Punyashlok Ahilyadevi Holkar SolapurUniversity, Solapur.

NAAC Accredited – 2022
'B++' Grade (CGPA 2.96)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Five Year Integrated M. Tech. Course in Cosmetic Technology

Name of the Course: M. Tech. II (Semester- III & IV)

(Syllabus to be implemented from June 2023)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur Syllabus of
Five Year Integrated M. Tech. (Cosmetic Technology)
(Choice Based Credit System)

Preamble:

In this course, there will be a clear study about the formulation, manufacturing, analysis and marketing of functional products. This area is mainly dependent on the subject of Pharmacy and Chemistry. The cosmetic technology course mainly revolves around industrial training and educational tours. This course includes studying raw materials, testing methods and laboratory procedures that are available worldwide.

Objective of the Course:

1) To formulate precise and effective cosmetic formulations by application of gained knowledge.
2) To apply new research and development in the field of Cosmetics to reduce environmental impacts.
3) To study the subjects which will have the skills, knowledge and scientific temperament for career in the field of cosmetics

Course Outcome:

1) Upon completion of programme students will have opportunities to work in cosmetic field related to Research & Development, Marketing & Academics of Cosmetic as well as Pharmaceutical Industries.
2) Students will be able to formulate a Research Design and complete a substantial work of new products.
3) Students will be familiar with relevant governmental regulations which will help to confirm product compliance in Domestic as well as International Market.
4) Programme will provide self employment opportunities.

Eligibility Criteria:

For Five Year Integrated M. Tech. Course in Cosmetic Technology following candidates are eligible.

1. Students with H.S.C. with Science Stream.
2. Students with B.Sc. (B group) subject: Chemistry, Zoology, Botany, Microbiology, Biotechnology, Biochemistry, Bioinformatics etc. are eligible for the direct admission to 3rd year after successful completion of Orientation/ Induction program. Orientation/Induction program will be conducted by the School in V sem. of third year.
3. Students with D. Pharmacy are eligible for the direct admission to 2nd year.
4. Students with B. Pharmacy are eligible for the direct admission to 3rd year.
5. Students after completion of fourth year are eligible to award B. Tech. degree.

Title of the Course: 5 Years Integrated M. Tech. (Cosmetic Technology)

Fees for Course: As per University norms.

Strength of the Students: 30

Admission/Selection procedure: As per university norms.

Duration of the Course: 4+1 (Integrated)

Period of the Course: (from June to April each academic Year)
Teacher's qualifications: M. Pharm. / M. Tech. (Cosmetic Technology) / M. Sc. / PhD.

Standard of Passing: As per University norms.

Nature of question paper with scheme of marking: Each theory paper will have 100 marks out of which 80 marks will be for Term End examination (University Examination) and 20 marks for Internal Assessment. Each practical paper will have 100 marks out of which 80 marks will be for Term End examination and 20 marks for Internal Assessment. The candidate has to appear for internal evaluation of 20 marks and external evaluation (University Examination) of 80 marks for each theory paper. The candidate also has to appear for internal evaluation of 20 marks and external evaluation (University Examination) of 80 marks for each practical paper.

Nature of Theory question paper:

1) Q nos. 1 and 2 are compulsory
2) Attempt any three questions from Q No. 3 to Q No. 7

Q. No.1) A. **Choose Correct alternative (MCQ) (10 Marks)**
B. **Fill in the blanks or write true of false (6Marks)**

Q.No.2) Answer the following (4 x 4 =16)
A)
B)
C)
D)

Q.No.3) Answer the following. (10 +6 or 8+8 =16)
A)
B)

Q. No.4) Answer the following (10 +6 or 8+8 =16)
A)
B)

Q.No.5) Answer of the following (10 +6 or 8+8 =16)
A)
B)

Q.No.6) Answer of the following (10 +6 or 8+8 =16)
A)
B)

Q.No.7) Answer of the following (10 +6 or 8+8 =16)
A)
B)

II) Nature of Practical question paper: Practical examination will be of 2 hours duration carrying 40marks.VIVA & record book will be for 05 marks each.

List of Laboratory Equipments Instruments, Measurements etc: Potentiometer, Colorimeter, pH meter, conductometer, Microscope etc.

