Punyashlok Ahilyadevi Holkar SolapurUniversity, Solapur

NAAC Accredited-2022

'B^{++}'Grade (CGPA2.96)

Name of the Faculty: Science & Technology

(As per New Education Policy 2020)

Syllabus: Five Year Integrated M. Tech. (Cosmetic Technology)

Name of the Course: Five Year Integrated M. Tech. Course in Cosmetic Technology Part-1 (Semester-I&II)

(Syllabus to be implemented from June-2024)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur.

Syllabus : Five Year Integrated M. Tech. Course in Cosmetic Technology Part-1 Sem. I & II

(As per New Education Policy 2020**)**

Preamble:

In this course of Integrated M. Tech. in Cosmetic Technology Part-1, there will be a fundamental study about the formulation, manufacturing, analysis and marketing of functional products. This area is mainly dependent on the subject of Pharmacy and Chemistry. This course includes studying raw materials, testing methods and laboratory procedures that are available worldwide. Aligned with the vision of the National Education Policy (NEP) 2020, the program offers a flexible, multidisciplinary, and learner-centric curriculum that encourages critical thinking, innovation, and holistic development. The Integrated M. Tech. in Cosmetic Technology program spans five years, with each year offering a progressively advanced curriculum designed to build a strong foundation in Cosmetic field while allowing for specialization and interdisciplinary learning. The curriculum is structured around several key components:

- **Major Courses:** These core courses form the backbone of the program, providing in-depth knowledge and understanding of essential Herbal Cosmetics and Chemistry concepts, theories, and methodologies. Students will engage with topics like Acid Base concepts, Raw Materials study with their purity and study of Natural Cosmetic Agents.
- **Minor Courses**: Students have the opportunity to choose minor courses from related or distinct disciplines, promoting an interdisciplinary approach to learning. This flexibility allows students to complement their Cosmetic education with insights from fields such as statistics, computer science, or biological science, enhancing their versatility and broadening their career prospects.
- **Open Electives/General Electives**: The program encourages intellectual exploration beyond the core discipline by offering a wide range of elective courses. These electives enable students to pursue their interests in diverse subjects, fostering creativity, critical thinking, and a well-rounded educational experience.
- **Vocational and Skill Enhancement Courses**: Practical skills and technical proficiency are integral to the program, with vocational and skill enhancement courses providing hands-on experience in areas such as water Analysis as well as Basic ICT tools. These courses are designed to prepare students for immediate employment and equip them with the tools necessary for career advancement in various scientific and technological fields.
- **Ability Enhancement Courses (AEC), Indian Knowledge System (IKS), and Value Education Courses (VEC):** In alignment with NEP 2020, the program integrates courses that emphasize the Indian Knowledge System, ethical values, and life skills. These courses foster a deep appreciation for India's rich cultural heritage, while also developing essential communication and ethical decision-making skills that arevital for personal and professional growth.
- **Field Projects/Internships/Apprenticeships/Community Engagement Projects/On-Job Training:** To bridge the gap between theoretical knowledge and real-world applications, the program includes opportunities for field projects, internships, apprenticeships, and community engagement. Theseexperiences provide students with practical insights, problem-solving abilities, and exposure to professional environments, enhancing their readiness for careers in Cosmetics and related fields.
- **Research Methodology and Research Projects**: Research is a critical component of this program, with students acquiring skills in research methodology, data collection, and analysis. By engaging in independent research projects, students are encouraged to develop innovative solutions to complex cosmetic problems, preparing them for advanced studies and research-oriented careers.

Programme Outcomes:

Students graduating from the Integrated M. Tech. in cosmetic technology Part-1 program will be able to:

Major Courses:

- PO 1: Demonstrate in-depth knowledge and understanding of core concepts, theories, and methodologies in the chosen major discipline.
- PO 2: Apply disciplinary knowledge to solve problems, analyze data, and take needful decisions in professional and research contexts.

Minor Courses:

- PO 3: Acquire complementary knowledge and skills from a related or distinct discipline, enhancing interdisciplinary understanding and versatility.

Open Electives/General Electives:

- PO 4: Explore diverse subjects beyond the core discipline, fostering a broad-based education and cultivating critical thinking and creativity.

Vocational and Skill Enhancement Courses:

- PO 5: Gain hands-on experience and technical proficiency in specific areas, preparing for immediate career opportunities.

