

LABORATORY:

Creative design - Model Preparation - Testing - Cost evaluation - Patent application.

References:

1. *HARRY NYSTROM, " Creativity and innovation", John Wiley & Sons, 1979.*
2. *BRAIN TWISS, " Managing technological innovation", Pitman Publishing Ltd., 1992.*
3. *HARRY B.WATTON, " New Product Planning ", Prentice Hall Inc., 1992.*
4. *P.N.KHANDWALLA - " Fourth Eye (Excellence through Creativity) - Wheeler Publishing ", Allahabad, 1992.*
5. *I.P.R. Bulletins, TIFAC, New Delhi, 1997.*

GE037 Intellectual Property Rights (IPR)

3 0 0 100

1 . UNIT I 5

Introduction - Invention and Creativity - Intellectual Property (IP) - Importance - Protection of IPR - Basic types of property (i. Movable Property ii. Immovable Property and iii. Intellectual Property).

2 . UNIT II 10

IP - Patents - Copyrights and related rights - Trade Marks and rights arising from Trademark registration - Definitions - Industrial Designs and Integrated circuits - Protection of Geographical Indications at national and International levels - Application Procedures.

3 . UNIT III 10

International convention relating to Intellectual Property - Establishment of WIPO - Mission and Activities - History - General Agreement on Trade and Tariff (GATT).

4 . UNIT IV 10

Indian Position Vs WTO and Strategies - Indian IPR legislations - commitments to WTO-Patent Ordinance and the Bill - Draft of a national Intellectual Property Policy - Present against unfair competition.

5 . UNIT V 10

Case Studies on - Patents (Basumati rice, turmeric, Neem, etc.) - Copyright and related rights - Trade Marks - Industrial design and Integrated circuits - Geographic indications - Protection against unfair competition.

Total No of periods: 45

TEXT BOOK

1. Subbaram N.R. " Handbook of Indian Patent Law and Practice ", S. Viswanathan (Printers and Publishers) Pvt. Ltd., 1998.

REFERENCES

- 1. Eli Whitney, United States Patent Number : 72X, Cotton Gin, March 14, 1794.*
- 2. Intellectual Property Today : Volume 8, No. 5, May 2001, [www.iptoday.com].*
- 3. Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000. [www.ipmatters.net/features/000707_gibbs.html.*

1 . UNIT I 9

Historical Background - Constituent Assembly of India - Philosophical foundations of the Indian Constitution - Preamble - Fundamental Rights - Directive Principles of State Policy - Fundamental Duties - Citizenship - Constitutional Remedies for citizens.

2 . UNIT II 9

Union Government - Structures of the Union Government and Functions - President - Vice President - Prime Minister - Cabinet - Parliament - Supreme Court of India - Judicial Review.

3 . UNIT III 9

State Government - Structure and Functions - Governor - Chief Minister - Cabinet - State Legislature - Judicial System in States - High Courts and other Subordinate Courts

4 . UNIT IV 9

Indian Federal System - Center - State Relations - President's Rule - Constitutional Amendments - Constitutional Functionaries - Assessment of working of the Parliamentary System in India.

5 . UNIT V 9

Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens - Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

Total No of periods: 45

TEXT BOOKS

1. *Durga Das Basu, " Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.*
2. *R.C.Agarwal, " (1997) Indian Political System ", S.Chand and Company, New Delhi.*
3. *Maciver and Page, " Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.*
4. *K.L.Sharma, " (1997) Social Stratification in India: Issues and Themes ", Jawaharlal Nehru University, New Delhi.*

REFERENCES

1. *Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.*
2. *U.R.Gahai, " (1998) Indian Political System ", New Academic Publishing House, Jalaendhar.*
3. *R.N. Sharma, " Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.*
4. *Yogendra Singh, " (1997) Social Stratification and Charge in India ", Manohar, New Delhi.*

1 . INTRODUCTION 5

Special and comparative features of German with English, Hindi and Tamil - German Alphabets, pronunciation.

2 . THEMA 10

Name, Land Wohnort - Studium, Beruf - Familie, Geschwister, Alter - Tagesablauf , termine - Einladung - Stellensuche, Berufswahl - Einkauf.

3 . GRAMMATIK 10

Personalpronomen, Verb, Wortstellung, Ort - Possessivpronomen, Verb - 'Sein' - Verb - 'Haben', Unbestimmter Artikel, Negation - 'Nicht' - 'Kein' - Zeit, Bestimmter Artikel, Starke Verben - Trennbare Verben, Imperativ - Modal Verben - Akkusativ.