Rules and regulations and ordinance if any: NA

Medium of the language: English

Allotment of workload (Theory/Practical)

Class	Intake Capacity					Subject	No of theory papers	No of lectures per week	Total theory work load	No of practical batches	No of practical per week per batch	Total practical work load	Work load	Total work load
	1st	2nd	3rd	4th	5th									
Five Year Integrated M. Tech. In Cosmetic Technology	30	30	30	30	30	Cosmetic Technology	04 (SEM I)	04	16	2	24	48	64 (SEM I)	257
							03 (SEM II)	04	12	2	16	32	44 (SEM II)	
							05 (SEM III)	04	20	2	16	32	52(SEM III)	
							05 (SEM IV)	04	20	2	16	32	52 (SEM IV)	
							05 (SEM V)	04	20	2	16	32	52(SEM V)	
							05 (SEM VI)	04	20	2	16	32	52 (SEM VI)	
							05 (SEM VII)	04	20	2	12	24	44 (SEM VII)	
							05(SEM VIII)	04	20	2	12	24	44 (SEMVII)	
							02 (Sem IX)	04	08	2	08	16	24(SEM IX)	
							1 (Sem X)	02	02	6	14	84	86(SEM X)	

Staffing of pattern: Contract/CHB

Paper duration: 3 Hrs for Theory /3 Hrs for Practical.

To be introduced from: June 2023

Second Year syllabus (according to the Semester Pattern Examination-CBCS)
w. e. f. Academic Year 2023-24

Semester	Code	Title of the Paper	Semester Examination			L	T	P	Credits
			Theory (UA)	CA	Total				
Sem-III		Hard Core							
	HCT3.1	Cosmetic Technology-I	80	20	100	4	--	--	4
	HCT3.2	Instrumental methods of Analysis - I	80	20	100	4	--	--	4
	HCT3.3	Unit Operations- I	80	20	100	4	--	--	4
	HCT3.4	Biomolecules -I	80	20	100	4	--	--	4
		Soft Core (Any one)							
	SCT3.1	Cosmetics Legislations-I	80	20	100	4	--	--	4
	SCT3.2	Introductory Pharmacology and Toxicology-I	80	20	100	4	--	--	4
		Seminar/Tutorial/ Industrial Visit/ Field Tour	---	25	25	--	1	--	1
	HCP3.1	Cosmetic Technology-I Practical	40	10	50	--	--	04	2
	HCP3.2	Instrumental methods of Analysis - I Practical	40	10	50	--	--	04	2
	HCP3.3	Unit Operations – I Practical	40	10	50			04	2
	HCP3.4	Biomolecules -I - Practical	40	10	50			04	2
	Total for Semester-III		560	165	725	20	01	16	29
Sem-IV		Hard Core							
	HCT4.1	Cosmetic Technology - II	80	20	100	4	--	--	4
	HCT4.2	Instrumental methods of Analysis - II	80	20	100	4	--	--	4
	HCT4.3	Unit Operations- II	80	20	100	4	--	--	4
	HCT4.4	Biomolecules -II	80	20	100	4	--	--	4
	HCT4.5	Environmental Studies	40	10	50	3	--	--	NC
		Soft Core (Any one)							
	SCT4.1	Cosmetics Legislations-II	80	20	100	4	--	--	4
	SCT4.2	Introductory Pharmacology and Toxicology-II	80	20	100	4	--	--	4
		Seminar/Tutorial/ Industrial Visit/ Field Tour	---	25	25	--	1	--	1
	HCP4.1	Cosmetic Technology-II Practical	40	10	50	--	--	04	2
	HCP 4.2	Instrumental methods of Analysis - II Practical	40	10	50	--	--	04	2
	HCP 4.3	Unit operations – II Practical	40	10	50	--	--	04	2
	HCP4.4	Biomolecules -II - Practical	40	10	50	--	--	04	2
	Total for Semester-IV		600	175	775	23	01	16	29

L=Lecture T=Tutorials P=Practical IA=Internal Assessment HCT=Hard CoreTheory
SCT=Soft Core Theory HCP=Hard Core Practical.

Paper Code: HCT3.1
COSMETIC TECHNOLOGY– I

Learning Objectives: Upon completion of this course students will be familiar with

1) Specific actives used in cosmetic formulations, their technical aspects and evaluation methods.
2) Chemistry involved in cosmetic formulations.
3) Common natural raw materials, especially the basic functional group involved, their physical and chemical properties and their applications.

Learning Outcomes: The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course, are described:

1) Able to do preformulation of excipients and cosmetic active agent.
2) Able to prepare monophasic formulations.
3) Able to select suitable surfactant to be used in cosmetics.
4) Able to decide the suitable packaging system for cosmetics.

