptotic notations, standard notations and common functions),

Linear Data Structures - Sequential representations - Arrays and Lists, Stacks, Queues and Dequeues, strings, Application.

Linear Data Structures, Link Representation - Linear linked lists, circularly linked lists. Doubly linked lists, application.

Recursion - Design of recursive algorithms, Tail Recursion, When not to use recursion, Removal of recursion.

Non-linear Data Structure: Trees - Binary Trees, Traversals and Threads, Binary Search Trees, Insertion and Deletion algorithms, Height-balanced and weight-balanced trees, B-trees, B+ -trees, Application of trees; Graphs - Representations, Breadth-first and Depth-first Search.

Hashing - Hashing Functions, collision Resolution Techniques.

Sorting and Searching Algorithms- Bubble sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap sort and Radix Sort.

Module – II

Dynamic programming algorithms (Matrix-chain multiplication, Elements of dynamic programming, Longest common subsequence)

Greedy Algorithms – (Activity- selection Problem, Elements of Greedy strategy, Fractional knapsack problem, Huffman codes).

Module – III

Data structure for disjoint sets :- Disjoint set operations, Linked list representation, Disjoint set forests.

Graph Algorithms: Breadth first and depth-first search, Minimum Spanning Trees, Kruskal and Prim's algorithms, single – source shortest paths (Bellman-ford and dijkstra's algorithms).

Module – IV

Fast Fourier Transform, string matching (Rabin-Karp algorithm), NP – Completeness (Polynomial time, Polynomial time verification, NP – Completeness and reducibility, NP-Complete problems (without Proofs), Approximation algorithms (Traveling Salesman Problem).

REFERENCES:

T.H. Cormen, C.E. Leiserson, R.L. Rivest,

C.Stein : Introduction to algorithms –2nd edition, PHI,2002.

Weiss Mark Allen, “Algorithms, Data Structures, and Problem Solving with C++”, AddisonWesley.

Horowitz Ellis & Sartaj Sahni, “Fundamentals of Data Structures”, Galgotria Pub.

Tanenbaum A. S. , “Data Structures using ‘C’ ”

LT 591

TANNERY PRACTICE II

0-0-3-3

AIM

To carry out the practical leather processing for organic tannage of raw hides and skins.

OBJECTIVES

At the end of the course students will gain confidence in processing of
Synthetic as well as resin tanning for various types of leathers

Manufacture of syntanned leather.

Manufacture of resin tanned leather.

Manufacture of Aldehyde tanned leather.

Manufacture of Oil tanned leather.

LT 592

FOOTWEAR DESIGN LAB

0 - 0 - 3 - 3

Different techniques of clicking. Tools and machinery for clicking. Nesting of different components.
Different steps of Pre-closing and Closing operations.

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Different types of light footwear and slipper making.
Designing and pattern cutting of various leather goods. Making of Gents' & Ladies' money purses.

Suggested Books :

5. Manual of Shoe Making - Clark.
 6. Text book of Footwear Manufacture- J.H.Thronton.
 7. Footwear Materials – Harvey.
- Leather Work - I.P.Roseman ; The Manual Arts Press.

LT593 DATA STRUCTURE & ALGORITHM LAB

0-0-3-3

Experiments should be done using C C++/Java :

Implementation of array operations:

Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements Merging

Problem : Evaluation of expressions operations on Multiple stacks & queues :

Implementation of linked lists: inserting, deleting, inverting a linked list. Implementation of stacks & queues using linked lists:

Polynomial addition, Polynomial multiplication

Sparse Matrices : Multiplication, addition.

Recursive and Nonrecursive traversal of Trees

Threaded binary tree traversal. AVL tree implementation

Application of Trees. Application of sorting and searching algorithms

Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.

HU-601 Principles of Management

3 – 0 – 0 – 3

1. Basic concepts of management: Definition – Essence, Functions, Roles, Level.
2. Functions of Management : Planning – Concept, Nature, Types, Analysis, Management by objectives; Organisation Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organisational Effectiveness.
3. Management and Society – Concept, External Environment, CSR, Corporate Governance, Ethical Standards.
4. People Management – Overview, Job design, Recruitment & Selection, Training & Development, Stress Management.
5. Managerial Competencies – Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship
6. Leadership: Concept, Nature, Styles.
7. Decision making: Concept, Nature, Process, Tools & techniques.
8. Economic, Financial & Quantitative Analysis – Production, Markets, National Income Accounting, Financial Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Interference, Forecasting, Regression Analysis, Statistical Quality Control.
9. Customer Management – Market Planning & Research, Marketing Mix, Advertising & Brand Management.
10. Operations & Technology Management – Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.

Readings:

1. Management : Principles, Processes & Practices – Bhat, A & Kumar, A (OUP).

LT601 CHEMISTRY AND TECHNOLOGY OF POST-TANNING OPERATIONS

3 – 0 – 0 – 3

1. **Neutralisation**:- Its objectives, necessities and controls to achieve desired up-take of dyes and fatliquors.
2. **Bleaching**:- Definition; theory; mechanism of chemical bleaching; classification and application of different methods of bleaching to leathers . Theory of optical bleaching and possibilities of its' application to leather bleaching .
3. **Dyeing** :- Theory and mechanism of dyeing ; concept of colour ; manual colour matching. Colour and Chemical Constitution of Dyes – Classification of Dyes – Different Dyes – Azo – Azoic – Sulfur Dyes – Anthraquinone Dyes – Acridine – Azine – Methine – Nitro – Nitroso – Oxazine – Quinoline Dyes – Phthalocyanine Dyes & Pigments – Organic Pigments – Basic Dyes – Cationic Dyes – Photochemistry of Dyes.
4. **Retanning**: Objectives of retannage- Effect of different retanning agents on properties of leather- Principles of bondage of retanning materials as special reinforcing agent.

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5. Retanning Syntans: Chemistry and classification- tanning power- role of hydroxyl group of and molecular size of syntans- electron affinity and chemical structure- mechanism of synthetic tanning- general method of manufacture of aromatic syntans-their general properties- different types of syntan- chromium and aluminium containing syntans- syntan for retanning purpose- bleaching action and neutralisation.