4 . UEBUNGEN 10

Partner urenungen - Sachriftliche Uebungen - Aussprache Uebungen - Kontrollue bungen - Text generation.

5 . DIALOGUE 5

Oral - Written.

6 . GLOSSARY 5

Technical Words.

7 . TUTORIAL 15

Total No of periods: 60

Text Book:

1. LERNZIEL DEUTSCH (Deutsch als Fremdsprache) - Grundstufe 1 from Max Hueber varlag.

Text Book:

1. LERNZIEL DEUTSCH (Deutsch als Fremdsprache) - Grundstufe 1 from MAX Hueber Verlag.

1 . 9

Introduction to Japanese Alphabets - Hiragana, Katakana and Kanji - group 1,2,3 & 4 Syllabus - Writing Practice - Pronunciation - word Order - Greetings - Receiving a visitor and exchange of pleasantries - Kanji Practice.

2 . 9

Basic structure of sentences - classification of verbs - Polite form of verbs - irregular verbs - Particle-E - Time expressions - question sentences - Japanese numerals - Kanji practice.

3 . 9

Classification of particles - Ga, Ka, Wa, O, E, Ni etc - aural comprehension - reading comprehension - noun -1 Wa, noun -2 desu - Demonstrative pronouns - kore, sore , are and dore - kono, sono, ano and dono - kochira - sochira - achira and dochira - particle - No, kara, ni and de - question - itsu - conversational grammar - soo desu ka - Na, I adjectives perfect and imperfect - question words - Doo and ikaga - particle - To, ne and yo - Kanji practice.

4 . 9

Desu as a substitute for a verb - demonstrative pronouns sono and sore - Group 1 particles - de, O, Made and Ka - conjunction - soshite - Question words - dare, nani, doko, itsu, dore, dochira, doyatte, ikutsu, ikura - Words for degrees - gurai or kurai - Phrase - Saa - anoo - numerals - counters and numbers - humble form of desu and arimasu - Kanji practice.

5 . 9

Verbs ending in-te or de - classification of Te forms and Masu forms - verb modifiers - koo, soo, aa and doo - Set phrase - Onegaishimasu - Sumimasen - Adverbs - Mazu, sore kara and saigo ni - formation of the Te form of I adjective and desu - kanji practice.

Total No of periods: 45

Text Books:

1. *OOTSUBO et al - " A Course in Modern Japanese ", Vol.1, 1983, The University of Nagoya Press, Japan.*
2. *SHIYO SUZUKI and IKUO KAWASE - Nihongo Shoho text book with audio tapes, 1981.*
3. *YAN - SAN Serial - Video tapes, Japan.*

1 .	9
<p>Demonstrative Pronouns: Are - Interjection: Ee - Quoted Sentences - omoimsu - Non polite form of verbs - Group 1 ending in -ert or iru, group 2 verbs ending in - u - Non polite forms of - I - adjectives -non polite form of desu,deshoo,daroo - Suffic - Sugiru - expression of reason - tame (ni) - Counters: - Hon and - Do - Kanji practice.</p>	
2 .	9
<p>Negative - Te - form of verbs -I adjectives - Permission and prohibition - te mo desuka and - te wa ikemasen ka - Na - adjectives - suki and kirai - Verbs:Itadaku - Conjunction - Nagara - Phrase - No koto na n desu ga - usage of chotto - kanji practice.</p>	
3 .	9
<p>Noun modifiers - Quoting modifier - Suffix - Kata - sa and me - Particles - Made ni and dake - te form of verb and iru/imasu - noun - Uchi - Eba form of verbs - Kanji practice.</p>	
4 .	9
<p>Potential sentences - group 1 verbs - group 2 verbs irregular verbs - Nouns - Tsumori and Hazu - Adverbs: Moo and Made - Form of address: moshomoshi - Expression - Ee - verbs: Naru and suru - Particles - De and ka - kanji practice.</p>	
5 .	9
<p>Comparative sentences - no hoo ga and yori - Negative comparative sentences - Negative request - Adverbs of extent - Konna ni, sonna ni and anna ni - Te form of transitive verb and - arul - Passive sentence - neutral passive sentence - technical vocabulary related to Engineering and Technology - Preparation of technical reports.</p>	
6 . TUTORIALS	15

Total No of periods: 60

Text Books:

1. *OOTSUBO ET AL - " A Course in Modern Japanese ", Vol.II, The University of Nagoya Press, Japan, 1983.*
2. *SHIYO SUZUKI and IKUO KAWASE - Nihongo Shoho text book with audio tapes, The Japan Foundation, Tokyo, Japan, 1981.*
3. *YAN - SAN Serial - Video tapes, Japan.*

