

## 16. LEATHER TECHNOLOGY

**Pre Tanning Operations :** Hides & Skins – Histological characteristics structure of hides & skins defects – curing & preservation methods – Animal by products – soaking, unhairing, liming, deliming, bating, pickling, depickling and degreasing– Their objectives & principles involved. Biochemistry of collagen and other substances – chemicals & auxiliaries used in pre-tanning operations – General pretanning processes for manufacture of different types of heavy and light leathers - Process control in pretanning – Ecofriendly pretanning operations – Physical and chemical testing - Standards and quality control measures in pretanning. By products of animal and tannery operations.

**Tanning Operations:** Tanning materials – Vegetable, mineral and organic - their classification – chemistry & Technology of tanning materials & methods – characterization manufacture & analysis of various tanning materials. Theory & mechanism of vegetable, chrome, Aluminium, Zirconium, Iron, Titanium, Aldehyde, Oil and other organic tanning. Various unit operations involved in tanning processes their objectives & principles – cleaner processing options – Analysis & characterization of various types of leathers - Physical and chemical testing - Standards and quality control measures in tanning operations.

**Post Tanning and Finishing Operations :** Retanning, dyeing – fatliquoring and finishing operations – Their objectives & principles – chemicals used for the above unit operations – Syntans, fatliquors, dyes, dye-auxiliaries, pigments, acrylic and protein binders, wax emulsion, fillers, topcoats, NC, CAB lacquers and lacquer emulsions, feel modifiers, their nature & properties in finishing – machinery & methods for post tanning and finishing operations – upgradation methods – chemical and physical properties required for various finished leathers – physical & chemical testing of finished leathers – Tannery Effluent treatment –Effluent treatment plant - Liquid and solid waste management.

**Leathers & Leather Products :** Various types of leathers – upper, sole, garment, leather goods, sports & specially leathers – their characteristics. Leather supplement and synthetics - Design & manufacture of footwear, leather goods & garments. Leather Economics and Industrial Management – Project feasibility reports – organization & management of leather sector – marketing & export of leather & products - Machines for leather products manufacture - mechanics & operation - IT applications for leather & product design. Professional Ethics and human values.

## 17. MATERIAL SCIENCE AND CERAMIC TECHNOLOGY

Atomic structure and chemical bonding – crystal structure of materials – Miller indices of directions and planes – packing geometry in metallic, ionic and covalent solids – determination of crystal structures by X-ray diffraction – crystal growth techniques – imperfections in crystalline solids and their role in influencing various properties – Strengthening mechanisms – Diffusion: Fick's laws and application of diffusion in sintering, doping of semiconductors and surface hardening of metals.

**Metals and Alloys:** Solid solutions, Solubility limit, phase rule, binary phase diagrams, lever rule, intermediate phases, intermetallic compounds, iron-iron carbide phase diagram, heat treatment of steels, cold, hot working of metals, recovery, recrystallization and grain growth-microstructure, properties and applications of ferrous and non-ferrous alloys. Polymers: Classification, polymerization, structure, properties, processing and applications. Composites: properties, processing and applications of various composites. Nanomaterials: synthesis, properties and applications – Biomaterials – shape memory alloys.

**Mechanical Properties:** Modulus of elasticity, yield strength, tensile strength, toughness, plastic deformation, viscoelasticity, hardness, impact strength, creep, fatigue, ductile, and brittle fracture.

Thermal Properties: heat Capacity, thermal conductivity, thermal expansion of materials. Electronic properties: concept of energy band diagram for materials – conductors, semiconductors and insulators, Electrical conductivity – effect of temperature on conductivity, intrinsic and extrinsic semiconductors. Dielectric properties and applications – Magnetic Properties: Origin of magnetism, paramagnetism, diamagnetism, antiferro magnetism, ferromagnetism, ferrimagnetism – domain theory of ferromagnetism – hysteresis – hard and soft magnetic materials – applications.

**Ceramic Raw materials:** Occurrence, properties and uses of clays, feldspar, quartz, sillimanite, bauxite, limestone, dolomite, magnesite, rutile, zircon. Synthesis, properties and applications of calcined alumina, mullite, silicon carbide, boron carbide, tungsten carbide, silicon nitride, boron nitrate, silicides, SiAlON, cermet, Carbon compounds.

**Conventional ceramics:** Body formulation and preparation of tiles, sanitary ware, tableware, insulators, stoneware products. Glaze raw materials, fritting process, glaze application methods, causes and remedies for glaze defects. Formation and structure of glass, glass batch preparation and melting annealing, special glasses. Different types of refractories, important refractory properties and applications. Coated abrasives preparation, types of bonds in bonded abrasives, different types of grinding wheels and grinding process.

**Special Ceramics:** Preparation and properties of glass fibers, alumina fibers, carbonaceous fibers, boron fibers. Composites with different matrices and their properties. Basic principle and fabrication of ceramic capacitors, ferroelectric ceramics, Magnetic ceramics, Varistors and fuel cells. Special coatings by PVD, CVD, plasma spray, dip coating, electro coatings. Calcium phosphate based and non calcium phosphate based bio-ceramic materials and their applications.

## 18. Pharmaceutical Technology

### **BIOCHEMISTRY and MICROBIOLOGY**

Biochemistry: Cell, Enzymes, Nucleic acids, Carbohydrates, Proteins and Lipids.

Microbiology: Introduction to Microbiology, Microscopy and staining techniques, Sterilization & Disinfection, Microbial Assay.

### **BIOTECHNOLOGY**

Fermentation methods and Fermenter design, Biopharmaceuticals, Types of immunity- humoral immunity, cellular immunity, Structure of Immunoglobulins, Hypersensitivity reactions, Immune stimulation and Immune suppressions. General method of preparation of bacterial vaccines and viral vaccines.

### **PHARMACEUTICAL TECHNOLOGY**

Introduction to dosage forms - Tablets, Parenterals, Suspensions, Emulsions, Suppositories, Semisolids, Capsules, Liquids, Stability of formulated products and Novel drug delivery systems. Biopharmaceutics and Pharmacokinetics-Bioavailability and Bioequivalence studies. Pharmaceutical engineering-Fluid flow, Heat transfer, Evaporation, Distillation, Drying, Size reduction and size separation, Filtration and Centrifugation.

### **INSTRUMENTAL METHOD OF ANALYSIS**

Theory, Practice, working and pharmaceutical applications of the following analytical techniques: UV Visible Spectroscopy, IR Spectroscopy, NMR Spectroscopy and other important absorption and emission spectroscopic techniques. Mass spectrometric technique. Conventional chromatographic techniques, Gas Chromatography, High Performance Thin Layer and Liquid Chromatographic techniques and recent advances in chromatography.