6. Fatliquoring :- Physical chemistry Of Colloids – Interfaces & Interfacial tension – Surface / Interfacial tension of solutions – Particle size Distribution – Viscosity – Concentration – Dielectric Constant – Theories of Stability of Emulsion (Surface theories and Electrical theories) – Inversion & Deemulsification – Chemistry of emulsifying agents – Emulsifier efficiency – HLB Method – Emulsification Techniques - Principles and objectives of fatliquoring ; difference between natural and synthetic fats & oils ; controls to achieve desired properties of leather . Concept of currying .

7. Synthetic fatliquor: Fischer – Tropsch synthesis – Mechanism of optical Dissociation – Mechanism of Photochemical Chlorination of Methane – Control of extent of Chlorination – Collision Theory _ Transitional State Theory – Comparison between Photochemical Chlorination, Fluorination, Bromination & Iodination of Methane – Photochemical Chlorination of Higher Alkanes – Prediction of yield of Positional Isomers – Mechanism of Sensitization – Mechanism of Photochemical Sulfochlorination of Mepasin – Raw Material Control – process Control – Mechanisms of Substitution Reaction – Manufacture of Anionic, Non-ionic, Cationic & Amphoteric Synthetic Fatliquor from Marsol, Advantages & Disadvantages of Synthetic Fatliquors.

8. Water proofing :- Definition , theory and need of water barrier characteristics in leather . Difference among water repellent, water resistant and water proof leather . Principles involved in different methods of water proofing followed in leather industry.

9. Theory Of Leather Drying:- Principles of energy and mass transfers ; physico- chemical aspects of leather drying ; different methods of drying followed in leather industry.

Suggested Books :

1. Introduction to the Principles of Leather Manufacture- S. S. Dutta, 4th Edn. I. L. T. A., Calcutta.
2. Chemistry & Technology of Leather-Roddy, O' Flaherty & Lollar, Vol. 3. Robert E. Krieger Publishing Co., N. Y.
3. Chemistry of Tanning Processes – K. H. Gustavson, Academic Press N. Y.
4. Fundamentals of Leather Manufacture – Eckhart Hidemann
5. Leather Technician's Handbook –J. H. Sharpouse, Vernon Lock Ltd., 125 High Holborn, London W-C1.
6. Theory and Practice of Leather Manufacture – K. T. Sarkar , Macmillan India Press , Madras.
7. Practical Leather Technology – Thomas C. Thorstenson , Robert E. Krieger Publishing Co. INC. N.Y.

LT 602 PHYSICAL TESTING OF LEATHER

STATISTICAL TESTING:

Basic statistical principles- Selection of sampling location for physical as well as chemical testing of leather.

Different methods and principles employed for physical testing of various leathers measurement of tensile strength, stitch tearing strength, tongue tearing strength, modulus of elasticity at specified load and elongation at break.

MEASUREMENT OF PHYSICAL PROPERTIES OF LEATHER:

- _ Tear Strength.
- _ Ball Bursting Strength (Lastometer).
- _ Two Dimensional Extension.
- _ Shrinkage Temperature.
- _ Water vapour permeability.
- _ Resistance to abrasion of sole leather.
- _ Grain cracking (Conical Mandrel Test) in sole leather.
- _ Resistance to cracking of grain in other leathers.
- _ Resistance to repeated flexing.
- _ Water penetration (Kubelka Method).
- _ Dynamic waterproofness testing in both sole and upper leather.
- _ Non-destructive testing of leather.

Suggested Books :

1. An Introduction to the Principles of Physical Testing of Leather- Prof. S.S. Dutta, ILTA, Kolkata.
2. Technological Controls in Leather Manufacture – S. Bangaruswami, C.L.R.I.
3. The Chemistry and Technology of Leather – O' Flaherty, Roddy, Lollar, Robert E. Krieger

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Publishing Co. N.Y. (1977).

LT 603 MECHANICS OF LEATHER MACHINES

3 – 0 – 0 – 3

Mechanics of Leather Machinery:

Wood- Characteristics/ specification/ requirement matching use.

Rubber- Quality requirement at different stages of leather machines; specification and testing; maintenance.

Knives used, their characteristics, their constituents, their preparation and optimum usages, their varied functioning.

Variation of speeds of different rollers and their justification matching requirement of leather making.

Electronics as applied and devices in different leather machinery, timer device.

Surface coating devices.

Insulation.

Different heating systems and economic usage depending upon the final results; thermostatic controls.

Varieties of pumps used in tannery, effluent treatment system.

Driving systems- varied load factors, economic system.

Conveyors.

Lubrications and lubricants.

Clutch mechanism, Crank slider, lever mechanism, Balancing and vibration – their application in high speed bladed cylinder and machines, Mechanism of cutting and slicking action of helical bladed cylinder, Bush, ball and roller bearings, cam, springs and their application and function in tannery machines.

Leather Machinery:

Design and Construction of pits, drums and paddles, Hide processors; three compartment light speed drum, Mechanism, operation and control and adjustment of Fleshing, unhairing, shaving, sammying, staking, glazing, setting buffing, splitting and measuring machines and Ironing and embossing presses, Rotary Ironing machines, finiflex (Rotopress, Contilux) Foundation and erection of tannery machines.

Vacuum Drying and other drying equipment, roller coater, handling tools- Horse, pallets, fork lifters etc., conditioning machine.

Planning of Layouts:

Internal transport, safety, water and steam distribution, drainage and disposals in tannery, Layout of tannery pits, drums, paddles and machines, Maintenance in tannery, Automation in tannery.

Hydraulic & Pneumatic Systems:

Hydraulic & pneumatic steering mechanism for leather machinery. Air compressors, blowers and dust control equipment used in tannery, Drying mechanism and dryers used in tannery.

Suggested Books :

01. Leather Technician's Handbook – J. H. Sharphouse, Leather Producers' Association, Northampton, 1971.

02. Lecture Notes on Leather – P. S. Venkatchalam, CLRI, Chennai, 1964.

03. Different Catalogues issued by different Leather Machinery producers.

LT 604 A CHEMISTRY AND TECHNOLOGY OF DYES AND FATLIQUORS

3 – 0 – 0 – 3

Structure and composition of Fats and Oils – Nonglyceride component of Fats and Oils – Reactions of Fats and Fatty acids – Physical properties of Fats and Fatty acids – Composition and characteristics of individual Fats and Fatty acids.

