

References:

1. *Flaherty, O., William Roddy, T.Robert, M. Lollar, " The Chemistry and Technology of Leather ", Vol.1 Preparation for Tannage, E Robert Krieger Publishing Company, New York, 1978.*
2. *Bienkiewicz, " Physical Chemistry of Leather Manufacture ", Krieger, Florida, 1982.*

1 . GENERAL TANNING PRACTICES & SOLE LEATHERS 12

General practices in vegetable tanning. Manufacture of E.I. skins and kips-Pit tanning and drum tanning- Modern practices in E.I.tanning. General practices in chrome tanning. Manufacture of wet blue hides and skins. Vegetable tanned and Chrome tanned sole leathers. Water proofing of sole leathers; Bag tanning of cattle and buffalo hides.

2 . INDUSTRIAL LEATHERS 12

Belting leathers, honing leathers, picking band leathers, picker as Apron leathers. Hydraulic and pneumatic leathers such as hand pump leathers, deep bore well leathers.

3 . SPORTS GOOD LEATHERS 12

Sports good leathers such as football, Rugby balls, Volley balls, hackey balls , Cricket balls etc. Glove leathers for Wicket Keepers, belting boxing etc, Harness, Saddenly, Bride leathers.

4 . LIGHT LEATHERS 12

Full chrome, retan, hunting suede, softy nappa and burnishable upper leathers from cattle hides. Printed and shrunken grain leathers, Dressing of E.I kips in to upper, lining, bags and for leather goods, hides and their dressing into kattai, Bunwar Upper and Case hides. Chrome tanned buffalo upper, upholstery and printed leathers.

5 . METHOD OF FINISHING 12

Formulation and methods of application of different dye-stuffs, fatiquors, leather auxiliaries like casein and acrylic binders, pigments, wax emulsions, lacquers emulsions, silicones and slip agents. Pretaining syntans, neutralising syntans etc. in the manufature and finishing of the above leathers. Method of drying of above leathers. Different types of finished leathers made from bag tanned leathers, Processing of splits for shoe suedes, garments suede, grain finished leather and speciality finishes.

Total No of periods: 60

References:

1. *Choichi Ogiwara, " A practical guide to heavy leather Processing ", Fuel and Leather Research Centre, Karachi, 1980.*
2. *Tuck, D.H. " The manufacture of upper leathers ", Tropical Products Institute, London, 1981.*
3. *Jyotrimay Dey, " Practical aspects of the manufacture of upper Leather ", Indian Leather Technologist Association, Calcutta, 1989.*

1 .	14
Vegetable tannins - definition and classification, Occurrence. Chemistry of hydrolysable tannins-gallotannins, ellagi tannins-their structural aspects including ellagi tannin dimers, trimers, etc., Chemistry of condensed (flavanoid) tannins proanthocyanidins, dimers, trimers and other oligomers.	
2 .	9
Tannins as well as non-tannins, polyphenolic constituents present in popular indigenous tanning materials like avaram, Konnam, wattle, cutch, babul, myrobalan, etc. Physico-chemical properties of tannins, non-tannins and their effect on the physical properties of leathers. Manufacture of vegetable tannin extracts.	
3 .	8
Mechanism of reaction of vegetable tannins with collagen. Electrolytic equilibria, diffusion equilibria, fixation and absorption equilibria.	
4 .	7
Synthetic tannins-classification-properties used in leather industry and their general methods of preparation. Mechanism of reaction with collagen.	
5 .	7
Formaldehyde, glutaraldehyde, oil, sulphonyl chloride and quinone tannage.	

