

**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,  
CHHATRAPATI SAMBHAJINAGAR.**



**CIRCULAR NO.SU/ Sci./College/NEP-2020/104/2024**

It is hereby inform to all concerned that, In continuation circular No.SU./Revised B.Sc./NEP/72/2024/25588-96 dated 29.04.2024, the revised syllabi prepared by the Board of Studies/Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technology, the Academic Council at its meeting held on 08 April 2024 has accepted **the following Revised B.Sc. Course Structure & Curriculum** as per direction by the State Government dated on 13 March 2024 under the Faculty of Science & Technology (as per National Education Policy – 2020) run at the Affiliated Colleges, Dr.Babasaheb Ambedkar Marathwada University as appended herewith.

<b>Sr.No.</b>	<b>Courses</b>	<b>Semester</b>
1	Physics	Ist and IInd semester
2	Instrumentation Practice	Ist and IInd semester
3	Electronics	Ist and IInd semester
4	Mathematics	Ist and IInd semester
5	Industrial Chemistry	Ist and IInd semester
6	Agrochemical Fertilizer	Ist and IInd semester
7	Horticulture	Ist and IInd semester
8	Biochemistry	Ist and IInd semester
9	Botany	Ist and IInd semester
10	Zoology	Ist and IInd semester
11	Biotechnology	Ist and IInd semester
12	bioinformatics	Ist and IInd semester
13	Microbiology	Ist and IInd semester
14	Dairy Science & TEchnology	Ist and IInd semester
15	Statistics	Ist and IInd semester
16	computer Science	Ist and IInd semester
17	Geology	Ist and IInd semester
18	Chemistry	Ist and IInd semester
19	Analytical Chemistry	Ist and IInd semester
20.	Polymer Chemistry	Ist and IInd semester
21.	Environmental Science	Ist and IInd semester
22.	Fishery Science	Ist and IInd semester

This is effective from the Academic Year 2024-25 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,  
Chhatrapati Sambhajnagar  
-431 004.  
REF.NO. SU/SCI./2024/27128-35  
Date:-27.05.2024.

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**Deputy Registrar,**  
**Academic Section.**

**Copy forwarded with compliments to :-**

- 1] **The Principal of all concerned Colleges,**  
Dr. Babasaheb Ambedkar Marathwada University,
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

**Copy to :-**

- 1] The Director, Board of Examinations & Evaluation, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajnagar.
- 2] The Section Officer,[B.Sc.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajnagar.
- 3] The Programmer [Computer Unit-1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajnagar.
- 4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajnagar.
- 5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajnagar.
- 6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajnagar.
- 7] The Record Keeper, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajnagar.

**Dr. Babasaheb Ambedkar Marathwada University**  
**Chhatrapati Sambhajinagar- 431001**



**B.Sc. Degree Programme**

**(Three Year / Four Years (Hons) / Four Years (Hons with Research))**

# **Course Structure and Syllabus for B. Sc. 1<sup>st</sup> Year**

**(Revised)**

**( AS PER NEP-2020)**

**Subject (Major): ANALYTICAL CHEMISTRY**

**Effective from 2024-25**

## PREFACE

As we stand on the threshold of a new era in education, the dawn of the National Education Policy 2020 illuminates our path toward a holistic, inclusive, and progressive educational landscape. The Bachelor of Science (B. Sc.) curriculum outlined herein reflects the ethos and aspirations of this transformative policy, aiming to equip learners with the knowledge, skills, and values necessary to thrive in the dynamic world of the 21st century.

At its core, the National Education Policy 2020 envisions an educational framework that is learner-centric, multidisciplinary, and geared towards fostering creativity, critical thinking, and innovation. It emphasizes the integration of knowledge across disciplines, breaking down traditional silos to encourage holistic understanding and application of concepts. The Bachelor of Science (B. Sc.) curriculum embodies these principles by offering a diverse array of courses spanning various scientific domains, while also incorporating interdisciplinary studies to nurture well-rounded graduates capable of addressing complex challenges with agility and insight.

Furthermore, the curriculum is designed to promote experiential learning, research, and hands-on exploration, recognizing the importance of practical engagement in deepening understanding and cultivating real-world skills. Through laboratory work, field experiences, internships, and project-based learning opportunities, students will have the chance to apply theoretical knowledge in practical settings, develop problem-solving abilities, and cultivate a spirit of inquiry and discovery.

Integral to the National Education Policy 2020 is the commitment to inclusivity, equity, and access to quality education for all. The Bachelor of Science (B. Sc.) curriculum reflects this commitment by embracing diversity in perspectives, backgrounds, and experiences, and by fostering an inclusive learning environment where every student feels valued, supported, and empowered to succeed.

Moreover, the curriculum emphasizes the cultivation of ethical values, social responsibility, and global citizenship, instilling in students a sense of accountability towards society and the environment. By integrating courses on ethics, sustainability, and social sciences, the Bachelor of Science (B. Sc.) program aims to produce graduates who are not only proficient in their respective fields but also compassionate, ethical leaders committed to making a positive impact on the world.

As we embark on this journey of educational transformation guided by the National Education Policy 2020, the Bachelor of Science (B. Sc.) curriculum stands as a testament to our collective vision of a more equitable, inclusive, and enlightened society. It is our hope that through rigorous academics, innovative pedagogy, and unwavering dedication to excellence, we can inspire the next generation of scientists, scholars, and change-makers to realize their full potential and contribute meaningfully to the advancement of knowledge and the betterment of humanity.

