

Punyashlok Ahilyadevi Holkar Solapur University, Solapur



Name of the Faculty: Science & Technology

CHOICEBASEDCREDITSYSTEM

**Syllabus: Five Year Integrated M. Tech. course
In Cosmetic Technology.**

Name of the Course: M. Tech. I (Sem. I & II)

(Syllabus to be implemented from June 2024)

Structure for SEM - I

Semester	Code	TitleofthePaper	SemesterExamination			L	T	P	Credits
			Theory (UA)	CA	Total				
Sem-I		Major							
	DSC 1-1	Cosmetic Technology I	30	20	50	2	--	--	2
	DSC 1-2	Herbal Cosmetics I	30	20	50	2	--	--	2
	DSC 1-3	Fundamental Chemistry	30	20	50	2	--	--	2
	DSC 1-1 (Practical)	Practical- Cosmetic Technology I	30	20	50	--	--	2	2
	DSC 1-2 (Practical)	Practical- Herbal Cosmetics I	30	20	50	--	--	2	2
	DSC 1-3 (Practical)	Practical- Fundamental Chemistry	30	20	50	--	--	2	2
		Vocational /Skill Enhancement Course.							
	SEC 1	Computer Applications	30	20	50	2	--	--	2
		Ability Enhancement Course (AEC) IKS, VEC							
	L1-1	English	30	20	50	2	--	--	2
	IKS	IKS Generic	30	20	50	2	--	--	2
	VEC -2	Environment studies	30	20	50	2	--	--	2
	CC1	Field Project / RP/CC/Internship/Apprenticeship/ Community Engagement	--	50	50	--	--	2	2
	TotalforSemester-I			300	250	550	14	--	8

Structure for SEM - II

Note:

Semester	Code	Title of the Paper	Semester Examination			L	T	P	Credits
			Theory (UA)	CA	Total				
Sem-II		Major							
	DSC 1-4	Cosmetic Technology II	30	20	50	2	--	--	2
	DSC 1-5	Herbal Cosmetics II	30	20	50	2	--	--	2
	DSC 1-6	Cosmetic Chemistry	30	20	50	2	--	--	2
	DSC 1-4 (Practical)	Practical- Cosmetic Technology II	30	20	50	--	--	2	2
	DSC 1-5 (Practical)	Practical- Herbal Cosmetics II	30	20	50	--	--	2	2
	DSC 1-6 (Practical)	Practical- Cosmetic Chemistry	30	20	50	--	--	2	2
		Generic / Open Elective							
	G.E.1/O.E.1	G.E. 1- Human Anatomy OR O.E. 1- B.O.S.	30	20	50	2	--	--	2
		Vocational /Skill Enhancement Course.							
	VSC 1	Analytical Chemistry	30	20	50	2	--	--	2
		Ability Enhancement Course (AEC) IKS, VEC							
	L1-2	English	30	20	50	2	--	--	2
	VEC -1	Constitution of India	30	20	50	2	--	--	2
	CC2	Field Project / RP/CC/Internship/Apprenticeship/ Community Engagement	--	50	50	--	--	2	2
Total for Semester-II			300	250	550	14	--	8	22

For Theory and Practical (DSC 1-1 to DSC 1.6) - University Assessment for theory and Practical paper will be of 30 marks, College assessment for theory and Practical paper will be of 20 marks.

For G.E.1/O.E.1, SEC-1, L-1, IKS, VEC-2, VSC-1, L-1-2, VEC-1 University assessment (Theory) for 30 marks and College assessment for 20 marks.

For CC1 / CC2 Field Project / RP/CC/Internship/Apprenticeship/ Community Engagement services college assessment will be of 100 marks.

Abbreviations:

Generic/ Open Electives: OE;

Vocational Skill Courses: VSC;

Ability Enhancement Courses: AEC;

Value Education Courses: VEC;

Field projects: FP; Co-curricular Courses: CC;

RM: Research Methodology; Project: RP

Vocational Skill and Skill Enhancement Courses: VSEC;

Skill Enhancement Courses: SEC;

Indian Knowledge System: IKS;

OJT: On Job Training; Internship/ Apprenticeship:

Community Engagement & Service: CEP

COSMETIC TECHNOLOGY-I

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

1. Basics of cosmetics.
- 1) Various types of cosmetics in various forms.
- 2) Packaging and labeling aspects of Cosmetics.