HS040 Technical French II**3 1 0 100**

1 .	9
Group III Verbs - Conjugations - Adjectives - Adverbs - sentences - present - past compound - Simple past - future.	
2 .	9
Comparative, superlative sentences - recent past - immediate future - grammatical analysis.	
3 .	9
Translation from English to French - Translation from French to English - Texts from Physics and Chemistry.	
4 .	9
Translation from English to French - Translation from French to English - Texts from Basic Engineering.	
5 .	9
Report writing and translation from English to French - Translation from French to English - Letter Writing - Dialogue - Glossary.	
6 . TUTORIALS	15

Total No of periods: 60

Text Books:

1. MAUGER, G - *Cours de Langue et de - Civilization Francaises*, HACHETTE - PARIS, 1986.
2. DOMINIQUE BERGER and REGINE MIRIEUX, *Cadences Methods de Francais*, Didier, Paris, 1994.

References:

1. CENTRE D'ETUDES FRANCAISES, " *Functional French for Scientists and Technologists* ", Jawaharlal Nehru University, New Delhi, 1986.
2. J.O.KETTRIDGE " *Dictionary of Technical terms and phrases Vol 1 & 2* ", The Gresham Press, Surrey, Great Britain, 1980.

1 . LISTENING 7

Listening comprehension-listening for specific information-note-taking-use of charts and diagrams.

2 . SPEAKING 7

Defining-describing objects-describing uses/functions-comparing-offering suggestions-analysing problems and providing solutions-expressing opinions (agreement/disagreement) predicting-expressing possibility/certainty-framing questions-providing answers-pronunciation practice (word stress).

3 . READING 12

Skimming-scanning-detailed reading-predicting content-interpreting charts and tables-identifying stylistic features in texts - evaluating texts-understanding discourse coherence-guessing meaning from the context- note - making / transferring information.

4 . WRITING 12

Sentence definition-static description-comparison and contrast-classification of information-recommendations-highlighting problems and providing solutions-formal and informal letter writing-using flow-charts/diagrams-paragraph writing-editing.

5 . FOCUS ON LANGUAGE 7

Word formation with prefixes and suffixes-discourse markers and their functions-degrees of comparison-expressions relating to recommendations and comparisons-active and passive voice-antonyms-tense forms-gerunds-conditional sentences-modal verbs of probability and improbability-acronyms and abbreviations - compound nouns and adjectives-spelling-punctuation.

6 . PRACTICE IN LANGUAGE LAB 15

Pronunciation practice - word stress - sentence stress - Listening comprehension - discussion - interpretation of visuals.

Total No of periods: 60

Text Books:

1. "*English for Engineers and Technologists* ", Volume I. Authors : *Humanities and Social Science Department, Anna University, Published by Orient Longman Ltd., 1990.*

References:

1. *Narayanaswami, V.R.Strengthen Your Writing, Orient Longman Ltd., Chennai 1996 (Revised Edition)*
2. *Pickett and Laster, Technical English, Writing, Reading and Speaking, New York Harper and Row Publications.*
3. *Swan, Michael, Basic English Usage, Oxford University Press, 1984.*

1 . LISTENING 7

Listening comprehension - listening for specific information - note-taking and using non-verbal devices.

2 . SPEAKING 7

Describing processes-stating purpose-offering opinions, suggestions and recommendations-summarizing-reporting-free discussion of chosen topics-pronunciation practice (word stress, consonant clusters-homonyms)

3 . READING 12

Skimming-scanning-note -making-understanding the organisation of texts discourse cohesion-predicting and evaluating content-evaluating style-inferring meaning-study reading-interpreting tables, flow-charts.

4 . WRITING 12

Extended definition-process description-cause and effect analysis-stating choice and justifying it -safety instructions-check list-letter of application-data sheet/resume.

5 . FOCUS ON LANGUAGE 7

Word formation-synonyms-prepositions-adverbs-passive voice-sequence words/discourse markers-connective adverbs-numerical expressions-expansion of abbreviations-rules for writing SI units-language of instructions, check-lists, causes and effects, purpose and means-indefinite adjectives of number and quantity-spelling and punctuation.

6 . PRACTICE IN LANGUAGE LABORATORY

Pronunciation practice - listening comprehension - discussion - interpreting and reporting from visual inputs.