Ability Enhancement Courses (AEC), Indian Knowledge System (IKS), and Value Education Courses (VEC):

- PO 6: Understand and appreciate the rich heritage of the Indian Knowledge System, integrating traditional wisdom with modern education.
- PO 7: Develop ability enhancement skills like communication and life skills along with ethical values, social responsibility, and a strong sense of citizenship, contributing positively to society.

Field Projects/Internship/Apprenticeship/Community Engagement Projects/ On Job Training/ Internship/Apprenticeship:

- PO 8: Apply theoretical knowledge to real-world situations through field projects, internships, community engagement and on job Training for gaining practical experience and problem-solving skills.

Research Methodology and Research Project:

- PO9: Acquire research skills, including data collection, analysis, and interpretation, fostering a scientific approach to problem-solving to develop independent research projects handling capabilities.

Programme Specific Outcomes:

- PSO 1: Upon completion of programme students will have opportunities to work in cosmetic field related to Formulation as well as Marketing of Cosmetics.
- PSO 2: Students will be able to formulate a Research Design and complete a substantial work of new products.
- PSO 3: Students will be familiar with relevant governmental regulations which will help to confirm product compliance in Domestic as well as International Market.
- PSO 4: Students will be able to identify various types of packaging materials and their suitability for different cosmetic products.

Eligibility Criteria:

- Candidates with H.S.C. in the Science stream are eligible for the Five-Year Integrated M. Tech. in Cosmetic Technology Part-1.

Title of the Course: Integrated M. Tech. (Cosmetic Technology) Part-1

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 50 marks out of which 30 marks will be for Term End examination (University Examination) and 20 marks for Internal Assessment. Each practical paper will have 50 marks out of which 30 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 30 marks for each theory paper. The candidate also has to appear for internal evaluation of 20 marks and external evaluation (University Examination) of 30 marks for each practical paper. For SEC-2, University assessment (Theory) for 30 marks and College assessment (Practical) for 20 marks.

I) Nature of Theory question paper:

Instructions
1) All Questions are compulsory
2) Figure to right indicate full marks

Q. No.1) Choose correct alternative. (MCQ) (6 Marks)

Q.No.2) Answer the following (Any Three) (6 Marks)

A)
B)
C)
D)
E)

Q.No.3) Answer the following. (Any Two) (6 Marks)
A)
B)
C)

Q. No.4) Answer the following (Any Two) (6 Marks)
A)
B)
C)

Q.No.5) Answer of the following (Any One) (6 Marks)
A)
B)

II) Nature of Practical question paper: Practical examination will be of 2 hours duration carrying 30 marks. 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

First Year structure as per NEP-2020

Level/ Difficulty	Sem.	Faculty			Generic/ Open Elective GE/ OE	Vocational and Skill Enhancement Courses (SEC/VSC)	Ability Enhancement Course (AEC),IKS, VEC	Field Project/ RP/CC/Internship/Apprenticeship/ Community Engagement & Services	Credits	Cumulative Credits
		Major		Minor						
		DSC	DSE							
4.5 100-200	I	DSC1-1 (2+2)#	--		GE1/ OE1(2)	SEC1 (2)	L1-1(2) IKS(2) VEC1(2) (Indian ConstitutionAnd Democracy)	--	22	**44 UG Certificate(44)**
		DSC2-1 (2+2)#	--							
		DSC3-1 (2+2)#	--							
	II	DSC1-2 (2+2)#	--		GE2/ OE2(2)	SEC 2 (2)	L1-2(2) VEC2(2) (Environmental Studies)	CC1 (2)	22	
		DSC2-2 (2+2)#	--							
		DSC3-2 (2+2)#	--							
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor										