Total No of periods: 45

References:

1. Howes, F.N. "Vegetable Tanning Materials", Butterworth London, 1953.
2. Rodd, "Chemistry of Carbon Compounds", Vol III-D, Chapter on Hydrosy.
3. Haslam, E. "The Biochemistry of Plants", Vol.7. Academic Press, 1981, Chapter 18, "Vegetable Tannins".
4. "A Survey of modern vegetable tannages", Tanning extracts Producers Federation, Switzerland, 1975.
5. Humphreyes, G.H.W and Jones, C.R. "The Manufacture of sole and other heavy leathers", Pergamon Press, 1966. Chapter 5, "Vegetable tannin materials and syntans".
6. O'Flaherty and Roddy, T.W., Lollar, R.M "The Chemistry and Technology of Leather", Vol-II Krieger Publishing Corpn, New York, 1977.
7. Gustavson, K.H. "Chemistry of Tanning Processes", Academic Press, New York, 1950.
8. Vegetable and Synthetic Tanning agents, Sundara Rao, V.S., et al-Kothari Desk book Series, p.71, 1995.
9. Sundra Rao, V.S. "Vegetable Tanning materials of India", Indian Leather, Chennai, 2001.

1 . CHEMICAL ANALYSIS 11

Chemical analysis of pelts and leathers; Analysis of limed and pickled pelts and chemical testing of vegetable tanned/chrome tanned/aluminum tanned/zirconium tanned/formaldehyde tanned/combination tanned leathers.

2 . INSTRUMENTAL METHODS OF ANALYSIS USED IN LEATHER CHEMISTRY 12

Potentiometry, non-aqueous titration, conductometry, chromatography, spectrophotometry and colorimetry, ion exchange resins, electrophoresis -principles and their application in analysis of leather and leather auxiliaries.

3 . PHYSICAL TESTING OF LEATHERS 11

Statistical testing - sampling position for physical testing of leathers. Different methods employed for physical testing of leathers - principles involved. Static and Dynamic methods. Non destructive testing of leathers.

4 . STANDARDS AND QUALITY CONTROL 11

Quality control in leather processing, Rectification of defects of hides, skins and leathers, control of yield, color and finish of leathers, etc. Physical and chemical characteristics (specifications) of various types of leathers.

Total No of periods: 45

References:

1. Dutta, S.S. " An introduction to the principles of physical testing of leather ", Indian Leather Technologist's Association, Calcutta, 1991.
2. " Methods of Chemical testing of leathers ", IS:582-1970, Bureau of Indian Standards, New Delhi, 1977.
3. " Methods of Physical testing of leathers ", IS:5914-1970, Bureau of Indian Standards, New Delhi, 1971.
4. Sakar, P.K. " Analytical Chemistry of Leather Manufacture ", Indian Leather Technologies Association, Calcutta, 1982.
5. Mahadevan, T.S.K. "A practical guide for chemical analysis and physical testing of leathers", Indian Leathers, Chennai, 2001

1 . IMPROPER INTEGRALS AND SERIES SOLUTIONS 9

Improper integrals-Gamma and Beta functions, Series solutions-Ordinary point, regular singular point of second order linear ordinary differential equation, series solution to a second order linear ordinary differential equation about an ordinary point and a regular singular point.

2 . BESSEL FUNCTIONS 9

Bessel's equation, bessel functions, recurrence relations, orthogonality property, generating function, equations reducible to Bessel's equation, modified Bessel functions. Applications to boundary value problems.

3 . LEGENDRE POLYNOMIALS 9

Legendre's equation, Legendre Polynomials, Rodrigue's formula generating function, recurrence relations, orthogonality property, Applications to boundary value problems.

4 . HERMITE AND LAGUERRE POLYNOMIALS 9

Hermite and Leguerre equations and their solutions-Polynomials, Rodrigue's formula, generating functions, recurrence relations, orthogonality property.

5 . DIFFERENCE EQUATIONS AND Z-TRANSFORM 9

Linear difference equation with constant coefficients, elementary properties of z transform applications of z transform, application of z transform to difference equations.

6 . TUTORIAL 15

Total No of periods: 60

Text Book :

1. Andrews.L.A., " Special Function for Scientist and Engineers ", McGraw-Hill, 1992.

References:

- 1. Narayanan, S.Manicavachagam Pillay and Ramanaiah.G, " Advanced Mathematics for Engineering Students ", Vol II and III S.Viswanathan Printers Private Limited, Madras, 1985.*
- 2. Grewal, B.S., " Higher Engineering Mathematics ", Khanna Publishers, Delhi, 1989.*
- 3. Andrews, L.C., and Shivamoggi, B.K., " Integral Transforms for Engineers and applied Mathematicians ", MacMillan, New York, 1988.*

CHEMICAL ANALYSIS

Analysis of Chrome tanning agents.