## Structure of B. Sc. (Three / Four Years Honours / Honours with Research Degree) Programme with Multiple Entry and Exit Options

### Subject (Major): Analytical Chemistry

#### BSc First Year: 1<sup>st</sup> Semester

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major ( Core) M1 Mandatory	DSC-1	Basic Concepts Of Analytical Chemistry-1	2		2		2+2 = 4
	DSC-2	Lab course -1		4		2	
Major ( Core) M2 Mandatory	DSC-1		2		2		2+2 = 4
	DSC-2	Practical based on DSC-1		4		2	
Major ( Core) M3 Mandatory	DSC-1		2		2		2+2 = 4
	DSC-2	Practical based on DSC-1		4		2	
Generic / Open Elective ( GE/OE) (Choose any two from pool of courses) It should be chosen compulsorily from the faculty other than that of Major	GE/OE-1	It should be chosen compulsorily from the faculty other than that of Major	2		2		2
SEC ( Skill Enhancement Courses) (Choose any one from pool of courses)	SEC-1	A. Water Treatment and Analysis B. Purification and separation techniques	1		1		2
	SEC-2	Practicals based on SEC-1 A. Water Treatment and Analysis B. Purification and separation techniques		2		1	
AEC, VEC, IKS	AEC-1	English ( Common for all the faculty)	2		2		2+2 =4
	IKS-1	Choose any one from pool of courses	2		2		
OJT/ FP/CEP/CC/RP	CC-1	Health and Wellness ( Common for all the faculty)		4		2	2
			13	18	13	09	22

GE/OE-1 : **Food Safety, Adulteration, and Detection** (This is a 2 credit theory course for other faculty (Other than Science & Technology))

## BSc First Year: 2<sup>nd</sup> Semester

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major ( Core) M1 Mandatory	DSC-3	Basic Concepts Of Analytical Chemistry -2	2		2		2+2 = 4
	DSC-4	Lab course -2		4		2	
Major ( Core) M2 Mandatory	DSC-3		2		2		2+2 = 4
	DSC-4	Practical based on DSC-3		4		2	
Major ( Core) M3 Mandatory	DSC-3		2		2		2+2 = 4
	DSC-4	Practical based on DSC-3		4		2	
Generic / Open Elective ( GE/OE) (Choose any two from pool of courses) It should be chosen compulsorily from the faculty other than that of Major	GE/OE-2	It should be chosen compulsorily from the faculty other than that of Major	2		2		2
VSC ( Vocational Skill Courses) (Choose any one from pool of courses)	VSC-1	A. Cosmetics-& perfumery B. Jam, Jelly, Sauce And Ketchups	1		1		2
	VSC-2	Practicals based on VSC- A. Cosmetics and perfumery B. Jam, Jelly, Sauce And Ketchups		2		1	
AEC, VEC, IKS	AEC-1	English ( Common for all the faculty)	2		2		2+2 =4
	VEC-1	Constitution of India ( Common for all the faculty)	2		2		
OJT/ FP/CEP/CC/RP	CC-2	Yoga Education / Sports and Fitness ( Common for all the faculty)		4		2	2
			13	18	13	09	22
Exit Option : Award of UG Certificate in 3 Majors with 44 credits and an additional 4 credits of core NSQF course / Internship OR continue with Major and Minor							

**GE/OE-2 : Dairy Chemistry** (This is a 2 credit theory course for other faculty (Other than Science & Technology))

Students will have to choose any three subjects as a **Major 1, Major 2, Major 3**, from Basket 1 under the Faculty of Science and Technology.

Students will be having three subject options of equal credits (instead of Major and / or minor verticals) in the first year. Students will have to select / declare choice of one subject as a **major subject** in the beginning of second year **out of three major options M1, M2 and M3 (which were opted in the first year)**.

### **Detailed Illustration of Courses included in 1<sup>st</sup> and 2<sup>nd</sup> semester:**

1) **Major (Core)** subject are mandatory.

DSC-1 : This is a 2 credit theory course corresponding to Major ( core) subject

DSC-2 : This is a 2 credit practical course based on DSC-1

DSC-3 : This is a 2 credit theory course corresponding to Major ( core) subject

DSC-4 : This is a 2 credit practical course based on DSC-3

2) **Generic / Open Elective (GE/OE):** (Needs to be chosen (any two) from pool of courses available at respective college). **These courses should be chosen compulsorily from faculty other than that of Major.**

GE/OE -1 : This is a 2 credit theory course should be chosen compulsorily from faculty other than that of Major.

GE/OE -2 : This is a 2 credit theory course should be chosen compulsorily from faculty other than that of Major.

3) **SEC (Skill Enhancement Courses) :** Choose any one from pool of courses. These courses needs to be designed to enhance the technical skills of the students in specific area.

**SEC-1 :** This is a 1 credit theory course to enhance the technical skills of the students in specific area.

**SEC-2 :** This is a 1 credit practical course based on SEC-1.

4) **VSC (Vocational Skill Courses) :** Choose any one from pool of courses. These courses should be based on Hands on Training corresponding to Major (core) subject.