Structure for SEM-I

Semester	Code	Course Code	Title of the Paper	Semester Examination			L	T	P	Credits
				Theory (UA)	CA	Total				
Sem-I			**Major**							
	DSC 1-1	CT01101	Cosmetic Technology I	30	20	50	2	--	--	2
	DSC 2-1	CT01102	Herbal Cosmetics I	30	20	50	2	--	--	2
	DSC 3-1	CT01103	Cosmetic Chemistry I	30	20	50	2	--	--	2
	DSC 1-1(Practical)	CT01104	Practical-Cosmetic Technology I	30	20	50	--	--	2	2
	DSC 2-1(Practical)	CT01105	Practical-Herbal Cosmetics I	30	20	50	--	--	2	2
	DSC 3-1(Practical)	CT01106	Practical-Cosmetic Chemistry I	30	20	50	--	--	2	2
			Generic/ OpenElective							
	G.E./O. E* 1	CT01107	Fundamental Chemistry	30	20	50	2	--	--	2
			Vocational/Skill EnhancementCourse.							
	SEC1	CT01108	Basics of Analysis and ICT	30	20	50	--	--	2	2
			Ability Enhancement Course (AEC) IKS, VEC							
	L1-1	ENG-101	English	30	20	50	2	--	--	2
	IKS	CT01109	IKS	30	20	50	2	--	--	2
	VEC-1	ICD-101	Indian Constitution and Democracy	30	20	50	2	--	--	2
		Total for Semester -I		330	220	550	14	--	08	22

Structure for SEM-II

Semester	Code	Course Code	Title of the Paper	Semester Examination			L	T	P	Credits
				Theory (UA)	CA	Total				
Sem-II			**Major**							
	DSC 1-2	CT01201	Cosmetic Technology II	30	20	50	2	--	-	2
	DSC 2-2	CT01202	Herbal Cosmetics II	30	20	50	2	--	-	2
	DSC 3-2	CT01203	Cosmetic Chemistry II	30	20	50	2	--	-	2
	DSC 1-2(Practical)	CT01204	Practical-Cosmetic Technology II	30	20	50	--	--	2	2
	DSC 2-2(Practical)	CT01205	Practical-Herbal Cosmetics II	30	20	50	--	--	2	2
	DSC 3-2(Practical)	CT01206	Practical-Cosmetic Chemistry II	30	20	50	--	--	2	2
			Generic/Open Elective							
	G.E./ O.E*2	CT01207	Analytical Chemistry	30	20	50	2	--	-	2
			Vocational / Skill Enhancement Course.							
	SEC2	CT01208	Human Anatomy	30	20	50	1	--	1	2
			Ability Enhancement Course (AEC)IKS, VEC							
	L1-2	ENG-201	English	30	20	50	2	--	-	2
	VEC-2	ENS24	Environmental Studies	30	20	50	2	--	-	2
	CC1		**CC1 (Any one)**	--	50	50	--	--	2	2
		CT01209	Field Project							
		CT01210	Project (RP)							
		CT01211	Co-curricular Courses (CC)							
		CT01212	Internship							
		CT01213	Apprenticeship							
		CT01214	Community Engagement							
			Total for Semester-II	300	250	550	13	--	9	22

Note:

For Theory and Practical (DSC1-1 to DSC3-2)- 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.1-2/O.E.1-2, SEC-1, L1-1, IKS, VEC-2, VSC-1, L1-2, VEC-1 University assessment (Theory) for 30 marks and College assessment for 20 marks.

For SEC-2 University assessment (Theory) for 30 marks and College assessment (Practical) for 20 marks.

For CC1 Field Project/RP/CC/Internship/Apprenticeship/Community Engagement services
College assessment will be of 50 marks.

Abbreviations:

Generic/ Open Electives: OE;
Vocational Skill and Skill Enhancement Courses: VSEC;
VocationalSkill Courses: VSC;
Skill Enhancement Courses: SEC;
Ability Enhancement Courses: AEC;
Indian Knowledge System: IKS;
Value Education Courses: VEC;
OJT: On Job Training: Internship/Apprenticeship:
Field projects: FP
Community Engagement & Service CEP
RM: Research Methodology;
Project: RP
Co-curricular Courses: CC;

Note: Students of School of Technology can opt for O.E. subject from other branch of Science and Technology (Student can select either G.E. or O.E)

DSC 1-1

Course Code: CT01101

COSMETIC TECHNOLOGY–I

Objectives of the Course:

Upon completion of this course students will be familiar with

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

Course 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 **(10L/15M)**

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 **(5L/10M)**

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

Unit-III: **(5L/10M)**

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

Unit-IV: **(10L/15M)**

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 **Labeling-** General labeling requirements and specimen labels for drugs and cosmetics. **Containers-** Types of containers Narrow mouth bottle, wide mouth bottle, tubes, tubular containers, powder containers, compact containers, stick 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, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.
3. Textbook of cosmeticology by Sanju Nanda & Roop K. Khar, Tata Publishers.
4. Textbook of Pharmaceutical formulations, B. M. Mithal, Vallabh Prakashan.
5. The Indian Pharmacopoeia.
6. Remington's Pharmaceutical Practices.
7. Cooper & Gum Dispensing for Pharmaceutical Students.
8. A. N. Martin-Physical Pharmacy.