7 . TUTORIAL 15**Total No of periods: 60**

Text Books:

1. *" English for Engineers and Technologists ", Volume II, AUTHORS :Humanities and Social Science Department, Anna University, Published by Orient Longman Ltd.,1990.*

References:

1. *Swales, John.M. and Christine B Feak, "Academic Writing for graduates students", The University of Michigan Press, USA, 1994.*
2. *Goddard, Ken - " Informative Writing - Your Practical Guide to Effective Communication ", Cassell Publication U.K. 1998.*
3. *Cutts, Martin " The Plain English guide-How to write clearly and Communicate Better ", Oxford University Press, New Delhi, 1995.*

1 . UNIT I 22

ORAL COMMUNICATION - Practical use of language in simulated real - life situations through role playing - social skills - interaction with employers, peers and subordinates - Group dynamics - Listening techniques - Phonological aspects of language use - pronunciation, stress and intonation.

Introducing oneself and others, narrating events - Making telephonic conversation - Making requests, Asking questions, Making recommendations using modal verbs, Expressing causal relations with suitable discourse markers, Giving instructions using imperatives, Expressing purposes and functions, obligation and preferences, Accepting offers and Counselling, Interpreting advertisements, Describing processes using sequential expressions. (Lecture:8, Practicals 14)

2 . UNIT II 12

Presenting one's ideas at meetings and conferences, Making extempore talks, Public speaking, Body language, Strategic competence, Use of audio - visual aids and multimedia presentations. (Lecture : 6, Practical 6)

3 . UNIT III 8

Technical Writing - the structure of organised writing - paragraph writing, coherence, cohesion (use of Discourse Markers) and punctuation, Use of titles, nonverbal devices - Layout - Revision strategies - Reading techniques.

Letter Writing: - Personal/Informal letters: Letters to family members and friends Business / Formal letters: Letters thanking the recipients, announcing functions, extending invitations, congratulating associates on important occasions, letters of application (Resumes), apology and complaint, letters to the editor. (Lecture:8, Practical : 0)

4 . UNIT IV 8

Report Writing: - persuasive, explanatory, argumentative and informative, Writing agenda, minutes, memos, project proposals and checklists.

(Lecture : 8, Practical 0)

5 . UNIT V 10

Grammar - study of grammatical items in contexts. Nouns, pronouns, adjectives, comparative adjectives, adverbs, gerund, prepositions, voice, tenses, 'if clauses, direct and indirect speech (reporting verbs), concord Vocabulary - Synonyms, antonyms, homonyms, homophones, hyponyms, affixes, reference words, phrasal verbs and prepositional phrases. (Lecture:10, Practical : 0)

Total No of periods: 60

Text Books:

1. *Doff, Adrian and Jones, Christopher, Language in Use: Classroom Book (Intermediate level). Cambridge: CUP. 1994 (2 audio cassettes).*
2. *Dr.V.Chellammal, Learning to Communicate - a resource book for Engineers and Technologists. Coimbatore: Kamakhya Publications 2002 (1 audio cassette)*

References:

1. *Sung, Abraham. 330 more Model Letters for all occasions Malaysia-Minerva Publications. 2002.*
2. *Bentley, T.J. Report Writing in Business: The Effective Communication of Information. New Delhi: Viva Books Pvt.Ltd., 2001*
3. *Vivanilam, J.V. More Effective Communication: A Manual for Professionals. New Delhi: Response Books. 2000*
4. *Michael, V.P.Communication and Research for Management. Mumbai: Himalaya Publishing House 2001.*
5. *Nauheim, Ferd. How to Write Business Letters. New Delhi; Crest Publishing House 2000.*
6. *Mohan, Krishna, Meera Banerji. Developing Communication Skills. New Delhi: Macmillan 1991.*
7. *Denny, Richard. Communicate to Win. New Delhi: Kogan Page 2002.*

LT035 Animal Byproducts Utilisation**3 0 0 100****1 . 9**

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. Protein meals from animal by-products including fallen animals and their significance in livestock feeds.

2 . DIFFERENT METHODS OF RENDERING 9

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

3 . ANIMAL BLOOD, ITS PRODUCTS AND THEIR UTILISATION 9

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 9

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 9

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

Total No of periods: 45

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.*

1 . 10

Histology and fibre packing in Skins. Techniques for study of macro-ultra and microstructural details of skins. Primary, secondary, tertiary and quaternary structure of collagen.

2 . 10

Molecular architecture of collagen. Inter and intra-chain forces in the stabilisation and aggregation of collagen molecules. Three dimensional network of collagen fibres in skins and leather matrix.

3 . 6

Hydration, fibre swelling and phase transitions in collagen fibres and their role in the dimensional stability of skin and leather matrix.