Theory of leather lubrication, composition of fatliquors, Functionalisation of oils for surface active function, chemical classification natural and synthetic oils, sulphation, sulphonation, sulphitation reactions of oils, role of double bonds and iodine value in functionalisation of oils, sulphochlorination, sulphaomidation, transesterification, maleinisation, phosphorylation reactions for fatliqour preparation. Stability of emulsions, grain and particle sizes of emulsions, factors controlling grain sizes of emulsions. Introduction to fatliqour manufacturing technology.

Theory of colours, chromphoric groups and their optical absorption, structural features of dyes, factors affecting hue and colour, intensity; acid, basic and reactive dye classification, Introduction to the chemistry and technology of dye manufacture.

Analysis and characterisation of natural and synthetic fatliquors in terms of charge, fat content, stability to acids and electrolytes.

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Colour and Constitution

- Synthesis of some important azo dyes (Methyl orange, Methyl red and Congo red)
- Synthesis of Triphenylmethane dyes (Malachite green, Para Rosaniline Anthraquinone dyes (Alizarin))
- Phthalein dyes-Eosin preparation- Introduction to Natural and Reactive dyes

Classification of dyes based on the mode of application of the dye to the fabric- Structural classification of dyes-Coupling reaction to produce azo dyes-Synthesis of the following azo dyes- Methyl orange, Methyl red and Congo red- Synthesis of Triphenyl methane dyes- Malachite green and para-rosaniline -Phthalein dye-Preparation of Eosin- Introduction to natural dyes and Reactive dyes.

Classification of leather dyestuffs – Testing of Leather Dyestuffs – Fastness properties of different dyestuffs – Evenness of dye shade – Processes involved in Dyeing – Tanning and Detanning action of Dyestuffs – Preparation of Leather for Dyeing – Levelling agents for various dyestuffs – Defects in leather dyeing and their Prevention.

LT E604 B SAFETY & OCCUPATIONAL HEALTH OF LEATHER INDUSTRY 3 – 0 – 0 – 3

Introduction to Occupational Health & Safety.

Basic principals in Epidemiological Practice:

How to perform an investigation, Basic measures & terms, Epidemiological researches, retrospective cohort studies, concept of 'relative risk', preventive role of epidemiology.

Ergonomics & Occupational Injuries:

Approach to prevention of occupation. Injuries, improvement of work & work place design, Use of anthropometric data. Biomechanics of lifting, pushing, pulling. role of environmental factors in occupational injuries. Setting up an 'ideal' computer workstation.

Musculoskeletal injuries (mention only with causes), cumulative trauma disorders occupations associated with.

Noise & Occupational hearing loss-prevention of hearing loss.

(1) Noise & its measurements, Impact & impulse noise, sound level meters, noise exposure evaluation, machines of hearing – brief overview, hearing tests, TTS, Assessment of hearing loss- brief overview, hearing conservation – reduction of noise exposure.

Working in heat – effects on human system.

thermal environment, heat exchange man-environment, response and adaptation to work in heat, occupations with 'heat' risk, Heat cramps, heat exhaustion, Heat stroke stress criteria- WBGT index, Effective temperature, effect of heat on productivity, control of heat stress.

Working with non-ionising radiation.

solar radiation, Infrared, visible radiation, ultraviolet, extreme low frequency radiations, lasers, electric fields, magnetic fields, -known effects, unconfirmed effects.

Ionizing Radiation

radiation physics-basics, radiation measurements, biological effects of radiation in man. Sources of radiation in the workplace. External radiation exposure prevention, shielding, radiation exposure guidelines for works.

Occupational Toxicology

basic principals, toxicokinetics, inhalation toxicology, toxicity testing, carcinogenesis, application of toxicology.

Biological monitoring

Environmental & biological monitoring, exposure monitoring, effect monitoring sources of error & quality assurance, monitoring exposure to carcinogens, In vivo measurement of body burden of chemicals, interpretation of chemicals, Interpretation of result, Analysis of specific chemicals-Al, As, Cd, Cr, Pd, Mn, Hg, CS₂, CO & Benzene, Toluene, Xylene, Dychloro methane, etc.

Occupational exposure and effects of some specific agents--

(incidence, industrial occurrence, jobs involved and at high risk, systemic effects, acute effects, chronic effects, preventive measure, bio-monitoring, symptoms & signs of ailments, treatments as available)

Occupational health laws in India-

Factories act, workmen's compensation act, ESI act-schedule of compensable occupational diseases, legal requirements as per factories act-physical amenities to be provided by employer, obligation of employer, obligation of practitioner in the field.

Suggested Books:

- Occupational Medicine, 3rd Ed, Mosby, --- Carl Zenz, Ed: O. Bruce Dickerson, Edward P. Horvath Jr.
- Occupational & Environmental Medicine, 2nd Ed, Prentice-Hall Int. Inc. Ed Joseph Ladon.

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LT E604 C INDUSTRIAL SOCIOLOGY

3 - 0 - 0 - 3

1. Natures definition and scope of industrial sociology.
2. Industrialisation process: early industrialisation, and its impact on temporary society.
3. Characteristics of industrial organisation.
4. Scientific management.
5. Hawthorne experiments and their impact on organisational structure.
6. Role of formal and informal groups.
7. Industrial management: Concept and techniques of management, top, middle and first levels of management.
8. Industrial relations and work; concept of work in traditional (Hindu) and modern societies.
9. Workers and management relations: Consensus versus conflict process; arbitration, adjudication and conciliation.
10. Social structure and trade unionism: trade unionism as an instrument of power, collective bargaining, trade unions, strikes and lockouts.
11. Industry and society: Industry and community; industry and family; industry and government; industrialism and social change; automation
12. and its effect on society.

LT 605 A DATABASE MANAGEMENT SYSTEM 3 – 0 – 0 – 3

Module I

Database System Architecture - Data Abstraction, Data Independence, Data Definitions and Data Manipulation Languages.

Data models - Entity Relationship(ER), Mapping ER Model to Relational Model, Network .Relational and Object Oriented Data Models, Integrity Constraints and Data Manipulation Operations.

Module II

Relation Query Languages, Relational Algebra, Tuple and Domain Relational Calculus, SQL and QBE.

Relational Database Design: Domain and Data dependency, Armstrong's Axioms, Normal Forms, Dependency Preservation, Lossless design, Comparison of Oracle & DB2

Module III

Query Processing and Optimization: Evaluation of Relational Algebra Expressions, Query Equivalence, Join strategies, Query Optimization Algorithms.