Learning Outcomes:

- 1) Able to explain the different types cosmetics available in market .
- 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 I (10 L)

Definition of cosmetics and, Misbranded Cosmetic, Spurious Cosmetic as per D & C Act, Cosmeceuticals meaning. Classification of cosmetic and cosmeceutical products. Study of Types of skin. **Raw materials used in the cosmetics:** Surfactants, rheology modifiers, humectants, emollients, preservatives and its application.

Unit-II(10 L)

Introduction to Dosage Form: Monophasic liquid formulations, and Biphasic dosage forms. Use of Co solvents, Change in pH, Hydrotrophy, Precipitation.

Unit-III: (5L)

Introduction of Surface active agents, Definition, Mechanism and classification based on chemical nature and HLB scale, properties and its significance in cosmetics.

Unit-IV:(15L)

Packaging and dispensing of cosmetic formulations: Importance of different materials for containers and closures. Packaging of cosmetic product. Environmental aspects of packaging materials, appropriate recycling and disposal. Green packaging. Cosmetic **Labelling**.- General labeling requirements and specimen labels for drugs and cosmetics. **Containers**- Types of containers Narrowmouth bottle, wide mouth bottle, tubes, tubular containers, powder containers, compact containers, stic containers, Pencil containers, applicator containers.

References:

1. Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
2. Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4 th Edition, Vandana Publications Pvt. Ltd., Delhi.
3. Text book of cosmelicology by Sanju Nanda &Roop K. Khar, Tata Publishers.
4. TextBookofPharmaceuticalformulations, BMMithal ,VallabhPrakashan.
5. The Indian Pharmacopoeia.
6. Remington'sPharmaceutical Practices.
7. Cooper&GumDispensingforPharmaceutical Students.
8. A. N. Martin- Physical Pharmacy.

DSC 1-1 (Practical)

COSMETIC TECHNOLOGY-I

- 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

DSC 1-2
Herbal Cosmetics - II

OBJECTIVE:

1. To know History, development and role of natural product in cosmetics.
2. To develop the knowledge base regarding source, chemical constituents and uses of phytochemicals.
3. To develop the ability to understand performing chemical tests, to identify natural cosmetic agents.

Learning Outcomes: At the end of the course students will be:

1. Able to explain the origin of natural ingredient from natural sources.
2. Able to understand the knowledge of the important natural products, their origin, properties.
3. Able to carry out the microscopic and morphological evaluation.
4. Able to explain the role of natural products and in identification of substance through various chemical tests.

Unit-1: Introduction to Natural Cosmetic Agents (10 L)

History, development and role of natural product in cosmetic and medicine.

Different systems of classification of drugs of natural origin-Alphabetical, Morphological, Taxonomical, Chemical, Pharmacological and Chemo taxonomical with their merits &demerits.

Unit-2: Herbs (10 L)

I) Definitions- Herbs, organized and unorganized.

II) Herbs description.

III) Morphology of following organized and unorganized herbs.**Organized herbs**– Root, Stem, Leaf, Fruit and Seed. **Unorganized herbs** – Mucilage, Latex and Extracts.Distinguish between organized and unorganized herbs.

Unit-3: Carbohydrate (10 L)

A) Definition, classification and general identification tests of carbohydrates.

B) Study of following carbohydrates used in cosmetics with respect to their source, chemical constituents and uses

I) Starch- Wheat, Maize, Rice, Potato.

II) Gums – Indian gum (Gum arabic), Jaguar-gum (GuafLOUR), Pectin, Agar, Tragacanth.

Unit-4: Lipids (10 L)

A) Definition, classification and general identification tests.

B) Study of following Lipids with respect to their source, preparation, chemical constituent

I) oils – Ricinus oil, Linseed oil, Olive oil, Teel oil (Benne oil), Coconut oil and Peanut oil.

II) Fat and waxes – Kokum butter, Wool fat (Hydrous wool fat), Beeswax, Cetaceum (Sperm wax), and Brazil wax (Palm wax).