- a. Moisture
- b. Cr₂O₃ content.
- c. Acid combined with chromium
- d. Basicity: Proctor and Lehigh basicities
- e. Distribution of acid groups combined with chromium
- f. Degree of olation

Acids and Salts in Vegetable Tannin Extracts by Different Methods.

Analysis of Alum Tanning Agents

Analysis of Formaldehyde By Different Methods. Chemical Analysis of Vegetable/Chrome/Aluminium/Combination Tanned Leathers

Analysis of PCP and Acrylamines.

BACTERIOLOGY (Demonstration only and not for examination)

- i. Preparation of various culture media
- ii. Staining of bacteria
- iii. Enumeration of bacteria in hides and skins and in tanliquors.
- iv. Biochemical properties of bacteria
- v. Isolation and identification of fungi in leathers.
- vi. Mildew resistance test for leathers.
- vii. Identification of insect and parasitic damages.

Total No of periods: 60

LT336 Tannery Works Practice II

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Manufacture of vegetable tanned sole leathers

i. by pit.

ii. by rapid tanning methods.

Manufacture of chrome and waxed chrome sole leathers Manufacture of waterproof sole leathers Processing of harness and saddlery leathers.

Lining leathers from different raw materials and tannage Book binding leathers. Chamios leather.

Total No of periods: 60

1 . 12

Finished Leathers and Composition of finishes Tanned leather/semi finished leathers EI leathers-Wet white-properties of these leathers-short description of their manufacture.

Function of different ingredients-Newer approaches in finishing. Problems encountered in finishing and their solutions.

2 . 12

Finished leathers from goat skins Glace kid-Resin uppers-Glazed uppers -lining leathers-shoe suedes-garment suedes-Details of processing techniques.

3 . 12

Finished leathers from hair sheep and wool sheep skin, EI and Wet blue leathers various types of finished leathers from them-sheep nappa, suede garments, upper-lining, diaphragm leathers, glove leathers, Assortment of leathers.

4 . 12

Upgradation of leathers & special effects. Retannages-Embossing -Special effects by screen and block printing-Roller coating and other modern equipment. Tie and dye leathers; Burnishable leathers and oil pull up leathers.

5 . 12

Speciality leathers -exotic leathers and furs, Morocco, pleated leathers, book binding and chamois leathers; reptiles, crocodiles, lizards, etc: Dressing of fur skins.

Total No of periods: 60

References:

1. *Briggs, P.S. " Gloving , clothing and special leathers ", Tropical Products Institute, London, 1981.*
2. *Kartheiz, Fuchs, H.P. " The Chemistry and technology of Novelty Leathers ", FAO, United Nations, Rome.*
3. *CLRI Process Bulletins*

1 . INTRODUCTION TO COORDINATION CHEMISTRY METAL IONS IN TANNING 12

Werner's theory of coordination, origins of coordination interactions, role of d and f orbitals, definition of ligands, nucleophilicity of ligands and electronegativity of donor atoms, chelation and masking, ligand field stabilisation energy and introduction of factors controlling molecular stability of transition metal complexes. Historical introduction to mineral tanning, Role of Aluminium (III) salts, transition metals in mineral tanning historical overview of mineral tanning using chromium, zirconium iron silica and poly phosphates.

2 . AQUEOUS CHEMISTRY OF CHROMIUM 8

Electric configuration and its implications, common oxidation states of chromium, redox, stabilities of chromium (VI) and Chromium (III) salts, redox potentials and their interconversion, protolysis, kinetic inertness of chromium (III), basicity, olation, oxolation and polymerisation, Stiansny's series, Mc Clandish precipitation point.

3 . FACTORS CONTROLLING CHROME TANNING 8

Single and double bath chrome tannages and their relative merits and demerits, preparation of Basic chromium sulphate salt, reaction parameters influencing composition of BCS kinetic of chrome tanning, diffusion and complexation, effects of float volume, pH, basicity, masking, temperature, drum speed ageing chrome tanned substrates.