**VSC-1 :** This is a 1 credit theory course based Hands on Training corresponding to Major ( core) subject.

**VSC-2 :** This is a 1 credit practical course based on VSC-1

5) **AEC (Ability Enhancement courses):** The focus of these courses should be based on linguistic and communication skills.

**AEC-1 : English**

This is a 2 credit theory course based on linguistic proficiency. It will be common for all the faculty.

**AEC-2 : English**

This is a 2 credit theory course based on linguistic proficiency. It will be common for all the faculty.

- 6) **IKS (Indian Knowledge System)** : The courses related to traditional and ancient culture of India will be included in this section. The respective college will have to choose one of the courses from the pool of courses designed by the University.

**IKS-1 : To be chosen from the pool of courses designed by the University**

This is a 2 credit theory course based on Indian Knowledge System. It will be common for all the faculty

- 7) **VEC (Value Education Courses)**: The courses such as understanding India, Environmental Science / Education, Digital and Technological solutions etc will be part of Value Education Courses.

**VEC-1 : Constitution of India**

This is a 2 credit theory course based on value education. It will be common for all the faculty

- 8) **CC (Curricular Courses)**: The courses such as Health and wellness, Yoga education, Sports and Fitness, Cultural activities, NSS/NCC, Performing Arts.

**CC-1 : Health and Wellness**

This is a 2 credit practical course based on Co-curricular activities. It will be common for all the faculty

**CC-2 : Yoga education / Sports and Fitness**

This is a 2 credit practical course based on Co-curricular activities. It will be common for all the faculty

## General Guidelines for Course Selection

- 1) The Major subject is the discipline or course of main focus, bachelors degree shall be awarded in that discipline / subject.
- 2) Students will have to choose any three subjects as a Major 1, Major 2, Major 3, from **Basket 1** under the Faculty of Science and Technology (based on the available options in the respective college).
- 3) Students will be having three subject options of equal credits (instead of Major and / or minor verticals) in the first year.
- 4) In the beginning of second year, students will have to select / declare choice of **one major subject** and **one minor subject** from three major options **M1, M2 and M3 (which were opted in the first year)**
- 5) Once the students finalize their **Major Subject** and **Minor Subject** in the beginning of the second year of the programme, they shall pursue their further education in that particular subject as their **Major and Minor** subjects. Therefore, from second year onwards curriculum of the Major and Minor subjects shall be different.
- 6) Students are required to select **Minor subject** from **other discipline of the same faculty**
- 7) Students are required to select **Generic /Open Elective** (vertical 3 in the credit framework) **compulsorily from the faculty different than that of their Major / Minor subjects.**
- 8) Vocational Skill Courses and Skill Enhancement Courses (VSC and SEC) shall be related to the Major subject
- 9) Curriculum of Ability Enhancement Courses (AEC), Value Education Courses (VEC), Indian Knowledge System (IKS), and Co-curricular Courses (CC) will be provided by the University separately.

## Programme Educational Objectives (PEOs) :

Programme Educational Objectives (PEOs) for the Bachelor of Science Curriculum under the National Education Policy 2020:

1. **Mastery of Discipline-Specific Knowledge:** Graduates of the Bachelor of Science program will demonstrate a deep understanding of fundamental principles, theories, and methodologies in their chosen scientific discipline, enabling them to analyze complex problems, propose innovative solutions, and contribute to advancements in their field.
2. **Interdisciplinary Proficiency:** Graduates will possess the ability to integrate knowledge and skills from multiple scientific disciplines, fostering a holistic approach to problem-solving and innovation. They will be equipped to address multifaceted challenges by drawing upon diverse perspectives and methodologies.
3. **Critical Thinking and Analytical Skills:** Graduates will develop strong critical thinking abilities, enabling them to evaluate information rigorously, analyze data effectively, and make informed decisions based on evidence. They will demonstrate proficiency in applying logical reasoning and scientific methods to solve problems and generate new knowledge.
4. **Leadership and Innovation:** Graduates will demonstrate leadership qualities and entrepreneurial mindset, capable of initiating and driving positive change in their organizations and communities. They will exhibit creativity, resilience, and adaptability, harnessing innovation to address complex challenges and seize opportunities for growth and advancement.
5. **Global Citizenship and Cultural Sensitivity:** Graduates will possess a global perspective and cultural sensitivity, recognizing the interconnectedness of diverse communities and the importance of collaboration across borders. They will engage in cross-cultural dialogue, embrace diversity, and contribute to the advancement of knowledge and understanding on a global scale.

These Programme Educational Objectives serve as guiding principles for the Bachelor of Science curriculum, reflecting our commitment to nurturing well-rounded graduates who are prepared to excel in their careers, contribute to society, and lead meaningful lives in a rapidly changing world.