Reference Books:

1. Text book of Pharmacognosy – Trease and Evan's
2. Pharmacognosy – By Clausand Tayler.
3. Text Book of Pharmacognosy – T. E. Wallis.
4. Materia Medica –By Nadkarni.
5. Indian medical plants: by Kirtikar&Basu
6. Pharmacognosy – By Dr.Kokate

DSC 1-2 Practical

HERBAL COSMETIC –I

- 1) Study of general identification test of Carbohydrate.
- 2) Study of Organoleptic properties and microscopic studies of the following:
 - a. Rice Starch
 - b. Maize starch
 - c. Potato starch
 - d. Wheat starch
- 3) Study of Organoleptic properties, Chemical Identification test and of the following:
 - a. Agar
 - b. Indian gum.
 - c. Tragacanth.
 - d. Guar-gum
 - e. Pectin
- 4) Study and identification test of fixed oils.

DSC 1-3
Fundamental Chemistry

Objectives:

1. To understand the basic concepts of Chemistry and green chemistry with their advantages and disadvantages.
2. To understand the periodic table and its significance.
3. To know how to prepare solutions with different concentrations.

Learning Outcome:

At the end of the course, students will understand:

1. The Periodic Table is a way to sort the elements.
2. The hazardous elements for the environment.
3. The solutions and their compositions.

Unit 1: Introduction to Chemistry (10 L)

Definitions and Importance of Chemistry, Various Branches of Chemistry, Atoms and their components, Molecules, Empirical and Molecular formulas, States of Matters and its interconversion, Boiling point, Melting point, and Freezing point.

Unit 2: Periodic Table and its properties (10 L)

Introduction to the modern periodic table, Laws of the periodic table, Classification of elements (*metals, nonmetals, metalloids, Nobel Gases*), Properties of elements (Atomic Radius, Ionization Energy, Electron Affinity, Electronegativity), Different types of orbits and their shapes, The concept of Hybridization and bonding (Covalent, coordinate, Ionic, Metallic, and Hydrogen bond)

Unit 3: Concept of Green Chemistry (10 L)

Introduction, Principles of Green Chemistry, Types of different green chemical reactions, Photosynthesis concept, Importance of Green Chemistry, Hazardous elements to the environment. Ozone Layer (Presence, depletion Causes, Effects, Precautions). Advantages and disadvantages of Green Chemistry.

Unit 4: Fundamentals of Analytical Chemistry (10 L)

Introduction to Analytical chemistry, Different types of apparatus used for analysis, Types of analysis, Mixture and their types, Solutions and their characteristics, Concentration and their units (Molarity, Normality, % W/V Solution, % V/V Solutions)

Reference Books:

- 1) Principles of Inorganic Chemistry - Puri, Sharma & Kalia.
- 2) Advanced Inorganic Chemistry - Satyaprakash, Tuli, Basu.
- 3) Inorganic Chemistry- Puri, Sharma and Pathania
- 4) Douglas A Skoog, Donald M West, F James Holler, Stainly R Crouch, Fundamentals of Analytical Chemistry, 9th edition
- 5) Vogel's Quantitative Analysis
- 6) G D Christian - Analytical Chemistry
- 7) Green Chemistry: Environmentally Benign Reactions" by V K Ahluwalia
- 8) "Environmental Chemistry: Green Chemistry and Pollutants in Ecosystems" by Eric Lichtfouse and Didier Robert

DSC 1-3 (Practical)
Fundamental Chemistry

1. Introduction to apparatus used in the Laboratory.
2. Calibration of volumetric apparatus.
3. Preparation of solutions: 1 Normal, 1 Molar, %w/v solution, %v/v solution.
4. Determination of physical constants.
5. Green chemistry Reaction: By using a Simple process.

Vocational /Skill Enhancement Course.

SEC-1

Computer Applications

Objectives: Upon completion of the course the student shall be able to

1. Know the various Components of computers
2. Know the various types of databases, software and hardware.
3. Know the various applications of Computer.

Learning Outcomes

1. Ability to familiarize with basics of computers.
2. Ability to navigate the file system.
3. Ability to create and edit documents, spread sheets, and presentations.
4. Ability to perform basic data manipulation using spread sheets and use Indian languages in documents.
5. Ability to send and receive emails, follows email etiquettes, and communicates over the internet.
6. Ability to create and upload videos.
7. Ability to safely and correctly use websites, social networks, chat sites, and email.