4 . MECHANISM OF CHROME TANNAGE 9

Theories of chrome tanning; absorption, coating, electrostatic and hydrogen bond interactions and coordinative forces involved in chrome tanning, indirect evidence for chrome binding sites in protein, hydrothermal stability of chrome-collagen compound, chromium induced structural changes in collagen.

5 . OTHER INORGANIC TANNAGES 8

Aqueous chemistry of aluminium (III), zirconium(IV) and titanium (IV) and its relevance to mineral tanning, Chemistry of silicates and phosphates and their tanning mechanisms, mechanistic classification of inorganic tannage and their relevance to combination tanning.

Total No of periods: 45

References:

1. *Fred O Flaherty, Roddy, T.W. and Lollar, R.M., " The Chemistry and Technology of Leather ", Vol.II, Type of tannages, Rober E.Krieger, Florida, 1982.*
2. *Gustavson, K.H., " Chemistry of Tanning Processes ", Academic Press, New York, 1956.*
3. *Bienkiewicz, " Physical Chemistry of Leather Manufature ", Krieger, Florida 1982.*

References:

1. Venkatraman, K. " *Chemistry of Synthetic Dyes* ", Academic Press, New York and Lond, 1971.
2. Myers, R.R., and Lond, J.S. " *Treatise on Coatings* ", Marcel Dekker, New York, 1975.

1 . MATERIAL 9

Classification of Leather Goods and Garments, Selection of Materials , grading and assorting of leathers for leather goods & garments; Property requirements for leather and lining materials; Accessories for Leather goods and garments.

2 . CUTTING AND CLICKING 9

Introduction of hand cutting ; Preparation of knives & tools; Clicking machines-mechanical and pneumatic/hydraulic; Pattern interlocking/nesting for material optimisation.

3 . ASSEMBLY & STICHING 9

Introduction to various sewing machines-Flat bed; cylinder bed & special type m/cs ; different feed mechanisms; Basic sewing practice; Various types of Assembly techniques for Leather Goods and Garments.

4 . PATTERN DESIGNING 9

Basic design development-measurements/Sizing chart for men, women & children;-Adoptation of styles to basic blocks; Pattern development for leather goods, Patteren grading for Leather Garments; CAD application for leather Goods and Garments design & production.

5 . ORGANISATION 9

Feasibility reports for leather goods and garments production; Machinery requirement/plant layout, process scheduling and line balancing; Quality control measures in leather products manufacture; Packaging methods & practices; Costing, pricing and marketing procedures-for domestic, international markets.

Total No of periods: 45

References :

- 1. Pattern Making Manual-Womens Garments, ESMOD, Paris, 1991.*
- 2. Fashion Drawing Method, ESMOD, Paris, 1992.*
- 3. Metric Pattern cutting for Menswear, Winifred Aldrich, BSP, Professional Books, London, 1990.*
- 4. Grading Manual, ESMOD, Paris, 1994.*
- 5. Training in Tanning Techniques and Leather Goods Manufacture-Course material, CLRI, Madras, 1990.*
- 6. Skiving Manual, First Edition, 1994 CLRI, Madras.*

1 . INTRODUCTION 7

Definition and function of leather auxiliaries, role of wetting agents, syntans, fatliquors, dyes, pigments, binder, top coats, feel modifiers and matting agents in leather processing.
Surface tension and principles of wetting importance of HLB, Chemical classification of wetting agents.

2 . SYNTANS 7

Chemical classificatoin of syntans, sulphonation of naphthalene, phenols, Napthaols, Phenols formaldehyde condensation reactions amd Novalac, Characterisation and photo oxidation mechanisms of phenolic terms, chemistry of light fast syntans, chemistry of amino resins and PU, Unit operation in syntan manufacture.

3 . FATLIQUORS 7

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 funclisation of oils, sulphochlorination, sulphoamidation, transesterification, maleinisation, phosphorylation reactions for fatliquor preparation. Stability of emulsions, grain and particle sizes of emulsions, factors controlling grain sizes of emulsions.
Introduction to fatliquor manufacturing technology.

4 . DYES 14

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.

Different types of top coat formulations, choice of polymers for surface protection, role of plasticizers.