## Programme Outcomes (POs) :

The National Education Policy (NEP) 2020 for India emphasizes several key aspects for Bachelor of Science (B.Sc.) programs, aiming to produce graduates who are not only well-versed in their respective disciplines but also equipped with skills necessary for holistic development and employability. While specific program outcomes may vary between institutions and disciplines within B.Sc. programs, here are some common outcomes aligned with NEP 2020:

- **PO1. The citizenship and society:** Apply broad understanding of ethical and professional skill in science subjects in the context of global, economic, environmental and societal realities while encompassing relevant contemporary issues.
- **PO2. Environment and sustainability:** Apply broad understanding of impact of science subjects in a global, economic, environmental and societal context and demonstrate the knowledge of, and need for sustainable development.
- **PO3. Ethics:** Apply ability to develop sustainable practical solutions for science subject related problems within positive professional and ethical boundaries.
- **PO4. Individual and team work:** Function effectively as a leader and as well as team member in diverse/ multidisciplinary environments.
- **PO5. Communication:** Communicate effectively on complex science subject related activities with the scientific community in particular and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO6. Project management and finance:** Demonstrate knowledge and understanding of the first principles of science and apply these to one's own work as a member and leader in a team, to complete project in any environment.
- **PO7. Life-long learning:** Recognize the need for lifelong learning and have the ability to engage in independent and life-long learning in the broadest context of technological change.

These program outcomes align with the broader goals of NEP 2020 to transform higher education in India and prepare students for the challenges and opportunities of the 21st century. Board of Studies designing B.Sc. curricula are encouraged to incorporate these outcomes into their program objectives and learning outcomes.

## Programme Specific Outcomes (PSOs):

**PSO1; Core competency:** The Analytical chemistry graduates will know the fundamental concepts of analytical chemistry and applied chemistry. These fundamental concepts would reflect the latest understanding of the field, and therefore, are dynamic in nature and require frequent and time-bound revisions.

**PSO2; Communication skills:** Analytical chemistry graduates will possess minimum standards of communication skills expected of a Analytical Chemistry graduate in the country. They are expected to read and understand the documents with in-depth analyses and logical arguments. Graduates are expected to be well-versed in speaking and communicating their idea/finding/concepts to wider audience.

**PSO3; Critical thinking:** Analytical chemistry graduates are expected to know basics of cognitive biases, mental models, logical fallacies, scientific methodology and constructing cogent scientific arguments.

**PSO4; Psychological skills:** Analytical chemistry Graduates are expected to possess basic psychological skills required to face the world at large, as well as the skills to deal with individuals and students of various sociocultural, economic and educational levels. Psychological skills may include feedback loops, self-compassion, self-reflection, goal-setting, interpersonal relationships, and emotional management.

**PSO5; Problem-solving:** Analytical Chemistry Graduates will be equipped with problem-solving philosophical approaches that are pertinent across the disciplines.

**PSO6; Analytical reasoning:** Chemistry Graduates acquire formulate cogent arguments and spot logical flaws, inconsistencies, circular reasoning etc.

**PSO7; Research-skills:** Analytical Chemistry Graduates will be keenly observant about what is going on in the natural surroundings to awake their curiosity. Analytical Chemistry Graduates are expected to design a scientific experiment through statistical hypothesis testing and other *a priori* reasoning including logical deduction.

**PSO8; Teamwork:** Analytical Chemistry Graduates will be team players, with productive cooperations involving members from diverse socio-cultural backgrounds.

**PSO9; Digital Literacy:** Analytical Chemistry Graduates are expected to be digitally literate for them to enroll and increase their core competency via e-learning resources such as MOOC and other digital tools for lifelong learning. Chemistry Graduates should be able to spot data fabrication and fake news by applying rational skepticism and analytical reasoning.

**PSO10; Moral and ethical awareness:** Analytical Chemistry Graduates will be responsible citizen of India and be aware of moral and ethical baseline of the country and the world. They are expected to define their core ethical virtues good enough to distinguish what construes as illegal and crime in Indian constitution. Emphasis be given on academic and research ethics, including fair Benefit Sharing, Plagiarism, Scientific Misconduct and so on.

**PSO11; Leadership readiness:** Analytical Chemistry Graduates are expected to be familiar with decision making process and basic managerial skills to become a better leader. Skills may include defining objective vision and mission, how to become charismatic inspiring leader and so on.

# Semester I

**DSC-1 : ( Title of Paper) FUNDAMENTALS OF ANALYTICAL CHEMISTRY-1**

Total Credits : 02

Total Contact Hours : 30 Hrs

Maximum Marks : 50

**Learning Objectives of the Course:**

- i) To explain importance of analytical chemistry
- ii) To aware sampling methods required to analysis
- iii) To acquaint with importance and SOP of Calibration of apparatus
- iv) Aware laboratory safety and precaution

**Course Outcomes ( COs) :**

After completion of the course, students will be able to -

- i) Classify method for analysis
- ii) Explain the principle of instrumental techniques
- iii) Understand different sampling methods
- iv) Identify the apparatus and their purposes
- v) Calibrate the apparatus,

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	<b>Introduction to Analytical Chemistry :</b> Definition, Role of analytical chemistry, classification of methods of analysis A. Instrumental Methods of analysis, Definition and principle of instrumental analysis pH metry, colorimetry, spectrophotometry, chromatography, Gas Chromatography. Advantages of instrumental methods of analysis B. Non Instrumental methods of analysis : Definition and principle of Volumetric Analysis, Gravimetric Analysis, Distillation and Fractional Distillation.  Types of Analysis : Proximate, Partial and Trace analysis	10 Hrs
II	<b>Sampling for Analysis</b> Definition of terms : samples, sampling procedures, sampling units, gross sample, sub-sample, increment, gross. Types of sampling : Random and Non Random Sampling, introduction to sampling of gases, liquids, and solids. Storage and transport of samples.  Errors : Definition and classification of errors in analysis	10 Hrs
III	<b>Laboratory Operations and Practices</b> Definition of Callibration, Filtration,. Introduction of graduated glasswares, graduated apparatus, graduated flasks, conical flasks, pipettes, burettes,	10 Hrs