4 . 9

Molecular mechanisms in protein, relaxation and folding with special reference to collagen. Helix coil transition and effects of thermomechanical stress on connective tissue fibres.

5 . 10

Shrinkage and cross linking phenomena in collagen. Influence of electromagnetic and high energy radiation on collagen molecule. Gamma ray analysis and dosage dependence of physical chemical events on collagen.

Total No of periods: 45

References:

1. *Flaherty, O. Roddy, T.W., Lollar, R.M., " The Chemistry & Technology of Leather ", Vol 1, E. Robert Krieger Publishing Co., New York, 1978.*
2. *Gustavason, K.H., " The Chemistry & Reactivity of Collagen ", Academic Press, New York.*
3. *Ramachandran, G.N., " Treatise on the Biology of Collagen ", Academic Press, New York.*

1 . INTRODUCTION 10

Brief description of tannery operations where measurement and control is needed. Discussion of parameters to be measured and controlled, viz. flow, temperature, pressure, pH etc. Discussion on necessity for controls. Advantages and disadvantages of process control application in tannery.

2 . INDUSTRIAL INSTRUMENTATION 12

Qualities of measurement. Measurement of temperature, flow, pressure and vacuum, level and pH. methods of composition analysis. Process instrumentation.

3 . PROCESS CONTROL 12

Introduction to the concept of automatic control. Types of control. Controller combinations, Pneumatic control circuits, Hydraulic control circuits, Electronic control circuits and applications.

4 . ROLE OF COMPUTERS IN PROCESS CONTROL 11

Case studies in wet operation, Utility - Requirements.

Total No of periods: 45

References:

1. Eckman, D.P. " Industrial Instrumentation "
2. Millard H. Lajoy, " Industrial Automatic Control "
3. Brunnel, L.E. & Yound, E.H " Process Equipment Design " Wiley Eastern Limited, New Delhi.

1 . PIGMENTS 9

Inorganic and organic pigments, Nacreous (Pearlescent) and interference pigments-their representation code in the colour index. Different forms of pigments, powders and pastes. Evaluation and control of their brilliance, opacity, particle size, resistance to solvent, heat and light and colour matching.

2 . POLYMERIC MATERIALS AND THEIR DISPERSION FORMS 9

General introduction to addition, condensation, natural polymers, Caesin, cellulose nitrate, cellulose acetate, acrylics, vinyls and urethanes - lacquers - solvents and thinners - emulsion and emulsifiers, Lacquer emulsion - evaluation and control.

3 . PRINCIPLES OF FINISHING, FINISH FORMULATION AND THEIR APPLICATION 9

Definition, aims, film - formation mechanisms, properties of films such as transparency, gloss and resistance to heat, light and solvent, role in dispersion and stability - Requirements in multiple coat technique - single coat composition methods like sparying, curtain coating, roller coating etc. Cationic finishes and their relative merits. Eco-friendly finishing - volatile organic compounds (VOC) reductions.

4 . NOVEL FINISHING TECHNIQUES 9

Role of newer equipments like autospary, roller coats, continuous embossing machines, dorn busch, finiflex, etc. Methods such as oil pull-up, waxy bunishable, antique, grain suede, screen priting, roller printing, tie and dye finishings. Also finishing easy-care and patent finishing.

5 . SPLIT PROCESSING AND UPGADATION 9

For Shoe suede, garment suede, grain finished leather and speciality finishes. Processing technologies and finishing techniques specially suited for the purpose.

Total No of periods: 45

Referernces:

1. *Pattern. T.E., " Pigment Hand Book ", vol. 3 Edition W.J., New York, 1973.*
2. *Patterson, P., " Pigments - An Introduction to Theory of Physical Chemistry ", Elsevier Publishing Co., Ltd., Amstredam, 1967.*
3. *" Treatise on coating ", Misers and Long Edition, Marcel Dekker, New York (5 Vol.).*

1 . PIGMENTS 9

Inorganic and organic pigments, Nacreous (Pearlescent) and interference pigments-their representation code in the colour index. Different forms of pigments, powders and pastes. Evaluation and control of their brilliance, opacity, particle size, resistance to solvent, heat and light and colour matching.

2 . POLYMERIC MATERIALS AND THEIR DISPERSION FORMS 9

General introduction to addition, condensation, natural polymers, Caesin, cellulose nitrate, cellulose acetate, acrylics, vinyls and urethanes - lacquers - solvents and thinners - emulsion and emulsifiers, Lacquer emulsion - evaluation and control.