Module IV

Storage Strategies: Indices, B-Trees, Hashing, Transaction processing: Recovery and Concurrency Control, Locking and Timestamp based Schedulers, Multiversion and Optimistic Concurrency Control Schemes.

Advanced topics: Object-Oriented and Object Relational databases, Logical Databases, Web Databases, Distributed Databases, Data Warehouse and Data Mining.

Module – V

Overview of Data Communications and Networking .

Physical Layer : Analog and Digital, Analog Signals, Digital Signals, Analog versus Digital, Data Rate Limits, Transmission Impairment, More about signals.

Digital Transmission : Line coding, Block coding, Sampling, Transmission mode.

Analog Transmission: Modulation of Digital Data; Telephone modems, modulation of Analog signals.

Multiplexing : FDM 150, WDM 155, TDM 157,

Transmission Media : Guided Media, Unguided media (wireless)

Circuit switching and Telephone Network : Circuit switching, Telephone network.

Module –VI

Data Link Layer

Error Detection and correction : Types of Errors, Detection, Error Correction

Data Link Control and Protocols:

Flow and error Control, Stop-and-wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ, HDLC.

Point-to -Point Access : PPP

Point -to- Point Protocol, PPP Stack,

Multiple Access

Random Access, Controlled Access, Channelization.

Local area Network : Ethernet.

Traditional Ethernet, Fast Ethernet, Gigabit Ethernet.

Wireless LANs: IEEE 802.11, Bluetooth virtual circuits: Frame Relay and ATM.

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Module – VII

Network Layer : Host to Host Delivery: Internetworking, addressing and Routing

Network Layer Protocols: ARP, IPV4, ICMP, IPV6 and ICMPV6

Transport Layer : Process to Process Delivery : UDP; TCP congestion control and Quality of service.

Module –VIII

Application Layer :

Client Server Model, Socket Interface, Domain Name System (DNS):

Electronic Mail (SMTP) and file transfer (FTP) HTTP and WWW.

Security Cryptography, Message security, User Authentication.

Text Books:-

1. Elmaski & Navathe -Fundamentals of Database Systems, 4th Edition, Pearson Education
2. C.J.Date - An introduction to Database Systems, Pearson Education
3. Bipin Desai -An introduction to Database System, Galgotia Publication
- 4.Data Communications and Networking : Third Edition. Behrouz A. Forouzan Tata McGraw-Hill Publishing company Limited.
- 5 Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.
6. Elmasri Ramez and Navathe Shamkant, "Fundamentals of Database Systems", Benjamin Cummings Publishing. Company.
7. Ramakrishnan: Database Management System , McGraw-Hill

References:

1. James Martin, "Principles of Database Management Systems", 1985, Prentice Hall of India, New Delhi
2. "Fundamentals of Database Systems", Ramez Elmasri, Shamkant B.Navathe, Addison Wesley Publishing Edition
3. "Database Management Systems", Arun K.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill
4. Gray Jim and Reuter Address, "Transaction Processing : Concepts and Techniques", MoraganKauffman Publishers.

LT 605 B INDUSTRIAL PSYCHOLOGY & ORGANISATIONAL BEHAVIOUR

3 - 0 - 0 - 3

1. **Introduction:** Meaning; objectives; scope; definition; methods of psychology applied to industry; history of industrial psychology.
2. **Occupational information:** Definition; occupational information and psychology; job description; job analysis; job evaluation; methods of evaluation.
3. **Individual differences and their evaluation:** introduction; personality, traits; motives; scheme; individual differences in various traits; expressive traits; physical traits; movement traits; perceptual traits; style traits; age and sex; physical performance Traits; intellectual abilities; interest.
4. **Personnel selection:** The selection problem; the problem on criteria; some available criteria; company records; rating critical; incident technique; forced-choice technique; selection by interview and application blank.
5. **Personnel test:** Value, use; status of intelligence test; steps in a test program; purposes of personnel tests in industry; selection; placement; promotion; kinds of personnel test, clerical ability; mechanical ability; personality; trade.
6. **Training in industry:** Introduction; steps in training needs; human relations; production waste; upgrading; satisfaction; safety; versatility; free enterprise; culture; training methods; systematic versus unsystematic training; individual training; conference versus lecture; case discussion; role playing.
7. **Accident and safety:** Concept of accident; cause of accident; personal factors, intelligence, vision, co-ordination; personality characteristics; fatigue experience: basic acceptance; environmental conditions related to accidents; lighting and temperature; severity of work; industrial theories of safety psychology; accident proneness theory ; goals; freedom_ alertness theory; adjustment-stress theory; industrial safety programme; overall accident prevention strategy.
8. **Work and Conditions of Work:** Common characteristics of work; rest, pauses and worker efficiency; repetitive work; eliminate boredom ;time and motion study; working environment noise, music atmospheric effects; financial incentives as applied to people at work.
9. **Motivation:** motivation and work; fundamentals of motivation; important incentives; Pay, wage-incentive systems; competition, praise and punishment; knowledge of result ; participation ; arousing enthusiasm.

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10. **Attitudes, Job-Satisfaction and Morale:** methods of finding employee attitudes; factors related to jobsatisfaction; personnel factors; inherent in the job; increasing job satisfaction ; meaning of morale; measurement and factors of morale; improving morale.

LT 605 C ECOLOGICAL ENGINEERING & ECOAUDIT

3 - 0 - 0 - 3

1. Ecosystem Concept:

- 1.1. Definition and Types
- 1.2. Biogeochemistry
- 1.3. Eco-cycling and Eco-energetics

2. Ecology and Individual Organisms:

- 2.1 Tolerance Range
- 2.2 Limiting Factors and Environmental Complex
- 2.3 Ecological Indicators

3. Population Ecology:

- 3.1 Population Growth
- 3.2 Population Density and Regulation

4. Community Ecology:

- 4.1 Organisation of Communities and Types of Interactions
- 4.2 Ecological Diversity
- 4.3 Natural Landscape and Community Change

5. Resources and Pollution:

- 5.1 Renewable and non-renewable resources
- 5.2 Bio-degradable and non-biodegradable pollutants
- 5.3 Treatment and Disposal Techniques
- 5.4 Eco-sphere and Pollution

6. Ecotoxicology:

- 6.1 Disciplines and Relevance of Toxicological Studies
- 6.2 Toxic response in Organisms
- 6.3 Exposure, Accumulation and Biotransformation of Toxins
- 6.4 Excretion of Toxic Agents
- 6.5 Toxic Action and Detection of Exposure
- 6.6 Toxicity Reduction and Antidotal Procedures

7. Ecotechnology:

- 7.1 Biomanipulation of eutrophication.
- 7.2 Biofilters for hazardous wastes.
- 7.3 Construction of Reed-beds land treatment of wastewater
- 7.4 Vermi-composting – system, design, benefits and limitations.
- 7.5 Biogas technology – requirements, operation, benefits and limitations.
- 7.6 Aquatic weeds and their utilisation in phytoremediation.
- 7.7 Wastewater fed aquaculture – energy from effluent.
- 7.8 Garbage farming – energy from solidwastes.