DSC 1-1 (Practical)

Course Code: CT01104

COSMETIC TECHNOLOGY–I (60 Hrs/50M)

Objectives of the Course:

1. To introduce students to monophasic dosage forms, including their types and characteristics.
2. To introduce students how to prepare various listed products with selection of appropriate ingredients.

Course Outcomes:

At the end of the course, students will understand:

1. Students will be able to define and describe monophasic dosage forms such as solutions, gels, and suspensions.
2. Students will be able to prepare various listed products with their active ingredients as well as their compositions.

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 2-1

Course Code: CT01102

Herbal Cosmetics-I

Objectives of the Course:

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 identity natural cosmetic agents.

Course Outcomes:

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 (6 L/10M)

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 (10L/15M)

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 (7L/12M)

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 (Gumarabic), Jaguar-gum (Gua flour), Pectin, Agar, Tragacanth.

Unit-4: Lipids (7L/13M)

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), Bees wax, Cetaceum (Sperm wax), and Brazil wax (Palm wax).

Reference Books:

1. Textbook of Pharmacognosy– Trease and Evan's
2. Pharmacognosy– By Claus and Tayler.
3. Textbook of Pharmacognosy–T. E. Wallis.
4. Materia Medica–By Nadkarni.
5. Indian medical plants: by Kirtikar & Basu
6. Pharmacognosy– By Dr. Kokate
7. Naturals and Cosmetics– By Dr. Satish Sakharwade

DSC 2-1 Practical

Course Code: CT01105

Herbal Cosmetics I (60 Hrs/50M)

Objectives of the Course:

1. To perform general identification tests to identify and characterize carbohydrates in different samples
2. To examine and compare the organoleptic properties and microscopic features of various starches.
3. To study the organoleptic properties and perform chemical identification tests for various gums.

Course Outcomes:

1. Students will be able to conduct various qualitative tests to identify carbohydrates.
2. Students will be able to compare the differences in texture, color, and microscopic appearance among the different starches.
3. Students will understand the basic functional properties and applications of each gum based on their tests and observations.

1) Study of general identification test of Carbohydrate.

2) Study of Organoleptic properties and microscopic studies of the following:

   a. Rice Starch
   b. Potato starch
   c. Maize starch
   d. Wheat starch

3) Study of Organoleptic properties, Chemical Identification test and of the following:

   a. Agar
   b. Tragacanth
   c. Indian gum.
   d. Guar-gum
   e. Pectin

4) Study and identification test of fixed oils.

DSC 3-1

Course Code: CT01103

Cosmetic Chemistry-I

Objectives of the Course:

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.

Course Outcomes:

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.

Unit1: Introduction to Chemistry (7L/12M)

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.

Unit2: Periodic Table and its properties (8L/13M)

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 (8L/13M)

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.

Unit4: Fundamentals of Analytical Chemistry (7L/12M)

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) Vogel's Quantitative Analysis
5) G D Christian- Analytical Chemistry
6) Green Chemistry: Environmentally Benign Reactions" by V K Ahluwalia
7) "Environmental Chemistry: Green Chemistry and Pollutants in Ecosystems" by Eric Lichtfouse and Didier Robert

DSC 3-1 (Practical)

Course Code: CT01106

Cosmetic Chemistry-I **(60 Hrs/50M)**

Objectives of the Course:

1. To familiarize students with the various types of laboratory apparatus and their specific uses.
2. To teach students the procedures for accurately calibrating volumetric apparatus.
3. To instruct students on the methods for preparing various types of solutions with accurate concentrations.

Course Outcomes:

1. Students will demonstrate the correct handling and maintenance of each apparatus.
2. Students will be able to perform the calibration process for volumetric apparatus correctly.
3. Students will be able to understand and apply the concepts of concentration and dilution.