Unit-1: Physiochemical properties of agents (Drug & Cosmetics) influencing design of product forms such as Dissociation Constant, Dielectric constant, Refractive Index, Dipole moment, Optical rotation, Stereochemistry. **(15 L)**

Unit-2: Introduction to Dosage Form: Monophasic liquid formulations, Biphasic dosage form and special emphasis on monophasic liquid formulation, techniques of enhancing solubility such as - Complexation, Salt formation, Use of surfactants, Use of Co solvents, Change in pH, Hydrotrophy, Precipitation. **(15 L)**

Unit-3: Surface active agents – Definition classification based on chemical nature and HLB scale, properties and significance in cosmetics. **(15L)**

Unit-4: Packaging and dispensing of cosmetic formulations: Importance of different materials for containers and closures. Packaging of cosmetic product and labeling. Environmental aspects of packaging materials, appropriate recycling and disposal. Green packaging. **(15L)**

Reference Books:

1. Text Book of Pharmaceutical formulations, BM Mithal ,Vallabh Prakashan.
2. The Indian Pharmacopoeia.
3. Remington's Pharmaceutical Practices.
4. Cooper & Gum Dispensing for Pharmaceutical Students.
5. Husa: Pharmaceutical Dispensing: mach Publishing Co.
6. Harry's Cosmeticology.

Paper Code: HCT3.2

INSTRUMENTAL METHODS OF ANALYSIS - I

Learning Objectives:

1. To study the different types of Instruments used for cosmetic product analysis.
2. To study the basic principles of Colorimetry and its classification.
3. To study the Conductometric acid-base titrations.
4. To study the Potentiometry and potentiometric titrations.

Learning Outcomes: After the end of the course, student can:

1. Understand the basic principles of Instruments used for cosmetic product analysis.
2. Be able to understand the Spectrophotometric titrations.
3. Easily understand the conduct metric applications.
4. Be able to know principle of Potentiometer and its applications.

Unit-1: Introduction to Instruments used for cosmetic product analysis. **(15 L)**

A. Introduction to Instruments used for cosmetic product analysis.

B. pH measurement: Theory, Instrumentation, Construction, Working, Application and Advantages

Unit-2: Colorimetry **(15 L)**

Introduction, General Discussion on theory of colorimetry, Lambert law & Beer's law (Derivation not expected), Terms used in Colorimetry, Application of Lambert law & Beer's law, Classification of methods of colour measurement or comparison, photoelectric photometer method - single cell photo-electric colorimeter.

Unit 3: Conductometry: **(15 L)**

Basic circuit of D.C., Wheatstone bridge, Measurement of conductance by Wheatstone bridge, Different types of conductivity cells, Experimental determination of specific, equivalent and molar conductance. Conductometric acid-base titrations, Advantages of conductometric titrations.

Unit 4: Potentiometry: **(15L)**

A. Introduction., Detail study of calomel, quinhydrone and glass electrodes, Basic circuit diagram of direct reading potentiometer.

B. Potentiometric titrations: Classical and analytical methods for locating endpoints

i) Acid – Base titrations. ii) Redox - titrations. iii) Precipitation titrations.

Advantages of potentiometric titrations.

Reference Books:

1. Instrumental Methods of Analysis–Dean ,Willar
2. Instrumental Methods of Analysis–Ewing.
3. Quantitative Inorganic Analysis–A.I.Vogel
4. Commercial Method of Analysis–Frank Biffen.

Paper Code: HCT3.3

UNIT OPERATIONS – I

Learning Objectives: To make students to know

1) Various unit operations of Cosmetic industries.
2) Instruments and Machines used in Cosmetic manufacturing process.
3) Merits and demerits of different machines used in unit operations.

Learning Outcome: Students will be able to

1) Understand the working and theories behind various industrial processes.
2) Design and develop the solutions to analyze industrial unit operations.
3) Use of resources.

Unit-1:

A) Flow of Fluids: Introduction to flow of fluids, Study of Different Manometers used in Industry, Reynolds experiment, Bernoulli's Theorem.

B) Measurement of fluid flow: Construction, working, uses of meters such as Orifice meters, Venturimeter, Pitot tube, Rotameter, displacement meter.

C) Transportation of fluids: Construction, working, uses of Pumps such as Reciprocating, Piston, Duplex diaphragm, rotary, centrifugal and turbine pumps. **(20L)**

Unit 2:

A) Size Reduction: Mechanism of Size reduction, Classification of equipments. Study of Factors effecting selection of mills. Principles, construction, working, uses, merits and demerits of mills such as Hammer mill, Rotary cutter mill, Colloidal mill, Roller mill, Fluid energy mill.

B) Size Separation: Official standards for powders, Sieves, Modes of motion in size separation, Sieve analysis of powders. Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator. **(15 L)**

Unit 3: Distillation: Theory, General equipments and Classification of Distillation Methods, Simple distillation, Flash distillation, Steam distillation, Distillation under reduced pressure. **(10 L)**

Unit 4: Conveyer: Objective and advantages of conveyor. Principle, Construction, Working, Applications, Advantages and Disadvantages of Belt conveyor, Screw Conveyor, Pneumatic Conveyor, Chain Conveyor, Bucket Conveyor. **(15 L)**

Reference Books:

1. Badger & Banchero : Introduction to chemical Engineering.
2. Mccabe & Smith : Unit operations in chemical Engineering.
3. Coulson and Richardson's & Vol. I & II : Chemical Engineering.
4. CVS Subrahmaniyam, J Thimma Shetty : Pharmaceutical Engineering, Principles and Practices.