5 . PIGMENTS 10

Definition of pigments, groups of polymer bases for colour, classification, formulations of pigments, particle size, refractive index, density, opacity criteria for the choice of pigments bases, Different techniques in particle size reduction and importance of particle size on functional properties of pigment formulation. Functional definition of binders, chemical classification of binders, acrylic, protein, polyurethane, introduction to manufacturing of binder formulations.

Principles of feel modification of polymer surfaces, types of feel modifiers and matting agents.

6 . BINDERS & OTHER AUXILIARIES 7

Functional definition of binders, chemical classification of binders, acrylic, protein, polyurethane, introduction to manufacturing of binder formulations.

Different types of top coat formulations, choice of polymers for surface protection, role of plasticizers, internal and external plasticizers.

Principles of feel modification of polymer surfaces, types of feel modifiers and matting agents.

References :

1. *Fred O.Flaherty, Toddy, T.W. and lollar, R.M, " The Chemistry and Technology of Leather ", Vol.II, Type of Tannages, Rober E.Krieger Publishing Co., New York, 1977.*
2. *Gustavson, K.H. " Chemistry of Tanning Processes ", Academic Press, New York , 1956*
3. *Venkatraman , K. " Chemistry of Synthetic Dyes ", Academic Press, New York and Lond, 1971.*
4. *Myers, R.R., and Lond, J.S. " Treatise on Coating ", Marcel Dekker, New York, 1975.*

I Strength Properties

- a. Tensile Strength and Elongation at break.
- b. Tongue tear strength
- c. Stitch tear and slit tear strengths
- d. Grain crack and bursting strength

II Wear and Comfort Properties

- a. Static/Dyanamic water abosrption
- b. Water vapour permeability
- c. Abrasion resistance

III Fastness Properties

- a) Rub fastness
- b) Water fastness
- c) Perspiration fastness
- d) Heat fastness
- e) Light fastness

IV Quality Properties

- a) Shrinkage temperature measurement
- b) Density

V Instumental methods of analysis

- a) Chromatography
 - i. TLC
 - ii. Paper
 - iii. GC
 - iv. HPLC
- b) Spectrophotometry and Colorimetry
- c) Electrophoresis
- d) Conductivity titration

Lab Preparation and Testing of (Demonstration only and not for examination)

- a. Fatliquors
- b. Syntans
- c. Lacquers and emulsions
- d. Binders
- e. Waxes

* Minimum TEN experiments (combination of Units) shall be offered.

Total No of periods: 60

LT347 Tannery Works Practice III

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Different types of leathers using raw/wet blue E.I Cow and buffalo hides, calf skins.

Belting leathers

Football leathers

Cricket ball leathers

Hockey ball leathers

Shoe Upper leathers

Aniline and semi-aniline calf/side leathers

Box and Willow leathers

Zug grain upper leathers

Nappa Upper

Patent leathers

Shrunken grain leathers

Mesh leathers

Kattai and Bunwar leathers

Suede upper leathers

Burnishable upper leathers.

* Minimum TEN experiments shall be offered.

Total No of periods: 60

Text Books:

1. *G.M.Masters, " Introduction to Environmental Engineering & Science ", Prentice Hall, New Delhi, 1997*
2. *J.G. Henry and G. W. Heike, " Environmental Science & Engineering ", Prentice Hall International Inc., New Jersey, 1996.*

References:

1. *S. K. Dhameja, Environmental Engineering and Management, S. K. Kataria and Sons, New Delhi, 1999.*
2. *State of India's Environment - A Citizen's Report, Centre for Science and Environment and Others, 1999.*
3. *Shyam Divan and Armin Rosencranz, Environmental Law and Policy in India, Cases, Materials and Statutes, Oxford University Press, 2001.*

1 . PART A: 21**1. PRINCIPLES OF MANAGEMENT AND ORGANISATION 7**

Planning, organisation, staffing, coordination, directing, controlling, communicating, organisation as a process and a structure; types of organisations.

2. PRODUCTION AND MANAGEMENT 10

Method study; work measurement techniques; basic procedure; motion study; motion economy; principles of time study; elements of production control; forecasting; planning, routing; scheduling; despatching; costs and costs control, inventory and inventory control.