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

Generic/Open Elective 1

Course Code: CT01107

Fundamental Chemistry

Objectives of the Course:

1. Introduction of Thermochemistry, Odorous materials manufactured synthetically and Polymers
2. Introduction of Alcohols, Aldehydes, Ketones, Phenols and Esters.
3. Basic fundamentals of Organic chemistry, Inorganic chemistry, Physical chemistry, analytical chemistry

Course Outcomes:

At the end of the course students will

1. Understand the basic properties of Alcohols, Aldehydes, Ketone, Phenol and Esters and its applications in Cosmetics.
2. Understand the basics of Thermal chemistry and Polymer chemistry.
3. Understand the manufacturing of synthetic odorous materials

Unit-1: (6L/11M)

Study of Introduction, Nomenclature, Physical properties, Chemical Properties and its uses/application in Cosmetics of following

A) Alcohols
B) Phenols
C) Aldehydes
D) Ketones
E) Esters

Unit-2: Odorous materials manufactured synthetically (7L/12M)

Introduction to Condensation, Nitration, Hydrogenation, Oxidation and Nitration. Odorous materials manufactured synthetically by (Reaction and flow diagrams) Oxidation – Vanillin, Heleotropins, Anisaldehyde, Benzaldehyde.

Unit-3: Thermochemistry (10L/15M)

Introduction, heat of reaction at constant volume and constant pressure, Heat of combustion, heat of neutralization, heat of solution and their determination. Laws of thermochemistry. Physical Properties and properties of liquids molecules such as i) Surface tension ii) Viscosity iii) Intermolecular forces and its impact on states of matter, physical properties and chemical constitution, parachor, dipole moment, Water and Its types viz. Distilled water, Deionized water, Purified water and Water for Injection as per Pharmacopoeia and its process of production.

Unit-4: Polymers (7L/12M)

Introduction, Basic concept and definition, Classification of polymers-Organic and Inorganic polymers, Comparison between organic and inorganic polymers, Polymer backbone, Homoatomic Inorganic polymer containing –i) Phosphorus ii) Fluorocarbons, Heteroatomic Inorganic polymer-i) Silicones ii) Phosphonitrilic compounds, Introduction to Natural Polymers and Its applications in cosmetics.

Reference Books:

1. Text Book of Organic Chemistry by Morrison and Boyd.
2. Text book of Organic Chemistry by Bahl &Bahl.
3. A.N. Martin – Physical Pharmacy
4. Glasstone– Elements of Physical Chemistry
5. A. J. Med – Physical Chemistry
6. Vogel- Quantitative Inorganic Analysis.
7. Bahl and Tuli: Essentials of Physical Chemistry

Skill Enhancement Course.

Course Code: CT01108

SEC-1 Basics of Analysis and ICT **(60 Hrs/50M)**

Objectives of the Course:

1. To develop practical skills in basic and conceptual Science.
2. To gain practical knowledge by applying the experimental methods to correlate with the theory
3. To prepare students to analyze water samples
4. To develop students to learn measuring skills in practical.
5. To develop basic awareness about IT.
6. To develop knowledge about computational tools.

Course Outcomes:

At the end of the course, students will understand:

1. Basic concepts in water sample analysis
2. Importance of measurement and observation of water parameters
3. Handling of different computational tools.

Students have to perform below practical's (A and B)

List of Experiments: (A) **(30 Hrs/25M)**

1. To determine pH of given water samples (Potable water, RO/DM water and Distilled water).
2. To determine conductivity of given water and emulsion samples. (Potable water, RO/DM water and Distilled water)
3. To determine carbonates from given water sample.
4. To determine chlorides from given water sample.
5. To determine Hardness of given water sample.

List of Experiments: (B) **(30 Hrs/25M)**

1. Windows10+Internet+GoogleDrive+GoogleChrome.
2. MS Word. (Basic Tools)
3. MS Excel (Basic tools)
4. MS PowerPoint.
5. Gmail

Ability Enhancement Course

Course Code: ENG-101

L1-1 ENGLISH

BOS

Course Code: CT01109

Indian Knowledge system (IKS)

Course Outcomes: Upon completion of this course students will be able
1. Understanding Indian Philosophical Systems and Knowledge Development
2. Analyzing Indian Contributions to Science, Astronomy, and Mathematics
3. Exploring Traditional Indian Approaches to Life, Health, and Environment

Unit I: Bhāratīya Civilization and Development of Knowledge System **(10 Hours)**

Indian Knowledge Systems (IKS): Foundational concepts and characteristics of Indian philosophical and scientific traditions.
Significance of Ancient Knowledge: Understand the need of ancient knowledge and its role in shaping modern civilization.
Indian Philosophical Systems: Development and distinctive features of both Vedic and non-Vedic philosophical systems, analyzing their historical and cultural contexts.
Ancient Educational Institutions: Takṣaśilā and Nālandā, and notable alumni who contributed to the spread of knowledge.