Paper Code: HCT3.4

BIOMOLECULES-I

Learning Objectives:

1. To get students familiar with use of various bio-molecules in cosmetics.
2. To get to know about the chemistry and toxicity of mostly used inorganic substances in cosmetics.

Learning Outcomes:

1. Well acquainted with the interaction study of biomolecules and cosmetics.
2. Familiar with different classes of inorganic ingredients and their use in cosmetics.
3. Students can get to know about the natural silicates and their use in cosmetics.

Unit-1: Amino Acids: Essential and non-essential amino acids, ketogenic & glycogenic amino acids, Zwitterions. Physical & Chemical properties of amino acids with respect to their use in cosmetic preparations, Peptides, carrier peptides and their use in cosmetics. General application in skin care and cosmetics. (**15 L)**

Unit -2 :**Proteins:** Sources, classification in detail. Physical and Chemical properties and relation of these properties in use of proteins in cosmetic preparations. Growth factors in cosmetics, Importance of proteins in cosmetic and Pharmaceutical industries. (**15 L)**

Unit -3: Enzymes: Definition, nomenclature & classification. Mechanism of enzyme action. Coenzymes & Prosthetic group. Properties of enzymes. Enzyme in cosmetic formulations. Types of enzymes in skin care and their benefits, their industrial uses with respect to cosmetic and pharmaceutical industries. (**15L)**

Unit –4: Clay minerals and the natural and synthetic silicates: Chemistry in brief of silicones. Properties, Natural silicates, synthetics, synthetics silicates. Their properties and uses in preparation of cosmetics and drugs. Toxicity of Silicones. Silk powder.

I) Synthetic Surfactants: Classification, commercial, commercial surfactants, cosmetic uses.

II) Insoluble Metallic soaps: Methods of manufacture and uses. (**15 L)**

Reference Books:

1. Chemistry & Manufacture of Cosmetics by M. G. DeNavarre

Paper Code: SCT 3.1

COSMETICS LEGISLATIONS – I

Learning Objectives:

1. The subject exposes the student to important legislations related to cosmetic profession in India.
2. It imparts knowledge about the Drug and Cosmetic Act and its Rules.
3. It impart knowledge about requirements of factory premises for the manufacturing of cosmetics with G.M.P.

Learning Outcomes:

1. Know the cosmetic legislations and their implications in the development and marketing.
2. Ability to know schedules and their applications in cosmetic as well as laws and penalties.
3. Ability to apply and knowledge of various licenses, registration certificate, cancellation of licenses.
4. Know the regulatory authorities and agencies governing the manufacture and sale of cosmetics

Unit-1: Drugs& Cosmetic Acts and Rules (with reference to cosmetics)
Objectives. Definitions: Drug, Misbranded Drug, Adulterated Drug, Spurious Drug.Misbranded Cosmetic, Spurious Cosmetic, Inspector and Government Analyst. Duties of Inspector and Government Analyst. DTAB (Drugs Technical Advisory Board): Constitution,Function of DTAB. Provision Related to Cosmetics: Prohibition of import of certain cosmetics, Manufacture of Cosmetics for Sale, Sale of Cosmetics, and Labelling of Cosmetics. Offences and Penalties relating to cosmetics. **(15L)**

Unit-2: The Medicinal and Toilet preparations (Excise duties) Acts and Rules Objectives. Definitions: Alcohol, Dutiable goods, Medicinal Preparation, Toilet Preparation,Manufacture, Narcotic Drug, Bonded Manufactory, Non- bonded Manufactory, Denatured Spirit or Denatured alcohol, Spirit Store, Restricted Preparation, Unrestricted Preparation, Substandard Preparation. Procedure for Licence to manufacture medicinal and toilet preparation, Particulars in Application. Bonded Laboratory or Bonded Manufactory. Non- bonded laboratory/ Non-bonded manufactory. Classification of Medicinal and Toilet Preparations containing alcohol. Warehousing of alcohol Preparations. Export of Medicinaland Toilet Preparations: Export of duty paid Goods, Export Under Bond. Movement of dutiable goods from one Bonded Warehouse to another Bonded warehouse, Entry, Search And Seizure. Offences and Penalties. **(15 L)**