	<p>weight burettes, piston burettes, measuring cylinders, heating apparatus, dessicators, dry boxes, heating apparatus.</p> <p><b>Working basics in Analytical Laboratory</b>  General safety regulations, handling of reagents, general idea of preparation of solution, rules for working with hazardous chemicals, first aid in laboratory, rules for fire preventions, preventive measures for accidents in laboratory.</p>	
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. A. I. Vogel, Textbook of quantitative Inorganic Analysis –</li> <li>2. H. Kaur, Instrumental Methods of Chemical Analysis –</li> <li>3. B K Sharma, Instrumental Methods of Chemical Analysis –</li> <li>4. Chatwal Anand, Instrumental Methods of Chemical Analysis –</li> <li>5. Skoog and West, Fundamentals of Analytical Chemistry –</li> <li>6. S.M. Khopkar, Basic Concepts of Analytical Chemistry –</li> <li>7. Alka Gupta, Analytical Chemistry – (Pragati Prakashan)</li> <li>8. Gurdeep Raj, Advanced Practical Inorganic Chemistry, Goel Publishing House, Meerut</li> <li>9. Chatwal Anand, Instrumental Methods of Chemical Analysis –</li> </ol>		

**DSC-2 : ( Title of Paper) Lab Course -1**

Total Credits : 02

Total Contact Hours : 60 Hrs

Maximum Marks : 50

**Learning Objectives of the Course:**

- 1) To develop the skill in chemistry experiments
- 2) To search and use SOP for assay of commercial samples
- 3) To search and use SOP for estimation of continents in given sample
- 4) To develop the skill of handling apparatus

**Course Outcomes ( COs ) :**

After completion of the course, students will be able to -

- i) Calibrate the apparatus as per SOP
- ii) Prepare solution of different concentration and their standardization.
- iii) Carry out assay of commercial samples as per standard procedures

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	<ol style="list-style-type: none"><li>1. Calibration of weight on Single pan balance</li><li>2. Calibration of volumetric apparatus like burette, pipette, standard flask.</li><li>3. To prepare standard solution of sodium carbonate and standardize the given solution of HCl / H<sub>2</sub>SO<sub>4</sub>.</li><li>4. To prepare standard solution of sodium oxalate and standardize the given solution of KMnO<sub>4</sub>.</li></ol>	20 Hrs
II	<ol style="list-style-type: none"><li>1. To prepare standard solution of K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and standardize the given solution of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>.</li><li>2. To prepare standard solution of sodium chloride and standardize the given solution of AgNO<sub>3</sub>.</li><li>3. Assay of commercial NaOH</li><li>4. Assay of Ferrous Sulphate</li></ol>	20 Hrs
III	<ol style="list-style-type: none"><li>1. Assay of Boric acid using Mannitol</li><li>2. Assay of Copper Sulphate</li></ol>	20 Hrs

	<ol style="list-style-type: none"><li>3. To estimate the amount of barium in the given solution of barium chloride.</li><li>4. To estimate the amount of iron in the given solution of ferrous salt.</li></ol>	
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***Text Books:***

1. Gurdeep Raj, Advanced Practical Inorganic Chemistry, Goel Publishing House, Meerut

**SEC-1 A : ( TITLE OF PAPER) - Water Treatment and Analysis**

Total Credits : 01 (Theory paper)

Total Contact Hours : 15 Hrs

Maximum Marks : 50

**Learning Objectives of the Course:**

- i) To know the sources of water pollutants
- ii) To aware about the properties of water
- iii) Know the difference between industrial effluent and municipal waste
- iv) Know the quality of drinking water and irrigation water

**Course Outcomes ( COs) :**

After completion of the course, students will be able to -

- i) Resources and properties of water
- ii) Understand the different pollutants
- iii) Understand treatment of domestic and industrial water
- iv) Understand the sources of water pollution

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	<b>Study of Water</b> a. Hydrosphere- Water resources. b. Properties of water- color, odor, turbidity, total salt content, total suspended water. b. Water pollution- Definition of water pollution, types of water pollutants, sources of water pollutants, trace element in water, water quality parameters and standards d. Purification of water- Treatment of domestic and industrial water e. Sources of Pollution - Physical, Chemical, Organic & Biological properties of Industrial Wastewater, Difference between industrial; municipal waste waters, Effects of industrial effluents on sewers and Natural water Bodies. <b>Chemistry of Water</b> a. Water Quality Parameters and Standards- Quality of drinking water, Quality of irrigation water, COD, BOD, b. Water Microbiology - TOCE-coli and total bacteria. c. Sewage analysis	15 Hrs
I. D.R. Khanna, R. Bhutiani, Laboratory Manual of Water and Wastewater Analysis, Daya Publishing House, Delhi, 2008 2. R.K. Trivedi Chemical and Biological Methods for Water Pollution Studies, , P.K.Goel, Oriental Printing Press, Aligarh, 1986		