Unit II: Science and Mathematics **(10 Hours)**

Physics: Indian concepts related to the atom, laws of motion, electricity, magnetism, and the mystery of light.
Chemistry: Indian innovations in daily-life chemistry, including dyes, paints, cements, glass, pottery, and metallurgy.
Mathematics: Indian origin of foundational mathematical and statistical concepts, such as the concept of zero, pi, the decimal number system and Probability. Bodhayana Sutra and Vedic Mathematics, emphasizing their influence on mathematical thinking.

Unit III: Life, Environment, and Health **(10 Hours)**

Approaches to Life and Health: Traditional Indian perspectives on life sciences, including plant science, anatomy and physiology, and agriculture.
Environmental Awareness: India's traditional emphasis on ecology and environmental sustainability. Ancient practices that promote environmental stewardship.

Text books:

1. IKS: The Knowledge System of Bhārata by Bhag Chand Chauhan
2. INTRODUCTION TO INDIAN KNOWLEDGE SYSTEM: CONCEPTS AND APPLICATIONS by B. MAHADEVAN
3. History of Science in India Volume-1, Part-I, Part-II, Volume VIII, by Sibaji Raha, et al. National Academy of Sciences, India and The Ramkrishna Mission Institute of Culture, Kolkata (2014)

VEC-1

Course Code: ICD-101

Indian Constitution and Democracy

Course outcomes:

Upon completion of this course students will be able to

1. Understand the significance of the Indian constitution and Democracy.
2. Identify and explain the key features and objectives of the constitution and Democracy.
3. Discuss the constitutional provisions related to social justice, equality and affirmative action**.**

Unit I - The Constituent Assembly and the Constitution: **(15L)**

A) Preamble of the Constitution.
B) Features of the Constitution
C) Fundamental Rights of Indian Citizen
D) Fundamental Duties of Indian Citizen

Unit II - Democracy in India: **(15L)**

A) Meaning, Definition, Features and Types of the Democracy
B) Election commission of India - Structure, Power and Function
C) Good Governance - Meaning and Features
D) Indian Election and Voting Awareness Programme

Semester II

DSC 1-2

Course Code: CT01201

COSMETIC TECHNOLOGY–II

Objectives of the Course:

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.

Course 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: **(7L/12M)**

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: **(9L/15M)**

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: **(9L/15M)**

Emulsions– Types, identification of emulsions, preparation.

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

Unit-4: Preservatives- Origin of contamination, factors influencing the effectiveness of preservatives, Ideal characteristics, uses and safety aspect **(5L/8M)**

Reference Books:

1) Textbook of Pharmaceutical formulations, B M 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.

DSC 1-2 Practical

Course Code: CT01204

Cosmetic Technology-II **(60 Hrs/50M)**

Objectives of the Course:

1. To prepare emulsions using the Dry-Gum and Wet-Gum methods and understand the differences between these methods.
2. To prepare various types of ointment bases and understand their properties and applications.
3. To prepare different types of bases for pastes, jellies, and sticks, and to understand their formulation and application properties.
4. To prepare face powders and understand the formulation principles required to achieve desirable cosmetic properties.

Course Outcomes:

1. Students will successfully prepare an emulsion using the Dry-Gum method, involving trituration of gum with oil before the addition of water.
2. Students will be able to compare the characteristics of emulsions prepared by the two methods, including ease of preparation, stability, and texture
3. Students will be able to prepare various types of ointment bases and understand its capacity to absorb water and other substances.
4. Students will be able to prepare face powders with the desired texture, color, and adhesion to the skin.

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 2-2

Course Code: CT01202

HERBAL COSMETIC- II

Objectives of the Course:

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 identity natural cosmetic agents.

Course Outcomes: 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 **(7L/12M)**

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** **(8L/13M)**

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** **(9L/15M)**

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 **(6L/10M)**

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

DSC 2-2 Practical

Course Code: CT01205

HERBAL COSMETIC-II **(60 Hrs/50M)**

Objectives of the Course:

1. To perform an organoleptic evaluation of resins to understand their sensory characteristics and distinguish between the substances based on their organoleptic properties.
2. To conduct a morphological study of tannin to understand its physical characteristics and structural features, which can aid in its identification and characterization.