3. QUALITY AND QUALITY CONTROL 4

Elements of quality control, role of control charts in production and quality control.

2 . PART B: 24**1. ENGINEERING ECONOMICS FOR PROCESS ENGINEERS 1****2. INTEREST, INVESTMENT COSTS AND COST ESTIMATION 8**

Time Value of money; capital costs and depreciation, estimation of capital cost, manufacturing costs and working capital, invested capital and profitability.

3. PROFITABILITY, INVESTMENT ALTERNATIVE AND REPLACEMENT 10

Estimation of project profitability, sensitivity analysis; investment alternatives; replacement policy; forecasting sales; inflation and its impact.

4. ANNUAL REPORTS AND ANALYSIS OF PERFORMANCE 3

Principles of accounting; balance sheet; income statement; financial ratios; analysis of performance and growth.

5. ECONOMIC BALANCE 2

Different unit operations with single and multiple variables.

Total No of periods: 45

References:

1. *Davis, G.S, " Chemical Engineering Economics and Decision Analysis ", CENDC, I.I.T., Madras, 1981.*
2. *Holand, F.A., Watson, F.A and Wilkinson, J.K., " Introduction to process Economics ", John Wiley, 1974.*
3. *Sumanth, D.T., " Production Engineering and Management ", McGraw-Hill, 1984.*
4. *Shukla, M.C., " Business Organisation and Management ", Sultan Chand and Sons, 1975.*

1 . ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy - professions and professionalism - professional ideals and virtues - theories about right action - self-interest-customs and religion - uses of ethical theories

2 . ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics-a balanced outlook on law-the challenger case study

3 . ENGINEER'S RESPONSIBILITY FOR SAFETY 9

Safety and risk - assessment of safety and risk - risk benefit analysis-reducing risk-the three mile island and Chernobyl case studies.

4 . RESPONSIBILITIES AND RIGHTS 9

Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - intellectual property rights (IPR)-discrimination.

5 . GLOBAL ISSUES 9

Multinational corporations - environmental ethics-computer ethics-weapons development-engineers as managers-consulting engineers-engineers as expert witnesses and advisors-moral leadership-sample code of conduct.

Total No of periods: 45

Text Book:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York 1996.

References :

- 1. Charles D. Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999.*
- 2. Laura Schlesinger, "How Could You Do That: The Abdication of Character, Courage, and Conscience", Harper Collins, New York, 1996.*
- 3. Stephen Carter, "Integrity", Basic Books, New York, 1996.*
- 4. Tom Rusk, "The Power of Ethical Persuasion: From Conflict to Partnership at Work and in Private Life", Viking, New York, 1993.*

References:

1. *Max, S.Peters and Timmerhaus, K.D., " Plant Design and Economics for Chemical Engineering ", McGraw-Hill International Book Company, New York, 1989.*
2. *Vibrandit, C.and Dryden, C.E. " Chemical Engineering Plant Design ", McGraw-Hill Book Company Inc., New York.*
3. *Lloyd, E.Brownell and Yound, E.H. " Process Equipement Design ", Wiley Eastern Limited, New Delhi.*
4. *Walas, " Chemical Process Equipement Selection and Design ", McGraw-Hill Book Company Inc., New York.*
5. *" Tanner Design " - CLRI Publication.*

1 . PRESPECTIVES 9

Leather industries and environmental implications, Legislations on environmental protection, standards for discharge of liquid effluents, air emissions into environment.

2 . TANNERY EFFLUENTS 9

Sources of generation of liquid and solid wastes in tanneries. Characterisation of liquid wastes and assessment of critical parameters of pollution (solids, BOD, COD, nutrients, metals and phenolics).

3 . PRINCIPLES OF TREATMENT OF TANNERY WASTE-WATER AND DESIGN OF EFFULENT TREATMENT PLANTS. 9

Units of operation in controlling solids at primary stages of treatment, units of operation in controlling dissolved organics at secondary stages of treatment, units of operation in controlling pollutants at tertiary stage.

4 . SOLID WASTE MANAGEMENT 9

Composition of solid wastes-physical, chemical and biological characteristics. Principles of treatment and disposal of solid wastes.