Unit-3: General requirements, Requirement of Plant and Equipment: Equipment Area and other requirement (if applicable) required for following cosmetics : Powder (face powder, cake make-up, compacts, face packs, rouges etc.), Cream, lotion, Shampoos, Hair oils, Emulsion, Shaving cream, Nail polishes and Nail lacquers, Lipsticks, Depilatories, Preparations used for Eyes: i) Eye brows, Eye lashes, Eye liner, Kajaland Surma, Aerosol, Alcoholic Fragrance solutions, Hair Dyes,
Tooth powders and Tooth pastes:
i)Tooth powder in General ii) Tooth Pastes iii) Tooth Powder (Black)
List of coal tar colours permitted to be used in Cosmetics.
Some of the standard specification of Powder hair dyes, Skin powder, AfterShave lotion, Shampoo,Skin cream and Nail polishes laid down by BIS. **(15L)**

Unit-4: Prevention of Cruelty to Animals Act.

Objectives. Definitions: Animals, Phooka or Doom Dev, Cruelty. Cruelty to animals. Animal Welfare Board of India: Objective, Constitution and Functions. Experimentation ofAnimals: Committee Constitution. Role of Committee. Entry and Inspection. Prohibition ofExperimentation of Animals. Offences and Penalties. **(15 L)**

Reference Books

1. Drugs & Cosmetic Acts & Rules. Govt. of India Publication.
2. Text Book of Forensic pharmacy by B.M .Mitthal
3. IP, BP, NF,USP.
4. Forensic Pharmacy by Dr. B. S. Kuchekar, A. M. Khadatare and Sachin Itkar.
5. Cosmetics rules 2020, Ministry of Health and Family Walefare

Paper Code : SCT3.2

INTRODUCTORY PHARMACOLOGY & TOXICOLOGY – I

Learning Objectives: To make students to

1) Understand various pharmacological processes.
2) Understand basic mechanism of drug action.
3) Impart knowledge on Material safety data sheet.

Learning Outcome: Students will be able to

1) Understand the drug action.
2) Understand the Factors effecting drug action.

Unit-1: Scope of Pharmacology in Cosmetics, Terminologies and Definitions Routes of Administration of drugs, their advantages and disadvantages, giving special emphasis on Topical route. **(15L)**

Unit-2: Various processes of Absorption, Distribution, Metabolism and Excretion of drugs and the factors influencing drug absorption. **(15L)**

Unit-3: General mechanisms of drug action, site of drug action, types of drug action and the factors influencing Drug action. **(15L)**

Unit-4: Material safety data sheet (MSDS), its scope, significance during cosmetic material handling with examples. **(15L)**

Reference Books

1. Pharmacology and Pharmacotherapeutics By R.S. Satoskar and S.Bhandarkar

2. Essentials of Pharmacotherapeutics By F.S.K.Barar.

Paper Code: HCP3.1

Cosmetic Technology-I Practical

1) Introduction to Monophasic Dosage Form
2) Preparation of toners.
3) Preparation of mouthwash.
4) Preparation of astringents.
5) Preparation of Gargles.
6) Preparation of liniments.
7) Preparation of gels

Paper Code: HCP3.2

Instrumental Methods of Analysis-I Practical

1) Determination of λ max., absorption curve of organic dyes by Colorimeter.
2) Determination of concentration of organic dyes by Colorimeter and Spectrophotometer.
3) Basic Experiment based on chromatography i.e. paper chromatography, thin layer chromatography and column chromatography

Paper Code: HCP3.3

Unit Operations-I Practical

1) Practice in lettering construction & uses of plain diagonal, vernier scalesand scale of chords.
2) Projections of points, lines and planes.
3) Section of solids.
4) Steam distillation – To calculate the efficiency of steam distillation.
5) Particle size analysis.
6) Construction, working and application of Machinery such as Hammer mill, Rotary cutter mill, Colloidal mill, Roller mill, Fluid energy mill.

Paper Code: HCP3.4

Biomolecule- I Practical

1) Qualitative test for proteins and amino acids.
2) Effect of pH change on proteins: Precipitation of caseinfrom milk.
3) Quantitative estimation of Glycine by Sorenson's method.
4) Colorimetric estimation of proteins by Biuret/Lowry's method.
5) Enzyme assay. Assay of amylase activity.

Paper Code: HCT 4.1

COSMETIC TECHNOLOGY – II

Learning Objectives:

Upon completion of this course the students will be familiar with:

1. Specific actives used in cosmetic formulations, their technical aspects and evaluation methods.
2. Chemistry involved in cosmetic formulations.
3. Common natural raw materials, especially the basic functional group involved, their physical and chemical properties and their applications.

Learning Outcomes:

1. The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course, are described:
2. Able to formulate emulsion and suspension.
3. Able to select correct preservative for cosmetics.
4. Able to select suitable bases for cosmetic formulation.