Course Outcomes:

At the end of the course, students will understand:

1. Students will develop the ability to perform and document an organoleptic evaluation as well as understand the importance of organoleptic properties in the identification.
2. Students will be able to observe and describe the physical appearance of tannin, including its color, nature, and texture.

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 gooseberry c. Pale catechu

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

DSC 3-2

Course Code: CT01203

Cosmetic Chemistry II

Objectives of the Course:

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.

Course Outcomes: 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 concepts of non-aqueous titration and cosmetic

Unit-1: **Impurities** (**8L/13M)**

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** **(7L/12M)**

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-aqueous Titration** **(8L/13M)**

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

Titration of weak base with perchloric acid. Endpoint detection- Methods to determine endpoint,

Non-aq. Titration of weak acid and weak bases- Indicators used and its application

Unit-4: Cosmetic Thickeners: **(7L/12M)**

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

Reference Books:

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

DSC 3-2 Practical

Course Code: CT01206

Cosmetic Chemistry II (60 Hrs/50M)

Objectives of the Course:

1. To perform volumetric estimations to measure the strength of both acids and bases using titration techniques.
2. To conduct limit tests to detect and quantify the presence of chlorides, sulphates, iron, and heavy metals in samples.
3. To educate students on the importance and use of Material Safety Data Sheets (MSDS) for ensuring safety and compliance inlaboratory and industrial settings.

Course Outcomes:

At the end of the course, students will understand:

1. Students will accurately determine the concentration of acids and bases solutions by titration techniques.
2. Students will be able to perform limit tests for chlorides, sulphates, iron, and heavy metals.
3. Students will be able to use MSDS to assess the risks associated with chemicals and materials used in practical work.

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 Bases1) Strong Base2) 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)

Generic/Open Electives 2

Course Code: CT01207
Analytical Chemistry

Objectives of the Course:

1. Introduction to Potentiometer
2. Basics of Acid and Base solutions.

3. General discussion of theory of colorimetry
4. Basic principles of electroplating

Course Outcomes:

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 **(7L/12M)**

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.

Unit-2: General discussion of theory of colorimetry **(8L/13M)**

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 'color' measurement or comparison, photoelectric photometer method-Single cell photoelectric colorimeter.

Unit-3: Fundamentals of potentiometry **(7L/12M)**

E.M.F. of Galvanic cell, Std. Oxidation Potential of an electrode, glass, calomel, redox electrodes, Principles of potentiometric titration

Unit-4: Basics of Electroplating **(8L/13M)**

Electrolysis, Faraday's laws, Cathode current efficiency. Basic principles of electroplating, cleaning of articles. Electroplating of Nickel and Chromium. Anodizing.

Reference Books:

1. Text book of Quantitative Inorganic Analysis - By A. I. Vogel (ELBS and Longman3rdEdition).
2. Instrumental methods of Chemical analysis by Willard, Merit and Dean.
3. Instrumental methods of Chemical analysis by Chatwal and Anand (Himalaya Publication).
4. Text Book of Physical Chemistry by S. Glasstone, Macmillan India Ltd.
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

SEC 2

Course Code: CT01208

Human Anatomy

Objectives of the Course:

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.

Course outcomes:

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

1. Cell, tissues their organelles
2. Anatomy and Functions of skin
3. Students will understand microscopic structures of different Tissues

Unit-1 **(8L/15M)**

A) Cell and Tissue

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.

B) Blood

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

Unit-2 Skin **(7L/15M)**

A) Structure and function of skin, types of colors related to skin, pigment responsible for skin colorization, sweat gland and Sebaceous gland, Difference between baby skin and adult skin.

B) Structure and function of Hair Teeth and Nails.

Reference books:

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

SEC-2 (Practicals) **(30 Hrs/20M)**

Objectives of the Course:

1. To conduct a microscopic examination of various tissues to understand their structural characteristics, identify different types of tissues, and learn about their functions and organization.
2. To measure and analyze the clotting time and bleeding time of blood samples to evaluate the coagulation ability.
3. To measure and evaluate the hemoglobin content in blood samples.