5 . IN-PLANT MANAGEMENT FOR REDUCTION OF POLLUTION 9

House-keeping, segregation of waste streams, Recovery and resuse of valuable waste materials found in liquid effluents including chromium, sulphides etc.

Total No of periods: 45

References:

1. Thomas, C.Thortensen, " *Fundamentals of Pollution Control for the leather Industry* ".
2. Emil, T. Chanleu, " *Environmental Protection* ", McGraw-Hill Publishing Co.Ltd., New Delhi.
3. Arceivala, S.J. " *Waste Water Treatment and disposal* ", Marcel Dekkar Inc., New York.
4. Metcalf and Eddy, " *Waste water engineering treatment* ", disposal and reuse ", 2nd end. Tata McGraw-Hill Publishing Co., Ltd. New Delhi, 1979.
5. Besselievie, B.Edmund and Schwartz. " *The Treatment of industrial wastes, Second Edition* ", McGraw-Hill. Publishing Co., Ltd., New Delhi.
6. Sawyer, C.M. and Maccatry, P.L, " *Chemistry for Environmental Engineering* ", 3rd Edition , McGraw-Hill, Kogakusha, Tokyo, 1978.
7. Cambell, M.E. and Glenn, W.M., " *Profit from pollution prevention : A guide to industrial waste reduction and recycling* ", Pollution problem foundation, Ontario.
8. Carre, M.C., Vuliermet, A and Vuliermet, B. " *Environment and tannery* ", Centre Technique due Cuir, Lyon, France, 1983.
9. UNDP and UNIDO - " *Tanneries and the Environment - A Technical guide, 1991.*

1 .	5
Scope and significance of leather industry - livestock Population - India Vs. World trends in their growth, Availability of Hides and Skins-Recovery process-wastage of fallen hides/skins, marketing of hides/skins.	
2 .	12
Location lay-out and selection of machinery for tanneries for manufacturing different types of leathers. Estimates of investment, costing and feasibility reports. Levels of Industry - Cottage, small, medium and large scale. Demand, capacity and production estimates - Employment of these levels of industry. Employment generation - training and training institutes at state and central -Govt.organisation and private organisations - Labour Laws for tanneries. Technology and Modernisation.	
3 .	12
Export performance -leather sector and product wise Analysis--govt.policies-Growth and competitiveness - overseas Market Surveys-Marketing strategies and development of markets-Marketing techniques Import of capital and processing chemical	
4 .	8
Features of overseas sales contract - Important clauses-Formalities at the port of shipment and custom clearance-Air cargo -documentation-types of Invoices, Letter of Credit , Bill of loading, Incoterms, etc.	
5 .	8
Financing of Imports and Exports of leather industry-Safeguard against risks. Significance of marine Insurance- ECGC-EXIM Bank. Role of financial Institutions-State and Central Bodies . Role of Research , service and development institutions-State and Central Govt.organisations, Leather Expos and Marts.	
Total No of periods: 45	

References:

1. CLRI, " *Report of All India Survey on Raw Hides & Skins* ", Madras, 1987.
2. CLRI, " *Report on Capacity utilisation and scope for modernisation in Indian Tanning Industries* ", Madras 1989.
3. Thyagarajan, g., Srinivasan, A.V. and Amudeswari, A., " *Indian Leather 2010, A technology, Industry and Trade Forecast* ", CLRI, Madras, 1994.
4. Sadulla, S. " *The Leather Industry Kothari's Deskbook Series* ", H.C. Kothari Group (Publications Division), Madras 1995.
5. Gopalakrishnan, A.A. " *Leather & Leather Products Industry in selected Asia-Pacific Countries*", A.H. Wheeler & Co., Ltd., New Delhi.

1 . ANATOMY OF HUMAN FOOT 9

Skeletal structure of foot-Muscles and Fascia-Structural stability-Contribution of Bones and Muscles for stability in both static and dynamic postures-Foot abnormalities-An introduction.

2 . FOOT COMFORT AND FOOTCARE 9

Comfort parameters-Perspiration-thermal studies-Pressure points in the shoes-shock absorption-physical and mechanical properties of materials like stress vs.strain, vapour permeability-thermal and electrical conductivity-compressibility-friction etc.