Unit 1: Basics of Information Technology (10L)

- Computer Systems: characteristics of a computer, components of a computer system – CPU, memory, storage devices and I/O devices
- Memory: primary (RAM and ROM) and secondary memory
- Storage devices: hard disk, CD ROM, DVD, pen/flash drive, memory stick
- I/O devices: keyboard, mouse, monitor, printer, scanner, web camera
- Types of software: system software (operating system, device drivers), application software including mobile applications
- Computer networking: Type of networks: PAN, LAN, MAN, WAN, wired/wireless communication, Wi-Fi, Bluetooth, cloud computers (Private/public)
- Multimedia: images, audio, video, animation

Unit 2: Office tool Word (10L)

Word

- Introduction to a word processor: create and save a document.
- Edit and format text: text style (B, I, U), font type, font size, text colour, alignment of text. Format paragraphs with line and/or paragraph spacing. Add headers and footers, numbering pages, grammar and spell check utilities, subscript and superscript, insert symbols, use print preview, and print a document.
- Insert pictures, change the page setting, add bullets and numbering, borders and shading, and insert tables – insert/delete rows and columns, merge and split cells.
- Use auto-format, track changes, review comments, use of drawing tools, shapes and mathematical symbols.

Unit 3: Office toolPowerpoint Presentation (10L)

- Presentation tool: understand the concept of slide shows, basic elements of a slide, different types of slide layouts, create and save a presentation, and learn about the different views of a slide set – normal view, slide sorter view and hand- outs.
- Edit and format a slide: add titles, subtitles, text, background, and watermark, headers and footers, and slide numbers.
- Insert pictures from files, create animations, add sound effects, and rehearse timings.

Unit 4: Office tools Spreadsheets (10L)

- Spreadsheets: concept of a worksheet and a workbook, create and save a worksheet.
- Working with a spreadsheet: enter numbers, text, date/time, series using auto fill; edit and format a worksheet including changing the colour, size, font, alignment of text; insert and delete cells, rows and columns. Enter a formula using the operators (+,-,*, /), refer to cells, and print a worksheet.
- Use simple statistical functions: SUM (), AVERAGE (), MAX (), MIN (), IF () (without compound statements); embed charts of various types: line, pie, scatter, bar and area in a worksheet

Reference:

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600
2. South Washington Square, USA, (215) 922-1330.
3. Computer Fundamentals-- Goel, Anita Pearson
4. Computer Fundamentals-- Architecture & Organization Ram, B. 4th ed New Age
5. Computer Fundamentals: Concepts, Systems & Applications Sinha, P. K. BPB
6. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002

Ability Enhancement Course

L-1 ENGLISH

BOS

Indian Knowledge system (IKS) - Generic

BOS

VEC-2
Environmental studies

BOS

CC1

**Students has to undergo the assigned Research Repot /Co-curricular course
/Community Engagement and Services /Apprenticeship/Internship**

Semester II
DSC 1-4
COSMETIC TECHNOLOGY–II

Learning Objectives:

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

1. Physiochemical properties of Drug & Cosmetics.
2. Specific actives used in cosmetic formulations, their technical aspects and evaluation methods.
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 :(10 L)

Physiochemical properties of agents (Drug & Cosmetics) influencing design of product forms such as Dissociation Constant, Dielectric constant, Refractive Index, Dipole moment, Optical rotation, Stereochemistry

Unit-2: (10 L)

A) Semisolid formulations: Introduction to Ointments, paste, creams, jellies, sticks, selection of ideal bases and preparation.

B) Solid formulations - Bulk powders, incorporation of different varieties of powders viz. dusting, compact, face and talcum.

Unit-3: Biphasic liquid formulations: (10L)

Emulsions – Types, identification of emulsions, preparation.

Suspensions – Flocculated and non- flocculated suspensions, selection of wetting suspending and dispensing agents, preparation and stability.

Unit-4: Preservatives- Origin of contamination, factors influencing the effectiveness of preservatives, Ideal characteristics, uses and safety aspect(10L)

ReferenceBooks:

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

DSC 1-4 Practical
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) Water miscible.
- 4) Preparation of paste, jelly bases and simple stick bases.
- 5) Preparation of face powders.