Suggested Books: -

1. Fundamentals of Ecology -Odum, E.P.
2. Basic Ecology-Odum, E.P.
3. Ecology-Chapman,
4. Instant notes on Ecology -Mackenzie, A., Ball, A.S. and Virdee, S.R. (1999) Viva Books pvt. Ltd. N.D.

LT 691 PHYSICAL TESTING LAB

0 - 0 - 3 -3

Conditioning of Leathers for physical testing purpose. Determination of strength of tensile strength, stitch tear strength, tongue tear strength, buckle strength, tearing strength and percent elongation at break.

TESTING FOR UPPER LEATHER & OTHERS:

Bursting strength of upper leather, grain crackiness of upper leather, air and water vapour permeability, dry and wet rub fastness of dyed and finished leather. Measurement of shrinkage temperature, measurement of water penetration. Measurement of flexing endurance, Measurement of two- dimensional extension. Hand measurement of leather and sampling location both physical and chemical testing. Non- destructive testing of leather.

TESTING FOR SOLE LEATHER:

Measurement of apparent and real density and porosity of sole leather. Determination of abrasive resistance of sole leather. Dynamic waterproofness of sole leather. Hardness determination of sole leather. Determination of bond strength between the leather surface and

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the finish film of finished upper leather. Cold crack resistance of finished upper leather.

Suggested Books :

1. An Introduction to the Principles of Physical Testing of Leather- Prof. S.S. Dutta, ILTA, Kolkata.
2. Technological Controls in Leather Manufacture – S.Bangaruswami, C.L.R.I.
3. The Chemistry and Technology of Leather – O' Flaherty, Roddy, Lollar, Robert E.Krieger Publishing Co. N.Y. (1977).

LT 692 MECHANICS OF LEATHER MACHINES

0 – 0 – 3 – 3

Free hand sketch and drawing of tannery drums and paddle.

Calculation of the pitch, contact angle, lead angles of helical blades, Fixing of blades in bladed cylinder.

Free hand sketch of different parts of Fleshing, shaving, staking, buffing, glazing, setting & measuring machines.

Study and adjustment of different parts of Fleshing, shaving, staking, buffing, glazing, setting and measuring machines.

Dismantling and assembling of mechanical type of shaving machine and staking machine.

Suggested Books :-

1. Leather Technician's Handbook – J. H. Sharphouse, Leather Producers' Association, Northampton, 1971.
2. Lecture Notes on Leather – P. S. Venkatchalam, CLRI, Chennai, 1964.
3. Different Catalogues issued by different Leather Machinery producers.

LT 693 COMPUTER AIDED DESIGN FOR LEATHER PRODUCTS

0 – 0 – 3 - 3

Principle of Computer Graphics:

Point plotting techniques, Layout & sketching, Elements of drawing, DDA Algorithms, types of projections.

2D – Drafting:

2-D transformation- scaling, Translation, Rotation, Clipping and Windowing,

2-D Drawing, shading, dimensioning, text, continuous dimensioning, tolerances etc.

3-D transformation, 3-D modeling procedure.

Application of Image Processing Techniques and related software.

Suggested Books :-

1. Computer Graphics And Design - P. Radhakrishnan & C. P. Kothandaraman
2. Computer Graphics - Zhigang Xiang & Roy Palstock
3. Auto CAD for Dummies - Bud Smith
4. Groover, MP and EW Zinimers, 'CAD/CAM Computer Aided Design and Manufacturing,- Prentice Hall of India (1986).

LT 694 DATABASE MANAGEMENT LAB

0 – 0 – 3 – 3

Structured Query Language

1. Creating Database
 Creating a Database

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- Creating a Table
- Specifying Relational Data Types
- Specifying Constraints
- Creating Indexes
- 2. Table and Record Handling
 - INSERT statement
 - Using SELECT and INSERT together
 - DELETE, UPDATE, TRUNCATE statements
 - DROP, ALTER statements
- 3. Retrieving Data from a Database
 - The SELECT statement
 - Using the WHERE clause
 - Using Logical Operators in the WHERE clause
 - Using IN, BETWEEN, LIKE, ORDER BY, GROUP BY and HAVING Clause.
 - Using Aggregate Functions
 - Combining Tables Using JOINS
 - Subqueries
- 4 Database Management
 - Creating Views
 - Creating Column Aliases
 - Creating Database Users
 - Using GRANT and REVOKE
- COMPUTER NETWORKS
 - NIC Installation & Configuration (Windows/Linux)
 - Familiarization with
 - Networking cables (CAT5, UTP)
 - Connectors (RJ45, T-connector)
 - Hubs, Switches
 - TCP/UDP Socket Programming
 - Multicast & Broadcast Sockets
 - Implementation of a Prototype Multithreaded Server
 - Implementation of
 - Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)
 - Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)
 - Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)

LT 701 CHEMISTRY AND TECHNOLOGY OF LEATHER FINISHING

OPERATIONS

4-0-0-4

1. Classification of finishes: (5 hours)

Characteristics of film. Theory of adhesion. Gloss and gloss retention. Different layers of finish coat. Theory of film formation. Nature of polymers used in finishing. Factors influencing the intermolecular forces of attraction. Plasticization and plasticizers. External and internal plasticization i.e. co-polymerisation, substitution branching. Function of different ingredients, gloss measurement.

2. Pigments: (5 hours)

Its functions in leather finishing, classification, requirements in general. Insolubility, particle size and particle size distribution, determination of particle size distribution, interaction of pigments with the medium, surface properties, effect of different additives on the charge and dispersion properties of the pigment, stability properties, impact of pigment volume concentration on different properties. Method of preparation of aqueous pigments paste.