Unit-1 : Solid formulations - Bulk powders, incorporation of different varieties of powders viz. dusting, compact, face and talcum. **(15 L)**

Unit-2: Semisolid formulations: Introduction to Ointments, paste, creams, jellies, sticks, selection of ideal bases and preparation. **(15 L)**

Unit-3: Biphasic liquid formulations:
Emulsions – Types, identification of emulsions, preparation.
Suspensions – Flocculated and non- flocculated suspensions, selection of wetting suspending and dispensing agents, preparation and stability. **(15L)**

Unit-4: Preservatives- Origin of contamination, factors influencing the effectiveness of preservatives, Ideal characteristics, uses and safety aspects **(15L)**

Reference Books:

1) Text Book of Pharmaceutical formulations, BM Mithal ,Vallabh Prakashan.
2) The Indian Pharmacopoeia.
3) Remington's Pharmaceutical Practices.
4) Cooper & Gum Dispensing for Pharmaceutical Students.
5) Husa: Pharmaceutical Dispensing: mach Publishing Co.
6) Harry's Cosmeticology.

Paper Code: HCT4.2

INSTRUMENTALMETHODSOFANALYSIS-II

Learning Objectives:

1. To study the different types of spectroscopic techniques.
2. To study the basic principles of spectroscopic techniques.
3. To study the basic principle of UV-Visible and IR spectroscopy.
4. To study the general Principles and classification of Chromatography.
5. To study the general principle and working of Atomic absorption spectroscopy.

Course Outcomes:

After the end of the course, student can:

1. Understand the basic in spectroscopy techniques.
2. Able to understand the Spectrophotometric titrations.
3. Easily understand the basic principle and Instrumentation in spectroscopy.
4. Able to know paper, TLC, and column chromatography and its applications.

Unit 1: Spectroscopy II **(15L)**

Introduction, Electromagnetic radiation-its properties and Electromagnetic spectrum, Energy level diagram & Rotational spectra of diatomic molecules: Simple Harmonic oscillator model Vibrational energies of diatomic molecules, Determination of force constant & zero point energy, Interaction of radiation with vibrating molecules.

Unit 2 : UV and Visible spectroscopy &Atomic absorption spectroscopy **(15L)**

Basic Principles &Essential parts of spectrophotometers, Uses and application of spectrophotometer, Spectrophotometric titrations, Introduction of Atomic absorption spectroscopy, Principle and Theory, Instrumentation & Working, Advantages and disadvantages, applications.

Unit 3: Infrared Spectroscopy **(15L)**

Principle of IR spectroscopy, Double beam IR spectrophotometer- Schematic diagram, Fundamental modes of vibrations & Types of vibrations, Hooke's law, Factors affecting values of vibrational frequencies, Conditions for absorption of radiation and selection rule, Fundamental group regions of IR spectrum & Functional group region, Finger print region, Aromatic region, Characteristic absorption of various functional groups, Determination of structure &Identification of functional groups.

Unit-4: Chromatography **(15 L)**

Introduction & General Principles, Classification of Chromatography, Paper chromatography (PC) Thin Layer Chromatography (TLC) and their applications. Introduction to HPLC, HPTLC,GC-MS, LC-MS .

Reference Books:

1. Instrumental Methods of Analysis– Dean, Willar
2. Instrumental Methods of Analysis–Ewing.
3. Quantitative Inorganic Analysis– A.I.Vogel
4. Commercial Method of Analysis–Frank Biffen.

Paper Code: HCT4.3

UNIT OPERATIONS – II

Learning Objectives: To make students to know

1) Various environmental conditions in cosmetic industry.
2) Different unit operations in cosmetic industry.
3) Working principles of different machines used in unit operations.

Learning Outcome: Students will be able to

1) Understand the concept of heat transfer.
2) Understand the mechanism of drying and mixing.
3) Understand the constructions and working of various machines.

Unit-1: **Humidification and air conditioning**:

Various definitions related to humidification and air conditioning, wet bulb theory determination of Humidity, Humidifiers and dehumidifiers. **(15 L)**

Unit-2: **A) Flow of heat:** Classification of heat flow processes, Fourier's law, Heat flow through cylinder, convection. Natural Convection, forced convection surface coefficients.
B) Radiations: Black body, Emissivity, Heaters, Heat interchangers, Parallel and countercurrent Heat Exchangers, Finned tube heat changers. **(15 L)**

Unit-3: **Drying:** Introduction, Theory of drying, Classification of drying equipments, Principle, Construction, Working, Advantages and Disadvantages of Tray dryer, Drum dryer, Spray dryer, Freeze dryer, Fluidized bed dryer. **(15 L)**

Unit 4: Mixing:

A) Mixing of Solids -Interparticle interaction, Mixing Process, Factor influencing mixing, Classification of mixing equipment for solid mixing, Equipments.