Course outcomes:

1. Students will be able to identify and classify various types of tissues
2. Students will be able to accurately measure the bleeding time using methods such as the Duke or Ivy method.
3. Students will be able to accurately determine the clotting time of blood samples using techniques such as the capillary tube method.
4. Students will able to accurately determine the hemoglobin content and understand the normal range for hemoglobin levels.

Experiments:

1. Microscopic examination of following Tissues a) epithelial tissue, b) nervous tissue, c) connective tissue, d) muscular tissue.
2. Recording of body temperature, Pulse and Blood Pressure
3. Determination of clotting time.
4. Determination of bleeding time
5. Determination of hemoglobin content.
6. Study of following (with the help of Charts and models, Educational Videos, Presentations etc.)
   a) Skin
   b) Tooth
   c) Hairs
   d) Nails

Note: **SEC-2** University assessment (Theory) for 30 marks and College assessment (Practical) for 20 marks.

L1-2 English

Course Code: ENG-201

BOS

VEC-2
Course Code: ENS24
Environmental Studies

Objectives of the Course:

1. To know the importance of environment and various issues in environment.
2. To test the knowledge and understanding of the students in the field of environmental science.
3. To inculcate the positive approach in the students towards environment and ecology from the social perspective.
4. To develop scientific, interpretive and creative thinking skills in the students about environment.
5. To explore the problems that we face in understanding our nature that correlate with socio-economical solution for sustainable development.

Course Outcomes:

At the end of this course students will:

1. Have awareness on issues with environmental pollution, their effects and possible solutions.
2. Gain knowledge of natural resources, their significance, and the effects of human activity on the resources in environment.
3. Be familiar with biodiversity conservation and its significance.
4. Understand the need of sustainable development for future and become competent and socially responsible citizen of India.

Unit 1: Introduction, Environmental Pollution, Biodiversity, Ecosystems, Natural Resources and Management **(15 Hrs)**

a) Introduction to Environmental Studies

• Multidisciplinary nature of environmental studies

• Scope and importance; Concept of sustainability and Sustainable Development Goals, Environment Social Governance (ESG), Green Finance and Environmental Economics.

• Environmental pollution types, causes, effects and controls; Air, water, soil and noise pollution, nuclear hazards and human health risks, Solid waste management, 3R Principle and Pollution case studies.

b) Biodiversity and Conservation

• Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots

• India as a mega-biodiversity nation; Endangered and endemic species of India

• Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex- situ conservation of biodiversity and Values of Biodiversity.

c) Ecology & Ecosystems:

 Structure and function of ecosystem, Energy flow, food chains, food webs and ecological succession. Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) and case studies.

d) Natural Resources: Renewable and Non-renewable Resources

• Land resources and land use change; Land degradation, soil erosion and desertification.

• Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.

• Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).

• Energy resources: Renewable and non- renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit 2: Environmental Policies, practices, Acts and regulations **(15 Hrs)**

a) Environmental Policies & Practices

• Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture

• Environment Laws: Environment Protection Act, Air (Prevention, & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).

• Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

b) Human Communities and the Environment

• Human population growth: Impacts on environment, human health and welfare.

• Resettlement and rehabilitation of project affected persons; case studies.

• Disaster management: floods, earthquake, cyclones and landslides.

• Environmental ethics and Environmental movements: Chipko, Silent valley, Bishnoi's of Rajasthan in environmental conservation.

• Environmental communication and public awareness, case studies (e.g. CNG vehicles in Delhi), National Climate Action Programme (NCAP)

Text Books:

1. Environmental Studies E-Text Book (Marathi and English Medium) Solapur University, Solapur ,
2. Environmental Studies – UGC- Text Book for Undergraduate Courses for all Branches of Higher Education – Erach Bharucha, Bharti Vidyapeeth Institute of Environment Education and Research, Pune
3. Text Book Of Environmental Studies, Asthana D.K. and Asthana Meera S Chand & Company
4. A Textbook of Environmental Studies, January 2006 Ahmed Khan ABD Publishers

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14. Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent.
15. Warren, C. E. 1971. Biology and Water Pollution Control. WB Saunders.
16. Wilson, E. O. 2006. The Creation: An appeal to save life on earth. New York: Norton.
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CC1

Course Code	Course Name of CC 1
CT01209	Field Project
CT01210	Project (RP)
CT01211	Co-curricular Courses (CC)
CT01212	Internship
CT01213	Apprenticeship
CT01214	Community Engagement

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