3. Optical properties of pigments- (5 hours)

Origin of colour in inorganic compound- opacity, Hiding power and tinting strength. Light fastness and thermal resistance. Difference between inorganic pigments and organic pigments. General manufacturing procedure of pigments. Chemistry and properties of different pigments e.g. Titanium dioxide, Iron pigments, quinacridone pigments, Phthalocyanine pigments, Azo pigments, Carbon black. Extender pigments- their functions in surface coatings. Chemistry and properties of Luminescent pigments.

4. Binders: (5 hours)

Theory of film formation: different types of polymeric materials and their suitability as film formers, Different factors influencing film properties, Glass transition temperature, its importance in film formation.

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5. Chemistry & properties of leading film forming polymers- (5 hours)

Polyacrylates, polyurethanes, polyacrylate- Butadiene copolymers, Styrene- Butadiene copolymers. Chemistry and properties of Polyethylene, polypropylene, polystyrene, polyvinyl chloride, polyvinyl acetate, polyvinyl alcohol etc. in brief and reasons for their unsuitability in leather finishing- along with condensation resins- e.g. phenol formaldehyde, urea-formaldehyde, epoxy resins and alkyd resins. Chemistry and properties of casein film and modified casein film.

6. Nitrocellulose lacquer:- (5 hours)

Chemistry and properties of N.C. lacquer, manufacturing process of N.C. lacquer and N.C. lacquer emulsion. Role of emulsifiers in producing a hydrophobic rough film, drawback of these top coating film formers.

Crosslinking polymers- their suitability in leather coating and merits over conventional thermoplastic polymers. Requisites of a polymer for cross linking phenomena.

7. Plasticization: (5 hours)

Definition and classification- requirements of plasticization- mechanism- plasticization and glass transition temperature relationship- effect of plasticization on film forming properties- important type of plasticizer.

8. Solvents & Diluents: (5 hours)

Definition- theoretical considerations of solvents- thermodynamical considerations- different important properties of solvent and diluent- other properties- Individual properties of some solvents and diluents.

Chemistry, properties and uses of other important auxiliaries in leather finishing e.g. Brightening dyes, formaldehyde, wax emulsion, silicon emulsion, other water proofing agents, matting agents, filler penetrator etc.

Suggested Books :

1. Chemistry of Tanning Processes- K.H. Gustavson, Academic Press, N.Y.
2. Introduction to the Principles of Leather Manufacture- S.S.dutta, 3rd edition. I.L.T.A.
3. Chemistry of synthetic dyes- K.Venkatraman, Academic Press, N.Y.
4. Synthetic Detergents- A. Davidson & B.M. Milidsky.
5. Chemistry & Technology of Leather vol.2 & 3 – Roddy , Flaherty & Lollar- Robert E.Krieger Publishing co., N.Y.
6. Treatise on Coatings- Myers & Long. 5 vol. Marcel Dekker, N.Y.
7. SBP Board of Consultants and Engineers- “synthetic resins and their industrial applications” – Small Business Publication No.57.
8. Modern surface Coatings- Mylen & Sunderland.

LT 702 ECO-FRIENDLY PROCESS TECHNOLOGY 3-1-0-4

1. CLEANER PROCESSING - BEAMHOUSE

Eco-friendly process

technologies: Salt free curing options, sulphide free unhairing systems, ammonia - free deliming, salt free pickling systems, solvent free degreasing systems. Paradigm shift from chemical processing of hides and skins to bio beam house processing.

2. CLEANER PROCESSING: TANNING, POST TANNING AND FINISHING

Less chrome and chrome-free tanning systems. Formaldehyde free syntan; VOX, AOX free post tanning; solvent free finishing systems; Latest concepts and trends in leather processing. Eco-labelling. integrated strategies to achieve permissible BOD, COD and TDS standards of tannery effluents

3. ADVANCED FINISHING, SPLIT PROCESSING AND UPGRADATION TECHNIQUES – CLEANER TECHNOLOGIES

Role of following finishing equipment like autospray, roller coats, embossing machines, finiflex, auto togglers, stacking machines etc. Techniques such as oil pull-up, waxy, burnishable, crazy horse, antique finish, screen printing, roller printing, tie and dye finishing. metallic effects, patent finishing, cationic finishing, other novel finishing techniques like electrostatic finishing.

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Shoe suede, garment suede, grain finished effect and speciality finishes at split leather - processing technologies and finishing techniques specially suited for the purpose. Upgradation of lower ends for better utilisation. Transfer foil, lamination techniques, etc in split finishing. Latest trends.

REFERENCES:

1. P.S.Briggs, "Gloving, Clothing and special leathers" products Institute, London 1981.
2. J.H.Sharphouse, "Leather Technicians Hand Book", Leather Producers Association, Northampton NN3 1JD, Reprinted 1995.

LT 703 APPLIED STATISTICS & QUALITY CONTROL

3-0-0-3

Definitions of Probability & Related Basic Concepts: (8+6+6+8) hrs.

- 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): (6+8) hrs.

- 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)

LT 704 THEORY OF ACCOUNTANCY AND COSTING

4 - 0 - 0 - 4

ACCOUNTANCY: (4+4+4+4) hours

1. Book-Keeping-Double Entry System, advantages and objects of double entry system. Different classes of accounts. Rules for debit and credit for each class of accounts. (4 hours)

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2. Posting of transactions from Principal and subsidiary book to ledger. Balancing of accounts in the ledger. Different types of cashbook, writing and balancing of cash books. Trade discounts and cash discount, distinction between them and how they are accounted in Cash Book. Recording of Bank Transactions in Cashbook, Trial Balance, Rectification of errors in Trial Balance through journal proper. Correction of wrongly prepared Trial Balance. **(4 hours)**
3. Final accounts of Proprietorship and Partnership business. Gross profit and loss. Net profit and net loss. Distinction between Trading Manufacturing Account and Trading Account and Profit and Loss Account. Distinction between Trial Balance and Balance sheet. Different kinds of assets and liabilities. Marshalling of assets and liabilities. Adjustments before final accounts. Outstanding and prepaid expenses. Accrued income and income received in advance. Depreciation of bad debts and Reserve for Bad and Doubtful debts. Reserve for discounts on debtors and creditors Re-drafting of wrongly prepared accounts. Manufacturing, Trading accounts, Profit & Loss accounts. **(4 hours)**
4. Definition of consignments and difference from Sale Consignor, Consignee Proforma Invoice, sales accounts and remittances. Entries in the book of Consignors and Consignees. Valuation of closing stock. Definition and classification of Bills of Exchange. Valuation of Closing Stock. Definition and classification of Bills of Exchange. Inland and Foreign Bills, Promissory Notes of Hundies, entries of bills of exchanges at different stages i.e. on payment on due date, on endorsement to creditor or dishonoured or Renewing and Retiring of bills. **(4 hours)**