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<b>SEC-2 A : ( TITLE OF PAPER) - Water Treatment and Analysis</b>		
Total Credits : 01 (Practical paper) Total Contact Hours : 30 Hrs		
Maximum Marks : 50		
<b>Learning Objectives of the Course:</b>		
<ul style="list-style-type: none"> <li>i) To know the sources of water pollutants</li> <li>ii) To aware about the properties of water</li> <li>iii) Know the difference between industrial effluent and municipal waste</li> <li>iv) Know the quality of drinking water and irrigation water</li> </ul>		
<b>Course Outcomes ( COs) :</b>		
After completion of the course, students will be able to -		
<ul style="list-style-type: none"> <li>i) Resources and properties of water</li> <li>ii) Understand the different pollutants</li> <li>iii) Understand treatment of domestic and industrial water</li> <li>iv) Understand the sources of water pollution</li> <li>v) Carryout experiment for determination of water quality parameters</li> </ul>		
Module No.	Topics / actual contents of the syllabus	Contact Hours
<b>I</b>	<ul style="list-style-type: none"> <li>1. Collection of water samples (Field work)</li> <li>2. Determination of total hardness of water</li> <li>3. Determination of alkalinity of water</li> <li>4. Determination of pH of water</li> <li>5. Determination of conductivity of water</li> <li>6. Determination of TDS in water.</li> <li>7. Determination of Dissolved Oxygen (DO) in water.</li> <li>8. Determination of BOD of water</li> <li>9. Determination of COD of water</li> </ul>	<b>30 Hrs</b>
I. D.R. Khanna, R. Bhutiani, Laboratory Manual of Water and Wastewater Analysis, Daya Publishing House, Delhi, 2008 2. R.K. Trivedy Chemical and Biological Methods for Water Pollution Studies, , P.K.Goel, Oriental Printing Press, Aligarh, 1986		

**SEC-1 B: ( TITLE OF PAPER) - Purification and separation techniques**

Total Credits : 01 (Theory paper)

Total Contact Hours : 15 Hrs

Maximum Marks : 50

**Learning Objectives of the Course:**

1. To make aware of principles and techniques for separation and purification of solid
2. To make aware of principles and techniques for separation and purification of liquids
3. To make aware of principles and techniques for separation and purification of steam volatile liquids
4. To make aware of principles and techniques involved in solvent extraction.

**Course Outcomes ( COs) :**

After completion of the course, students will be able to -

1. Separate and purify solid by crystallisation
2. Apply distillation technique for separation
3. Select steam distillation for steam volatile liquids
4. Use solvent extraction technique skillfully.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	Principles, efficiency and techniques involved in <ol style="list-style-type: none"><li>1. Filtration,</li><li>2. Distillation,</li><li>3. Fractional distillation</li><li>4. Steam distillation</li><li>5. Vacuum distillation</li><li>6. Solvent extraction</li></ol>	15 Hrs

**Reference books**

1. A. I. Vogel, Vogels Qualitative Inorganic Analysis, Prentice Hall, 7th Edition.
2. Vogels textbook of chemical quantitative analysis, Longman Scientific
3. R. Brent The golden book of chemistry experiments, , Golden press, NY
4. V. K. Ahluwalia, & R. Aggarwal Comprehensive Practical Organic Chemistry, , Universal Press.
5. R. K. Bansal Lab Manual of Organic Chemistry, , New Age Pub.
6. B. D. Khosla Senior Practical Physical Chemistry, , R. Chand & Co

7. O. P. Pandey, D.N. Bajpai, S. Giri Chemistry Practical, , S. Chand

8. J . Singh Advanced practical chemistry,

**SEC-2 B : ( TITLE OF PAPER) - Purification and separation techniques**

Total Credits : 01 (Practical paper)

Total Contact Hours : 30 Hrs

Maximum Marks : 50

**Learning Objectives of the Course:**

1. To make aware of principles and techniques for separation and purification of solid
2. To make aware of principles and techniques for separation and purification of liquids
3. To make aware of principles and techniques for separation and purification of steam volatile liquids
4. To make aware of principles and techniques involved in solvent extraction.

**Course Outcomes ( COs) :**

After completion of the course, students will be able to -

1. Separate and purify solid by crystallisation
2. Apply distillation technique for separation
3. Select steam distillation for steam volatile liquids
4. Use solvent extraction technique skillfully.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	Practical based on <ol style="list-style-type: none"><li>1. Filtration,</li><li>2. Distillation,</li><li>3. Fractional distillation</li><li>4. Steam distillation</li><li>5. Vacuum distillation</li><li>6. Solvent extraction</li></ol>	30 Hrs

**Reference books**

1. Stoichiometry and Process Calculation by K.V. Narayanan, B Lakshmikutty (Z-lib.org)
2. Stoichiometry Vth edition by B.L. Bhatt and S.B. Thakore
3. Complete Chemistry Guide to Stoichiometry by Mellisaa Maribel

**Web References :**

1. [https://en.wikipedia.org/wiki/Laboratory\\_glassware#:~:text=Laboratory%20glassware%20refers%20to%20a,%2C%20biology%2C%20and%20analytical%20laboratories.](https://en.wikipedia.org/wiki/Laboratory_glassware#:~:text=Laboratory%20glassware%20refers%20to%20a,%2C%20biology%2C%20and%20analytical%20laboratories.)
- 2 <https://brilliant.org/wiki/inductive-effect-electromeric-effect-resonance/>