DSC 1-5
HERBAL COSMETIC-II

OBJECTIVES:

1. To identify the common adulterants and substitutions.
2. To develop the knowledge base regarding source, chemical constituents, method of preparation and uses of natural cosmetic agents.
3. To develop the ability to understand performing chemical tests, to identify natural cosmetic agents.

OUTCOME: At the end of the course students will

1. Easy to identify the common adulterations and substitutions.
2. Attain Knowledge of the important natural products, their origin, properties.
3. Help to carry out the microscopic and morphological evaluation.
4. Ability to explain the role of natural products and in identification of substance through various chemical tests.

Unit-1: Ingredients of Mineral origin (10 L)

Study of following Ingredients of Mineral origin with respect to their source, preparation, chemical constituent, chemical tests and uses. Kaolin, Bentonite, Talc, Fuller's earth, Mica, Calamine.

Unit-2: Resin and balsam (10 L)

A) Definitions, classification and Isolation.

B) Study of following Resins and Balsam with respect to their source (Biological and Geographical), preparation, chemical constituent, chemical tests and uses. Balsam of Tolu, Balsam of Peru, Benzoin, Storax, Colophony, Asafoetida.

Unit-3: Tannins (10 L)

A) Definition, Classification and Chemical Test.

B) Study of following Tannins with respect to their source (Biological and Geographical), preparation, chemical constituent, chemical tests and uses. Black Catechu, Tannic Acid, Indian goose berry (Emblica), Baheda (Bahera), Myrobalan and Pale catechu

Unit-4: Adulteration (10 L)

Definitions and types of adulteration. Method of adulteration.

Methods of detection of adulteration in Natural ingredients- Physical method, Chemical method, Microscopic method, Morphological (Organoleptic) method and Biological method.

Reference Books:

1. Text book of Pharmacognosy by Trease and Evan's
2. Pharmacognosy – By Claus and Tayler.
3. Text Book of Pharmacognosy by T.E. Wallis.
4. Materia Medica – By Nadkarni.
5. Indian medical plants: by Kirtikar & Basu
6. Pharmacognosy – by Dr. Kokate

DSC 1-5 Practical
HERBAL COSMETIC-II

1. Organoleptic study and identification of following resins containing agents
 - a. Benzoin
 - b. Storax
 - c. Colophony
 - d. Asafoetida

2. Morphological study and identification of following tannin containing agents:
 - a. Black Catechu.
 - b. Indian goose berry
 - c. Pale catechu

3. Organoleptic study of Kaolin, Bentonite, Talc, Fuller's earth, Mica, Calamine.

DSC 1-6
Cosmetic Chemistry

OBJECTIVE:

1. To study sources of impurities and their control in Cosmetic raw materials.
2. To understand the basic concepts of Non-aq. titration of weak acid and weak bases.

OUTCOME: At the end of the course students will understand:

1. The impurities and limits of heavy metals and harmful ions in Cosmetic raw materials
2. The fundamental of Acid Base titration and uses of Indicators in Acid base titration.
3. The basic concept of Non-Aqueous titration and cosmetic

Unit-1: Impurities (10 L)

Definition- Impurities, Pure chemical compound, Official Substance, Official Preparations. Sources and types of impurities and their control in raw materials.

Test for Purity and Methods used in purification of Inorganic substances.

Introduction to limit test, limit test of chlorides, sulfates, lead, arsenic and Heavy metals.

Unit-2: Acid and base (10 L)

Theory of acids and bases with their advantages and disadvantages, concept of pH and pH scale, Concept of Buffer- Definition, Types, Buffer action. Standard solutions-Types and examples, Preparation of standard solution. (Definition with examples)Introduction to Acid Base titration, Theory of Acid base titration curves. Applications of Acid Base titration.

Unit-3: Non-aq. Titration (10 L)

Introduction to non-aqueous titration, Principle, Solvents used in non-aqueous Titrations, advantages and disadvantages.

Titration of weak base with perchloric acid. End point detection- Methods to determine end point, Non-aq. Titration of weak acid and weak bases- Indicators used and its application

Unit-4: Cosmetic Thickeners: (10 L)

Introduction, Purpose of use of Cosmetic Thickener, Choice of Thickener, Types of thickener with example.