COSTING: (5+5+6) hours

1. Fundamental principles, advantages and disadvantages. Different methods of cost accountancy and their application to manufacturing industry. Elements and division of costs. Direct and indirect expenditures. Books used in cost accountancy. **(5 hours)**
 2. Purchase and receipt of materials, their records. Order books, bin card, store ledger, Issue of materials, bill of materials and material abstract. Return and transfer of surplus materials, Entries in cost accounts. Wastage of materials- normal and abnormal. Pricing of materials. Stock taking, perpetual and periodical inventory. Causes of difference with physical verification of stores. **(5 hours)**
 3. Definition and classification of overheads. Determination and allocation of overheads. Items of chargeable expenses. Distinction between chargeable expenses and overheads. Time recording system in production. Methods of remunerating labour e.g. time basis and piece work basis. Preparation of pay roll. Idle time, normal and abnormal- how they are treated in cost accounts. Production on time basis. **(6 hours)**

Suggested Books:

- 1) Financial Accounting: Basu & Das, Rabindra Library, (Latest edition)
- 2) Financial Accounting: Amitava Basu, Pea Dee publication Pvt. Ltd. (Latest edition)
3. Financial Accounting: Mukherjee & M.Hanif, Tata Mac Graw Hill Co.
5. Cost Accounting: Bhabotosh Banerjee, World Press Pvt. Ltd.
6. Cost & Management Accounting: Basu & Das, Rabindra Library

LT 705 COMPUTER NETWORK

Contact: 3L+ 1T

4 – 0 – 0 – 4

Credits: 4

Module I:

Data Communication Fundamentals: Layered Network Architecture; Mode of communication, topology, Data and Signal; Transmission Media: Guided, Unguided; Transmission Impairments and Channel Capacity; Transmission of Digital Data: Interfaces DTEDCE, MODEM, Cable MODEM; The telephone network system and DSL technology; [10L]

Module II:

Data Link Control: Interfacing to the media and synchronization; Error Control: Error Detection and Correction (Single bit, Multi bit); Flow control: Stop and Wait ARQ, GoBackN ARQ, SelectiveRepeat ARQ

Data Link Protocols: Synchronous, Asynchronous Protocols, Point toPoint Protocol(PPP). [12L]

Module III:

Switching Communication Networks: Circuit switching; Packet switching; Routing in packet switched networks; X.25; Frame Relay; ATM, SONET. [07L]

Module IV:

Communication Network: Topology; Medium Access Control Techniques; IEEE CSMA/CD based LANs; IEEE Ring LANs; High Speed LANs – Token Ring Based(FDDI); High Speed LANs – CSMA/CD based; Wireless LANs: Bluetooth; [07L]

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Network Security: Introduction to Cryptography; User Authentication; Firewalls. [04L]

References:

- Data Communications and Networking, Behrouz A. Forouzan, TMH
- Data and Computer Communications, William Stallings, PHI
- Computer Networks, Andrew S. Tanenbaum, PHI

LT 791

TANNERY PRACTICE IV

0-0-3-3

AIM

To carry out the practical leather processing for Finishing of chrome tanned and vegetable tanned crust.

OBJECTIVES

At the end of the course students will gain confidence in processing of
Finishing of chrome tanned and vegetable tanned crust.

Manufacture of Finished Leather from chrome tanned crust

Manufacture of Finished leathers from vegetable tanned crust

LT792 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 793 Network Lab

Contact: 3P

Credits: 2

- IPC (Message queue)
- NIC Installation & Configuration (Windows/Linux)
- Familiarization with
 - o Networking cables (CAT5, UTP)
 - o Connectors (RJ45, Tconnector)
 - o Hubs, Switches
- TCP/UDP Socket Programming
- Multicast & Broadcast Sockets
- Implementation of a Prototype Multithreaded Server
- Implementation of
 - o Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)
 - o Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)
 - o Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)

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Organisational Behaviour

HU801A

Contracts: 2L

Credits- 2

1. Organizational Behaviour: Definition, Importance, Historical Background, Fundamental Concepts of OB, Challenges and Opportunities for OB. [2]
2. Personality and Attitudes: Meaning of personality, Personality Determinants and Traits, Development of Personality, Types of Attitudes, Job Satisfaction. [2]
3. Perception: Definition, Nature and Importance, Factors influencing Perception, Perceptual Selectivity, Link between Perception and Decision Making. [2]
4. Motivation: Definition, Theories of Motivation - Maslow's Hierarchy of Needs Theory, McGregor's Theory X & Y, Herzberg's Motivation-Hygiene Theory, Alderfer's ERG Theory, McClelland's Theory of Needs, Vroom's Expectancy Theory. [4]
5. Group Behaviour: Characteristics of Group, Types of Groups, Stages of Group Development, Group Decision Making. [2]
6. Communication: Communication Process, Direction of Communication, Barriers to Effective Communication. [2]
7. Leadership: Definition, Importance, Theories of Leadership Styles. [2]
8. Organizational Politics: Definition, Factors contributing to Political Behaviour. [2]
9. Conflict Management: Traditional vis-a-vis Modern View of Conflict, Functional and Dysfunctional Conflict, Conflict Process, Negotiation – Bargaining Strategies, Negotiation Process. [2]
10. Organizational Design: Various Organizational Structures and their Effects on Human Behaviour, Concepts of Organizational Climate and Organizational Culture. [4]

References:

1. Robbins, S. P. & Judge, T.A.: Organizational Behavior, Pearson Education, 15th Edn.
2. Luthans, Fred: Organizational Behavior, McGraw Hill, 12th Edn.
3. Shukla, Madhukar: Understanding Organizations – Organizational Theory & Practice in India, PHI
4. Fincham, R. & Rhodes, P.: Principles of Organizational Behaviour, OUP, 4th Edn.
5. Hersey, P., Blanchard, K.H., Johnson, D.E.- Management of Organizational Behavior Leading Human Resources, PHI, 10th Edn.