3 . PRINCIPLES OF FINISHING, FINISH FORMULATION AND THEIR APPLICATION 9

Definition, aims, film - formation mechanisms, properties of films such as transparency, gloss and resistance to heat, light and solvent, role in dispersion and stability - Requirements in multiple coat technique - single coat composition methods like sparying, curtain coating, roller coating etc. Cationic finishes and their relative merits. Eco-friendly finishing - volatile organic compounds (VOC) reductions.

4 . NOVEL FINISHING TECHNIQUES 9

Role of newer equipments like autospary, roller coats, continuous embossing machines, dorn busch, finiflex, etc. Methods such as oil pull-up, waxy bunishable, antique, grain suede, screen priting, roller printing, tie and dye finishings. Also finishing easy-care and patent finishing.

5 . SPLIT PROCESSING AND UPGADATION 9

For Shoe suede, garment suede, grain finished leather and speciality finishes. Processing technologies and finishing techniques specially suited for the purpose.

Total No of periods: 45

References:

1. Williams, D.J., " *Polymer Science & Engineering* ", Prentice Hall, New York, 1971.
2. Austin, G.T., Shrer's " *Chemical Process Industries* ", 5th Edition, McGraw-Hill International Book Co., Singapore, 1984.
3. Elrich F.R. " *Science & Technology of Rubber* ", Academic Press, New York, 1978.
4. Lubin, " *Handbook of compsites* ", Van Nostand Reinhold Co., New York.

1 . VEGETABLE TANNING & SYNTANS 12

Chemistry of vegetable tannins, extraction criteria for vegetable tannins, solid-liquid ratio for extraction, chemical modification and blending of vegetable tannins.

2 . MINERAL TANNING SALTS 12

Types of mineral tanning salts, chemistry of Basic chromium sulphate preparation, basicity and masking systems, factors influencing exhaustion of chromium (III) during tanning.

Acid - base properties of Aluminium (III), Zirconium (IV) and Titanium (IV) salts, masking systems for Aluminium (III), Zirconium (IV), Titanium (IV). Phenol - formaldehyde syntans, their molecular weight and colour fastness limitations, concept of light fast and heat stable syntans, molecular weight and particle size distribution and their relationship to fibre packing in leather processing.

3 . DYES AND PIGMENTS 12

Anionic and cationic fatliquors, importance of free oil to emulsifier ratio, Theory of leather lubrication, criteria for choice of oil formulations for fatliquors.

Dyes, pigments and colourants, Colour measurement techniques, factors influencing fastness properties of dyes, pigments and colouring substances.

4 . FINISHING AUXILIARIES & PRESERVATIVES 9

Finishing auxiliaries and importance of surface feel modification, feel modifiers and the role of slip agents, fillers and matting agents and concept of modification of refractive index of finish films. Protein preservatives, and role and function of hydrophobicity/hydrophilicity in preservation.

Total No of periods: 45

References:

1. Myers, R.R. and Long, J.S. " *Treatise on Coatings* ", vols., Marcel Dekker, New York, 1975.
2. SAP Board of Consultants and Engineers, " *Synthetic resins and their industrial applications* ", Small Business Publications No.57.
3. Rajadurai, S. and Kulasekaran, S. " *Acrylics and their uses in leather manufacture* ", CLRI, 3 Madras, 1982.

LT041 Costing and Value Engineering in Leather	3	0	0	100
1 . INTRODUCTION TO VALUE ENGINEERING				9
a. Value and value analysis				
b. Identification of its function/end use				
2 . OBJECTIVES OF VALUE ANALYSIS				9
a. Importance in import substitution				
3 . VALUE ANALYSIS AT DIFFERENT STAGES				9
a. Techniques of value analysis				
4 . VALUE ANALYSIS PROCEDURE				9
a. The information phase				
b. The analytical phase				
c. Recommendation				
d. Implementation				
5 . ORGANISATION FOR VALUE ANALYSIS				9
a. Organisation structure				
b. Responsibilities of individual departments				
			Total No of periods:	45

Project Work

Application of value analysis - A case study

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 Deskbook Series, H.C. Kothari Group (Publications Division), Madras, 1995.

1 . AN OVERVIEW 9

Types of tannery available in India. Their nature and composition. Present methods of collection and utilisation. Recovery of salt from the same. Its treatment and re-use. Theoretical and practical aspects of recovery of chrome. Protein and biogas from the same.

2 . BEAM-HOUSE PRODUCTS 9

Recovery of fat, proteins, chemical and glue and their use. Pet Treats, finished splits, gloves, washers etc.