B) Mixing of Liquids: Mechanism of Mixing, Mixing Vessel, Equipments. **(15L)**

Reference Books:

1. Badger & Banchero : Introduction to chemical Engineering.
2. Mccabe & Smith : Unit operations in chemical Engineering.
3. Coulson and Richardson's & Vol. I & II : Chemical Engineering.
4. CVS Subrahmaniyam, J Thimma Shetty : Pharmaceutical Engineering, Principles and Practices.

Paper Code: HCT 4.4

BIOMOLECULES-II

Learning Objectives: To get students familiar with

1. chemistry of various surfactants, lipids in cosmetics
1. To get to know about availability of natural viscosity modifier

Learning Objectives:

1. Well acquainted with the use of molecules such as lipids, humectants, polyols in cosmetics.
2. Students can get to know about pear farming.
3. Students can get to know about the importance of vitamins in cosmetic products.

Unit-1: Lipids:
Sources, classification, structure of simple triglycerides. Waxes: classification, Composition, properties and importance of these properties in cosmetic formulations, uses.
Fatty acids: classification essential fatty acids, Production method, Production method, Properties and uses of fatty acids with respect to cosmetic and pharmaceutical establishments
Lanolin: composition, derivatives & uses. Derivatives of fatty acids: Their role in Cosmetics, Fatty Alcohols: Chemistry, types & uses in cosmetics. **(15 L)**

Unit-2:

I) **Humectants and Polyols:** Choice of humectants, unusual humectants, example of humectants, pecial uses of humectants. Lanolin: Source, composition, properties, derivatives &their uses in cosmetics.

II) **Viscosity Modifiers** – eg. gum, alcohol and electrolytes, solvents etc. **(15 L)**

Unit-3: Vitamins:
Definition, fat soluble and water soluble Vitamins, sources, structure, Physiological & Metabolic role of Vit. A, D, E & K Importance in cosmetics & Pharmaceuticals. Structure & Sources of water soluble vitamins, B Complex & Vit. C. Their role in Cosmetic industries. **(15 L)**

Unit-4: Pearls and Pearl Essence:Definitions, commercial uses, production methods, synthetic pearly substances. Ion exchange resins and their cosmetic uses in case of purified water, Raw water, standards for water as per IP, BP, USP (with recent amendments) (**15 L)**

Book Recommended: 1. Chemistry & Manufacture of Cosmetics by M. G. DeNavarre

Paper Code: SCT 4.1
COSMETICS LEGISLATIONS – II

Learning Objectives:

1. The subject exposes the student to important legislations related to cosmetic profession in India.
2. It imparts knowledge about the various Act and its Rules.
3. It provides the basic idea regarding patenting in India.

Learning Outcomes:

1. Describe the significance and relevance of various acts in India.
2. Ability to know various laws and penalties related to the various acts.
3. Ability to apply and knowledge of various licenses, registration certificate, cancellation of licenses.
4. Describe the Patent, process, advantage, essential documents with patent application amendments to Indian patent act.

Unit-1: **Pharmacy Act.**

Objectives, Definitions: Central Council, Central Register, Medicinal Practitioner, Registered Pharmacist, Displaced Person and Repatriate. Pharmacy Council of India: Constituent, Functions, President and Vice-President of Council, Terms of Office and Causalvacancies, Staff remuneration and allowances, Executive committee. Approval of Institution:Procedure for approval of Institution. Withdrawal of approval. Central Register of Pharmacists. State Pharmacy Council and Joint State Pharmacy council constituent, President and Vice-President of State Council, Terms of Office and causal vacancies, Staff remuneration and allowances,Executive committee. Registration of Pharmacists. Offences and Penalties. **(15 L)**

Unit-2: **FactoryAct.**

Objective. Applicability. approval, licensing and registration of factories.General duties of Occupier and manufactures. Inspecting staff and Powers of Inspectors. Certifying surgeonsand duties of surgeons. Health provision. Safety provision. Welfare provision. Working hours of adult. Employment of young persons. Working hours of children. Annual leaves with wages. Offences and penalties. Cognizance of offences. (**15L)**

Unit-3:

A. **Shop & Establishment Act:** Objectives. Scope and Coverage. Main Provisions. Registration of Establishment. Opening and Closing Time. Working Hours. Closing Day.Employment of Children, Young personand Women. Health and SafetyProvision. Leave and Wages. Enforcement and Inspection. Offences and Penalties. Miscellaneous.