Or

Project Management

HU801B

Contracts: 2L

Credits- 2

1. Project Management Concepts: Concept and Characteristics of a Project, Importance of Project Management. [1]
2. Project Planning: Project Evaluation, Financial Sources, Feasibility Studies. [4]
3. Project Scheduling: Importance of Project Scheduling, Work Breakdown Structure and Organization Breakdown Structure, Scheduling Techniques – Gantt Chart and LOB, Network Analysis – CPM/PERT. [6]
4. Time Cost Trade-off Analysis – Optimum Project Duration. [2]
5. Resource Allocation and Leveling. [2]
6. Project Life Cycle. [2]
7. Project Cost – Capital & Operating Costs, Project Life Cycle Costing, Project Cost Reduction Methods. [2]
8. Project Quality Management: Concept of Project Quality, TQM in Projects, Project Audit. [1]
9. Software Project Characteristics and Management [2]
10. IT in Projects: Overview of types of Softwares for Projects, Major Features of Project Management Softwares like MS Project, Criterion for Software Selection. [2]

References

1. Gopalkrishnan P. and Rama Mmoorthy: Text Book of Project Management, Macmillan
2. Nicholas John M.: Project Management for Business and Technology – Principles and Practice, Prentice Hall India, 2nd Edn.

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3. Levy Ferdinand K., Wiest Jerome D.: A Management Guide to PERT/CPM with GERT/PDM/DCPM and other networks, Prentice Hall India, 2nd Edn.
4. Mantel Jr., Meredith J. R., Shafer S. M., Sutton M. M., Gopalan M. R.: Project Management: Core Text Book, Wiley India, 1st Indian Edn.
5. Maylor H.: Project Management, Pearson, 3rd Edn.
6. Nagarajan K.: Project Management, New Age International Publishers, 5th Edn.
7. Kelkar. S.A, Sotware Project Management: A concise Study, 2nd Ed., PHI

LT 801 PLANT LAYOUT AND PROJECT FORMULATION OF TANNERY

3 - 0 - 0 - 3

Introduction to Plant Layout; Scope and Importance; Factors affecting Plant Layout; Approach to Designing, Organisation for layout; Data Acquisition and Analysis for basic layout; Planning for Layout, Developing and Installation of the Layout, Case Studies of plant layout.

Terms of reference, background of the project, background of the organisation and status now and foreseen, location and suitability- capacity and target decision, building and shed etc., study of water, electricity, storage facilities and other environmental conditions,

Study of pollution control systems, study of availability of raw materials and proposed arrangement, determination of product mix, analytical study of raw material/ chemical/ product mix/ capacity, study of technical capabilities and input, types of machines required- both indigenous and imported, analysis of quality of machines making end products and keeping provision for flexibility, study of established machine manufacturer, appropriate charges of various operations per piece and output, study of organisational structure and manpower, marketing and market survey, total capital requirement, means of financing, cost estimation of buildings, scheme wise estimate of building, manpower requirement, wages calculation (direct wages) , management/staff requirement (including fringe benefits), indirect salary and wages, calculation of total estimated overheads, estimation of Break-Even points, assumption of projected profitability, list of plant and equipment and prices thereof, energy requirements and capacity of plant & equipment, boilers, estimated electrical installation, statement of projected profitability, details of taxation, projected cash flow statement, details of depreciation (preparation of cost of running individual machines),

Set up of industrial characteristics: production parameters, structural parameters, input parameters etc.

Key Co-efficient: Productivity/man, yield in terms of flow space, yield per hide, power factor, consumption of chemicals, consumption of fuel, consumption of electricity, unit consumption of chemicals, hides/skins per worker, output per worker in terms of weight, availability of electricity from plant generators, water consumption, water consumption per kg. of input, transformation, weight of individual machines, output of machines, boiler output in respect to hides/ kg., relationship to flow space to heating area of boilers, output in terms of flow space, relationship of flow space to horsepower, processing capacity of the horsepower installation, output of the compressors, relationship of water consumption to flow space, relationship of drum capacity to flow space.

Suggested Books :-

LT802

Technology of Animal and Tannery Byproducts Utilization

1. Animal & Tannery Byproducts Utilization 3 0 3 3

Types of animal byproducts - from abattoirs, meat processing plants, poultry, fishing and other sources including fallen animals. Present methods of collection, processing and utilisation in developing countries vis - a - vis developed countries : conservation techniques and concept of two tier technology. Protien meals from animals by-products including fallen animals and their significance in livestock feeds.

2. DIFFERENT METHODS OF RENDERIN

Bone products and their utilisation. Keratinous proteins - various sources keratinous based products and their uses.

3. ANIMAL BLOOD, ITS PRODUCTS AND THEIR UTILISATION

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Alimentary tract and its processing into various products. Present status of the industry in the country. Pet foods methods of preparation in brief.

4. COLLECTION AND CONSERVATION OF ORGANS AND GLANDS FROM SLAUGHTERED ANIMALS : POSSIBLE SCOPE OF THEIR UTILISATION

Anaerobic digestion, its significance for the preparation of animal feed, fuel gas, fertilizer, etc. Quality control including microbiological aspects of products processed from animal by products.

5. PRESENT INDUSTRIAL STATUS OF VARIOUS BY-PRODUCTS IN THE COUNTRY

Process studies on

- a. Glue making from tannery wastes
- b. Bone glue and deproteinisation of bone
- c. Horn and hoof meal
- d. Protein meals by different methods

References:

1. Burnham, F. " Rendering - the invisible industry ", Aero Publishers, Inc., Fallbrook, CA 92028, 1978.
2. Mann, I. " Processing and Utilisation of animal by-products ", Food and Agriculture organisation, Rome, 1962.
3. Scaria, K.J., Mahendrakumar and Divakaran, S. " Animal by-Products - processing and utilisation ", Central Leather Research Insitute, Madras, 1981.
4. Taiganides, E.P. " Animal Wates Applied Science ", Publishers Ltd., Essex, 1977.
5. Mahendrakumar, " Hand Book of rural technology for the processing of animal by-products ", FAO Agricultural Servies Bulletin 79, Food and Agriculture Organisation.
6. Divakaran, S. " Animal Blood - Processing and utilisation Food and Agriculture Organisation ", Rome, 1978.

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