3 . LEATHER SHAVINGS AND TRIMMINGS 9

Chemistry and Processing into hydrolysates, glue gelatin, syntans, fertilizers, processing into leather and acoustic boards.

4 . NATURE OF TANNERY HAIR 9

Chemistry and processing into protein meal hydrolysates and their uses - Conversion into felts and other utility products.

5 . PROCESS STUDIES 9

Glue and protein meal from tannery fleshing, Quality evaluation of glue and protein meal, pet treats limited stock recovery of salt from used salt - Analytical procedures of protein meals.

Total No of periods: 45

References:

1. Mann, I. " *Process of Utilisation of Animal by Products* ", FAO Rome, 1962.
2. Scaria. K.J. Mahendrakumar and Divakaran, S. " *Animal by Products - Their processing and utilisation* " CLRI, Madras, 1961.
3. Taiganides, E.P. " *Animal Wasters* ", Applied Science Publishers Ltd., Essex, 1977.
4. " *Low Cost Waste Treatment* ", NEERI, Nagpur, 1972.
5. Cawe, M.C. et. al. " *Environment and Tannery Centre Technique der Cuir*, Lyon, France.

1 .	6
Macro and microporosity of skin and influence of hydration and water structure on the pore size pattern in skin. Functional sites in protein for interactions with vegetable and pretanning materials, Electrophilic and nucleophilic reactions at protein sites.	
2 . TYPES OF TRANSPORT OF FLUIDS INTO SOLID MATRICES	9
Diffusion and transport phenomena in collageneous matrices. Kinetics and diffusion of tannery materials, dyes; forced diffusion into collageneous matrices.	
3 .	15
Molecular level processes and changes in soaking liming/dehairing, deliming/bating, picking, tanning, dyeing and Fatiliquoring.	
4 .	6
Dimensional changes and Ultra and micro stuctural variations of skins during soaking, liming, deliming/bating, pickling, tanning, retanning, Fatiliquoring and drying as well as finishing with resin and casein finishes.	
5 .	9
Surface science application to leather. Surface charge and energy of full chrome and chrome retanned leather. Emulsions in leather processing and the surface charge and potential of leather finish films, adhesion, mechanisms, influence of opacity, refractive index and scattering coefficient of pigment and pigment formulations and factors controlling the stability of leather finish films.	
	Total No of periods: 45

References:

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2. *Beinkiewicz, " Physical Chemistry of Leather Manufacture ", Krieger, Floridaa, 1982.*
3. *Gustavson, K.H., " Chemistry of Training Processes ", Academic Press, New York, 1956.*

1 . PROTEINS AND NUCLEIC ACID & ENZYMOLOGY 12

Chemistry of DNA and RNA: Structure, Conformation and function Proteins - Chemistry, structure and Function, Separation Principles in proteins. Classification, assay, characterization, mechanism of action, enzyme kinetics, immobilized enzymes.

2 . GENETIC ENGINEERING (RECOMBINANT DNA TECHNOLOGY) 10

Principles and methods : Essentials of biotechnology - products of biotechnology, Restriction of enzymes, vectors, DNA cloning strategies.

3 . BIOTECHNOLOGY FOR HIDES/SKINS IMPROVEMENT 11

Cleaner Leather Processing : Use of enzyme options in beam house operations - Soaking unhairing, bating, degreasing, offal treatment : Types of enzymes - proteases, lipases - properties, assay systems and production. Types of fermentation, Preparation of media, preparation of inoculum, separation and purification of products.

4 . WASTE MANAGEMENT AND UTILISATION OF COLLAGENOUS TISSUES FOR BIOMEDICAL AND OTHER APPLICATIONS 12

General features of the organic and inorganic pollutants of tannery. Stabilisation and disposal of organic and chemical wastes and their biological treatment. Treatment of tannery effluents. Energy recovery. Collagen and its application in food, cosmetic and medical fields.

Total No of periods: 45

References:

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1 . ENERGY SOURCES 9

Conventional Energy sources - Non-Renewable energy sources - Coal, oil - Exploitation of natural energy resources and present trends - Need for energy conservattion - Energy and future mankind . Non-conventional energy sources - Renewable energy sources - Solar, wind, hydel,tidel energy -Potential of renewable energy source - Future energy sources.

2 . ENERGY SOURCES OF LEATHER INDUSTRIES 9

Normal energy sources utilised in leather industries - Utilisation pattern of various energy sources. Energy intensive leather industries - Tannery - footwear -Leather products sectors.