3. <https://sciencing.com/glassware-apparatus-uses-7445911.html>
4. [https://chem.libretexts.org/Ancillary\\_Materials/Laboratory\\_Experiments/Wet\\_Lab\\_Experiments/Organic\\_Chemistry\\_Labs/Misc/COMMON\\_LABORATORY\\_TECHNIQUES](https://chem.libretexts.org/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/Organic_Chemistry_Labs/Misc/COMMON_LABORATORY_TECHNIQUES)
5. <https://www.youtube.com/watch?v=Q47hTa1KvN0&t=871>
6. [https://chem.libretexts.org/Ancillary\\_Materials/Demos\\_Techniques\\_and\\_Experiments/General\\_Lab\\_Techniques](https://chem.libretexts.org/Ancillary_Materials/Demos_Techniques_and_Experiments/General_Lab_Techniques)
7. <https://ucblucash.edu/content/dam/refresh/blucash-62/documents/academics/academic-departments/chemistry/LabSafetyRules.pdf>

**This course will be available for the students of other faculty**

**GE/ OE -1 : ( TITLE OF PAPER) Food Safety, Adulteration, and Detection-I**

Total Credits : 02

Total Contact Hours : 30 Hrs

Maximum Marks : 50

**Learning Objectives of the Course:**

1. to make aware about healthy food.
2. to make aware about risk of adulterated food.
3. to aware about detection of adulteration in some food items.
4. to aware about rules and regulations related to adulteration in foods.

**Course Outcomes ( COs) :**

After completion of the course, students will be able to -

1. recognize difference between adulterated and unadulterated food.
2. encourage society to use healthy food.
3. evaluate the economic and health impact of food adulteration.
4. propose innovative solutions for food safety and security.
5. develop educational materials to raise food safety awareness

Module No.	Topics / actual contents of the syllabus	Contact Hours
<b>I</b>	<p><b>Introduction to Food Safety</b></p> <p>a) Introduction- Food, Components of food.                      b) Importance of safe food for public health.                      c) Key regulatory bodies working for food safety and their roles.                      d) GMP (Good Manufacturing Practices) and GHP (Good Hygienic Practices)</p>	<b>10 Hrs</b>
<b>II</b>	<p><b>Food Safety Communication</b></p> <p>a) Importance of Communication in Food Safety-Communicating risks and preventive measures, Crisis communication in case of food safety issues                      b) Consumer Education and Empowerment-Promoting awareness about food safety, Understanding food labels and certifications                      c) Case Studies and Real-life Examples- Analyzing past incidents of food safety issues, Learning from success stories in ensuring food safety                      d) Future Trends in Food Safety- Discussing upcoming challenges and solutions, Integrating technology and policy for continuous improvement</p> <p><b>Adulteration in Food</b></p> <p>a) Definition and Types of Food Adulteration-Adulteration vs. contamination</p>	<b>10 Hrs</b>

	<p>b) Foodborne Hazards-Microbial contaminants (bacteria, viruses, fungi), Chemical contaminants (pesticides, additives, preservatives), Physical contaminants (foreign objects)</p> <p>c) Causes of adulteration in food</p> <p>d) Consequences of adulteration in food</p>	
III	<p><b>Detection Food Adulteration</b></p> <p>a) Detection of- water in milk, detergent in milk</p> <p>b) Detection of other oils in coconut oil</p> <p>c) Detection of- sugar solution in honey, chalk powder in sugar</p> <p>d) Detection of Aluminium leaves in silver leaves</p> <p>e) Detection of- foreign resin in asafetida (hing), papaya seeds in black pepper</p> <p>f) Artificial colour in chilli powder, saw dust in chilli powder</p> <p>g) Detection of chalk in common salt</p> <p>h) Differentiation of common salt and iodized salt</p>	10 Hrs
<p><b>Books for Reference:</b></p> <ol style="list-style-type: none"> <li>1. Ian C. Shaw, Food Safety: The Science of Keeping Food Safe, Publisher: Wiley (2018)</li> <li>2. by Yasmine Motarjemi, Huub Lelieveld, Food Safety Management: A Practical Guide for the Food Industry Publisher: Academic Press (2014)</li> <li>3. Nina E. Redman, Food Safety: A Reference Handbook, Publisher: ABC-CLIO(2018)</li> <li>4. Ashish Kumar Singh, Food Safety and Standards: Acts, Rules and Regulations, Publisher: Wolters Kluwer (2018)</li> <li>5. FAO/WHO guidance to governments on the application of HACCP in small and/or less-developed food businesses -FAO FOOD AND NUTRITION PAPER (86) by World Health Organization and Food and Agriculture Organization of the United Nations</li> <li>6. Detect Adulteration with Rapid Test (DART) Booklet by Food Safety and Standards Authority of India</li> <li>7. Ian C. Shaw, Food Safety: The Science of Keeping Food Safe, Publisher: Wiley-Blackwell (2019)</li> <li>8. Richard L. Linton, L. Jean Dunn, and Gerald J. Cox, Food Safety Handbook Publisher: Wiley (2016)</li> <li>9. John Spink and PhD Douglas C. Moyer, Food Adulteration and Food Fraud, Publisher: Wiley (2016)</li> <li>10. P.V. Ramesh and P. Venkatesh Food Adulteration: Incidents, Concerns, and Solutions, Publisher: CRC Press (2019)</li> <li>11. John W. Spink, Food Fraud Prevention: Introduction, Implementation, and Management, Publisher: Academic Press (2019)</li> <li>12. Suwendu Bhattacharya, Food Adulteration and Consumer Awareness, Publisher: Springer (2014)</li> </ol> <p><b>Resources:</b></p> <ol style="list-style-type: none"> <li>1. <a href="http://www.fssai.gov.in">www.fssai.gov.in</a></li> <li>2. <a href="https://youtu.be/eA0gmP4A8Z4">https://youtu.be/eA0gmP4A8Z4</a></li> <li>3. <a href="https://youtu.be/b6no4afqS6Q">https://youtu.be/b6no4afqS6Q</a></li> <li>4. <a href="https://youtu.be/X9eWJvbQN24">https://youtu.be/X9eWJvbQN24</a></li> <li>5. <a href="https://youtu.be/JEcQv8p708I">https://youtu.be/JEcQv8p708I</a></li> <li>6. <a href="https://youtu.be/3xLHjXA1Sxw">https://youtu.be/3xLHjXA1Sxw</a></li> </ol>		