B. **Sales Promotion Act:** Objective. Definitions: Establishment, Notified industry. Leave Entitlement Procedure and Compliance: Mandatory Holidays, Earned Leave, Medical Leave, Quarantine Leave, Leave At Discretion of Employer Extraordinary Leave and Casual Leave. List of Other Welfare Acts.Mandatory procedures underthe act andrules. Inspectors. Offences by companies. Cognizance of offence. **(15 L)**

Unit-4: **Patenting in India & Global**

Purpose of getting patent. Role of Patent System. Types of Patents. Patentableand Non Patentableinventions.Term of patent.Essential documents with patent application. Expiry ofPatent.Stages from filling to grant of a Patent. Patent infringement. Advantage of patenting. Rights of Patentee. Jurisdiction for filling patent application. Renewal fee. Patent Cooperation Treaty (PCT). **(15 L)**

Recommended Books:

1. Drugs & Cosmetic Acts & Rules. Govt. of India Publication.
2. Text Book of Forensic pharmacy by B.M .Mitthal
3. IP, BP, NF,USP.
4. Forensic Pharmacy by Dr. B. S. Kuchekar, A. M. Khadatare and Sachin Itkar.

Paper Code: SCT 4.2

INTRODUCTORY PHARMACOLOGY & TOXICOLOGY – II

Learning Objectives: To make students to

1) Understand pharmacology of different topical agents.
2) Understand side effect of heavy metals.
3) Understand potentials and mechanism of action of anti-infective.

Learning Outcome: Students will be able to

1) Understand the role of active ingredient in different cosmetics
2) Apply knowledge for management of heavy metals

Unit-1: Pharmacology of Topical drugs, Introduction. Types of Topical drugs:

a. Protectives and absorbents
b. Demulcents
c. Emollients
d. Astringents andantiperspirants-deodorants
e. Irritants, Rubefacients and Vesicants.
f. Sclerosing Agents.
g. Caustics andEscharotics
h. Keratolytics (DesquamatingAgents)
i. Cleansingpreparations.
j. Miscellaneous Dermatologic- mouth washes, gargles, sunscreens, melanizers&demelanizers. **(15L)**

Unit-2: Miscellaneous Topical Drugs – Local antinfective agents- classification, properties, method of estimation of potency and mechanism of action of antibacterial agent, antifungal agent, ectoparasiticides **(15L)**

Unit-3: Pharmacology of Cosmeceuticals used for Antiaging, Antiwrinkle, Fairness-bleaching& Sunscreens, Antidandruff, Anti inflammatory, Anti acne/pimple, Pigmentation etc. Autocoids: Introduction to various autocoids; Histamine, its physiological role and antihistamines. **(15L)**

Unit-4: Heavy metals and metal antagonist: Symptoms and management of lead, Mercury &Arsenic poisoning. **(15L)**

Reference Books:

1. Pharmacology and Pharmacotherapeutics By R.S. Satoskar and S.Bhandarkar
2. Essentials of Pharmacotherapeutics By F.S.K.Barar.

Paper Code: HCP4.1

Cosmetic Technology- II Practical

1) Preparation of emulsion by Dry gum method and Wet gum method
2) Preparation of suspension- Calamine Lotion.
3) Preparation of ointment bases–
   i) Hydrocarbon ii) Absorbable iii) Watermiscible.
4) Preparation of paste, jelly bases and simple stick bases.
5) Preparation of face powders.

Paper Code: HCP4.2

Instrumental Methods of Analysis- II Practical

1) Experiment based on pH–Meter- pH determination of cosmetic raw material and products as per IP specification.
2) Experiment based on Conductometer- Determination of specific conductance/ conductivity of various electrolytes, standard graph,determination of concentration of electrolytes.
3) Study of refractometer- determination of refractive index of cosmeticingredients as per IP specifications.
4) Experiment based on polarimeter- determination of optical rotation of specificoptical rotation of optically active substances as per IP specifications.

Paper Code: HCP4.3

Unit Operations-II Practical

1) Elementary ideas of Ist angle and IIIrd angle projectors. Top view, front view and sections.
2) Projections of simple solids such as cones, cylinders, prisms of pyramids with different positions and groundlines.
3) Isometric projections of simple solids.
4) Determination of humidity of air – i) from wet and dry bulb temperatures – use of Dew point method.
5) Determination of moisture content and loss on drying
6) Demonstration of colloid mill, planetary mixer, fluidized bed dryer and such other major equipment.

Paper Code: HCP4.4

Bimoleculs- II Practical

1) Qualitative test for lipids.
2) Determination of Saponification value of fats.
3) Determination of Acid value of fats.
4) Determination of Iodine value of fats.
5) Estimation of Ascorbic Acid (Vit. C)
6) Identification test and analysis of lanolin.
7) Identification test and analysis of Kaolin.
8) Identification test and analysis of Bentonite.
9) Analysis of water as per IP, BP and USP.