3 . ENERGY MANAGEMENT 9

Need for optimisation of energy utilisation - Production and energy utilisation. Process improvements for energy conservation - Use of energy efficcient equipments for all applications energy conservation among employees and various methods.

4 . ENERGY AUDITS 9

Defintion of energy audit - Need for regular energy audit in leather industires Methodology. Various steps involved in energy audits - Implementation of audit recommandations.

5 . ADOPTION OF RENEWABLE ENERGY SOURCES 9

Application of renewable energy sources in leather industries - Solar energy - Processes hot water - Leather dyeing - Salt and chrome recovery -Wind energy - Pumping -rural drum operations.

Total No of periods: 45

References :

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2. Gemard M.Grmlay; *Energy*, Mcmillon Publishing Co., New York, 1975.
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4. V. Kadambi and Manohar Prasad, "*An Introduction to Energy Conversion: Basic Thermodynamics*, New Age International Limited, Vol.I
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7. GD Rai"*Non-Conventional Energy Sources*" Khanna Publishers, Edn.IV, 2001
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11. Richard TW and Bernard JN "*Environmental Science : Towards a Sustainable Future*" Prentice Hall of India, Edn.VIII, 2002.

1 . SAFETY PHILOSOPHY	5
Legal framework of safety & health in India. International conventions and trends. Responsibilities and enforcement mechanisms. Need for safety & health(cost/benefit rational ; safety , environment and productivity triangle).	
2 . HAZARD IDENTIFICATION AND ASSESSMENT	5
Role of industrial hygiene. Hazard classification(hazard categories and groups) Hazard identification and assessment(tools and methods).	
3 . SAFETY IN USE OF HAZARADOUS SUBSTANCES AT WORK	8
Chemical and biological hazards in the work place in the leather industry . Health effects of chemical and biological exposure. Hazard information systems on hazardous substances(material safety data sheets, labelling) Workplace exposure, monitoring and evaluation. Hazard prevention and control measures(Storage, handling, and disposal) in the leather industry.	
4 . PRODUCTIVE MACHINE SAFETY IN THE LEATHER INDUSTRY	8
Safety hazards of machinery, machine tools and electrical installations. Hazard prevention and safeguarding of machinery (guards, machine controls, ergonomics). Role of preventive maintenance.	
5 . WORK ECOLOGY AND ERGONOMICS	9
Safe workstation design and layout . Manual handling of material. Lighting (Standards, use of natural and artifical illumination) Climate control (Standards, temperature/humidity, improving general ventilation). Noise management (standards, prevention and protection). Safety of factory premises and installations (railings, flooring, safe structures). Welfare measure. Personal protection and hygiene (selection, use, maintenance).	
6 . EMERGENCY PREVENTION AND PREPAREDNESS	7
Planning for emergencies Control of fire and explosion Dealing with medical emergencies.	
7 . SAFETY & HEALTH MANAGEMENT AND PROMOTION	3
Promoting safety & healty practices at the workplace (traning, safety and warning signs) Role and responsibilites of managers, supervisors and workers.	

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References :

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1 . LEGISLATIONS ON ENVIRONMENTAL POLLUTION CONTROL AND MANAGEMENT 8

Environmental Legislations in India, Europe, USA and Canada. Development of Legislations, Standards and guidelines.

2 . OBLIGATIONS OF INDUSTRIES TO CONTROL ENVIRONMENTAL POLLUTION 5

Water (Prevention and Control of Pollution) Act 1974, Air (Prevention and Control of Pollution) Act 1981, Environmental Protection Act 1986, Hazardous Waste Management Rules and Guidelines for siting of Industries. Standards for discharge of treated liquid effluent into water bodies, including inland water bodies and sea, standards for disposal of air emissions(SO₂, SPM, NH₃, H₂S and HC) into atmosphere.

3 . OCCUPATIONAL HEALTH HAZARDS AND INDUSTRIES 8

Factory Act 1987 of India. Occupational health and safety requirements and standards of ILO, compliance of rules and guidelines of Factory Act applicable to industries.

4 . ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND AUDIT (EA) 10

Principles of environmental impact assessment and audit guidelines and legislature requirements for siting of industrial units in estates/ complex. Preparatory procedures for EIA study, evaluation of impact on air, water and land environment.

5 . ENVIRONMENTAL AUDIT(EA) 9

Principles of enviromental auditing , cleaner technologies in industrial processes and evaluation of processes. Auditing techniques in preparation of EA.

6 . ENVIRONMENTAL MANAGEMENT PLAN 5

Monitoring of ambient environment, including air, water and land, noise, liquid and solid waster management.

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References :

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