3 . FOOTWEAR MANUFACTURE 9

Introduction to sizing system-Basic concepts of Design and pattern cutting-Material Selection-Grading - Clicking-Preparation-Closing-Shoe room operation-upper lasting.

4 . 9

Bottom preparation - sole manufacture - sole attachment - finishing operations - edge treatments.

5 . 9

Shoe dressing and shoe polishes-their composition and application.

Total No of periods: 45

References:

1. Thornton, J.H. " *Textbook of Footwear Manufacture* ", Heywood, London, 1964.
2. Thornton, J.H. " *Textbook of Footwear Materials* ", Heywood, London, 1995.
3. Harvey, A.J " *Footwear Materials and Process Technology* ", Lasra Publication, New Zealand.

- 1. Adjusting the position of rollers for proper fleshing of skins and hides in a fleshing machines
- 2. Adjusting the position of rollers to achieve proper grain setting in a mechanical setting in a mechanical setting machine
- 3. Adjusting the position of different rollers in a splitting machine to get the required thickness while splitting
- 4. Adjusting the grinding stones to achieve the required level profile in a splitting band knife.
- 5. Adjusting the position of rollers in a sharing machine to achieve proper thickness
- 6.a. Replacing the worn-out helica blades in sharing machine
 - b. Procedure to be followed in removing the worn - out knife.
- 7.a. Replacing the rubber beading in a drum door
 - b. Changing the main ball bearing in a drum
- 8.a. Adjusting the worn-out staking blades in a slo-comb staking machine for prooper staking
 - b. Increasing the staking pressure
- 9.a. Selection and fixing of the emery paper in a buffing machine
 - b. Adjusting the lateral oscillation of a buffing cylinder
 - c. Adjusting the feed roll position for proper buffing
 - d. Fixing the felt diseases in a buffing machine
- 10.a. Fixing the glass roll in glazing machine
 - b. Fixing the leather strap to the cast iron bed of a glazing machine
 - c. Increasing the glazing machine
- 11.a. Adjusting the various knobs in a spray gun to achieve proper spraying over leather
 - b. Adjusting the air compressor pressure for proper spraying.
- 12. Drawing a neat lay out for a small tannery showing the wet yard and finishing yard arranging the machines as per the sequence of operation for standard leather process.

* Minimum TEN experiments (combination of Units) shall be offered

Total No of periods: 60

DIFFERENT TYPES OF LEATHERS USING RAW/WET BLUE/E.I.GOAT AND SHEEP SKINS :

- Crushed kid leathers.
- Glazed kid leathers
- Gold and silver kid
- Nubuck leathers
- Dress glove and utility glove leathers
- Aniline and semi-aniline upper leathers.
- Resin upper leathers
- Nappa/Softy upper leathers
- Suede upper leathers
- Suede garment leathers
- Grain garment leathers
- Tie and dye leathers
- Mesh leathers
- Diaphragm leathers
- Skins with hair on
- Shearings

*Minimum TEN experiments shall be offered.

Total No of periods: 60

LT437 Seminar and Comprehension

0 0 4 100

The object of the seminar & comprehension test is to assess the overall level of proficiency and the scholastic attainment of the student in the various subjects studied during the degree course.

Total No of periods:

1. INTRODUCTION**9**

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

2. TQM PRINCIPLES**9**

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDCA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

3. STATISTICAL PROCESS CONTROL (SPC)**9**

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

4. TQM TOOLS**9**

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

5. QUALITY SYSTEMS**9**

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits.

TEXT BOOK:

1. Dale H.Besterfield, et al., Total Quality Management, Pearson Education Asia, 1999. (Indian reprint 2002).

REFERENCES:

1. James R.Evans & William M.Lindsay, The Management and Control of Quality, (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
2. Feigenbaum.A.V. “Total Quality Management, McGraw-Hill, 1991.
3. Oakland.J.S. “Total Quality Management Butterworth – Heinemann Ltd., Oxford. 1989.
4. Narayana V. and Sreenivasan, N.S. Quality Management – Concepts and Tasks, New Age International 1996.
5. Zeiri. “Total Quality Management for Engineers Wood Head Publishers, 1991.