Reference Books:

1. Text book of Practical Pharmaceutical Chemistry by Beckett and Stenlake.
2. Quantitative Inorganic analysis by I.Vogel.
3. Cosmetic Chemistry -I by Dr. Sheela Kulkarni

DSC 1-6 Practical

Cosmetic Chemistry

1. Volumetric estimation involving Measurement of the strength of acids 1) Strong Acid 2) Weak Acid
2. Volumetric estimation involving Measurement of the strength of Bases 1) Strong Base 2) Weak Base.
3. Experiments based on limit tests of chlorides, sulphate, Iron & Heavy metals.
4. Demonstration of Arsenic Acid limit test.
5. Practical significance of Material Safety Data Sheet (MSDS)
6. Determination of Hardness of water.

G.E. 1 – Human Anatomy

Objectives:

1. To study cross morphology, structure & function of various organs of human body.
2. To identify various tissues, organs of different systems of human body.
3. To understand mechanism of blood flow, blood component with function.

Learning outcomes:

At the end of this course, student will get familiar with-

1. Cell, tissues & their organelles
2. Anatomy & Functions of skin & hair
3. Morphology & different types of blood group

Unit 1. Cell and Tissue (10 L)

Definition, structure and function of cell and tissue, types of Tissue such as

- a) epithelial tissue, b) nervous tissue, c) connective tissue, d) muscular tissue.

Cell cycle.

Unit 2. Blood (10 L)

Study of blood components, study of blood group, blood coagulation, definition, process of blood coagulation, effect of impurities present in blood on skin appearance.

Unit 3. Skin (10 L)

Detailed anatomy and physiology of skin, types of colours related to skin, pigment responsible for skin colourization, sweat gland and Sebaceous gland, Difference between baby skin and adult skin.

Unit 4. Hair (10 L)

Detailed structure and function of hair, hair cycle, definition of keratin with types, keratinization, etiology of keratinization.

References:

1. The living body by Best and Taylor.
2. Human Physiology and Anatomy by Kimber.
3. Anatomy and Physiology in health and illness by Ross and Wilson.
4. Anatomy and Physiology for nurse by Windwood R. S.
5. Textbook of Pathology by Harsh Mohan. Jaypee brothers' medical publishers.
6. Basic Pathology by Robin and Kumar. Elsevier health sciences division.

O.E.-1

BOS

VSC – 1
Analytical Chemistry

OBJECTIVE:

1. Introduction to Potentiometer
2. Basics of Acid and Base solutions.
3. General discussion of theory of colorimetry
4. Basic principles of electroplating

OUTCOME: At the end of the course students will

1. Understand the professional way of handling the instruments.
2. Understand the basic principle and working of all the instruments.
3. Applications of learned principles, procedures in cosmetic analysis.

Unit-1: pH metry: pH and hydrogen ion concentration, pH calculation for weak acids and weak bases. Buffer solutions and types, mechanism of buffer action of acidic and basic buffers. **(10L)**

Unit-2: General discussion of theory of colorimetry: Lambert, Beer's law (Derivation not expected), Terms used in Colorimetry, Application of Beer's law, Deviation from Beer's law. Classification of methods of 'colour' measurement or comparison, Photoelectric **(10L)**

Unit-3: E.M.F. of Galvanic cell, Std. Oxidation Potential of an electrode, glass, calomel, redox electrodes, Principles of potentiometric titration **(10L)**

Unit-4: Electrolysis, Faraday's laws, Cathode current efficiency. Basic principles of electroplating, cleaning of articles. Electroplating of Nickel and Chromium. Anodizing. **(10L)**

Reference Books:

1. Text book of Quantitative Inorganic Analysis - By A. I. Vogel (ELBS and Longman3rdEdition).
2. Instrumental methods of Chemical analysis by Willard, MeritandDean.
3. Instrumental methods of Chemical analysis by Chatwal and Anand (HimalayaPublication).
4. Text Book of Physical Chemistry by S. Glasstone, MacmillanIndiaLtd.
5. Elements of Physical Chemistry by D. Lewis and S. Glasstone (Macmillan).
6. Principles of Physical Chemistry by Maron and Lando (Amerind).
7. An Introduction to Electrochemistry by S. Glasstone

L-2 English

BOS

VEC -1

Constitution of India

BOS

CC2

**Students has to undergo the assigned Research Repot /Co-curricular course
/Community Engagement and Services /Apprenticeship/Internship**