# Second Semester

**DSC-3 : ( Title of Paper) FUNDAMENTALS OF CHEMISTRY-2**

Total Credits : 02

Total Contact Hours : 30 Hrs

Maximum Marks : 50

**Learning Objectives of the Course:**

- i) To part knowledge of construction and working of chemical balances
- ii) Acquaint grading, classification, properties and use of laboratory reagents & solvents
- iii) To develop skill for the calibration of apparatus used in chemical analysis
- iv) Understand mathematical calculation for preparation of various solution
- v) To impart knowledge for selection of indicators in volumetric analysis

**Course Outcomes ( COs) :**

After completion of the course, students will be able to -

- i) Understand the principle and working of balance
- ii) calibrate the weights.
- iii) use laboratory apparatus and carry out their calibration as per SOP
- iv) Carry out basic calculation required for making solutions
- v) Classify solvents and reagents and their properties

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	<b>Balance :</b> Analytical Balance : Construction and working of single pan and double pan balance, Precautions in using analytical balance, Calibration of weights, errors in weighing. <b>Chemical Apparatus and Laboratory Notebook for Analytical Chemistry</b> Classification of Chemical Reagents, grade (LR Grade, AR Grade, CP Grade, spectroscopic grade) primary standard grade and special purpose reagent and chemicals. Rules for handling reagents, apparatus, cleaning and marking of lab-wares, handling of volumetric flask, Calibration of burette, pipette, and volumetric flask.	10 Hrs
II	<b>Chemical Calculations</b> Mole Concepts: Atom, Molecule, Molar Volume, Atomic Weight, Molecular Weight, Equivalent Weight.	10 Hrs

	<p>Concentration Units : Standard solutions, Normality, Molarity, Molality, Mole Fraction, Strength, ppm, ppt, ppb. Introduction of Stoichiometry.</p> <p><b>Indicators</b> Definition and Types, Methods of preparations, Selection of indicators in acid base titration,</p>	
<b>III</b>	<p><b>Reagents and Solvents</b></p> <p>Reagents : Classification of reagents according to their action as acids, bases, salts, oxidizing, reducing, complexing and precipitating reagents.</p> <p>Solvents : Classification of solvents as protic, aprotic, and amphiprotic solvents, Acidic, basic and neutral solvents, polar and non-polar solvents, aqueous and non - aqueous solvents, suitable examples of all</p>	<b>10 Hrs</b>
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. A. I. Vogel, Textbook of quantitative Inorganic Analysis –</li> <li>2. H. Kaur, Instrumental Methods of Chemical Analysis –</li> <li>3. B K Sharma, Instrumental Methods of Chemical Analysis –</li> <li>4. Chatwal Anand, Instrumental Methods of Chemical Analysis –</li> <li>5. Skoog and West, Fundamentals of Analytical Chemistry –</li> <li>6. S.M. Khopkar, Basic Concepts of Analytical Chemistry –</li> <li>7. Alka Gupta, Analytical Chemistry – (Pragati Prakashan)</li> <li>8. Gurdeep Raj, Advanced Practical Inorganic Chemistry, Goel Publishing House, Meerut</li> <li>9. Chatwal Anand, Instrumental Methods of Chemical Analysis</li> </ol>		

**DSC-4 : ( Title of Paper) Lab course-2**

Total Credits : 02

Total Contact Hours : 60 Hrs

Maximum Marks : 50

**Learning Objectives of the Course:**

- i) To use the sophisticated instruments for the analysis
- ii) To calculate and prepare solutions of different concentrations.
- iii) To represent the results in graphical form
- iv) To estimate the important components in tea leaves as per SOP

**Course Outcomes ( Cos) :**

After completion of the course, students will be able to –

- v) Prepare solutions by dilution methods
- vi) Handle colorimeter for experiment
- vii) Carry out experiment on flamephotometer
- viii) Determine component in tea

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	<ol style="list-style-type: none"><li>1. Preparation of 0.1 N solution of HCl, HNO<sub>3</sub> using density and percentage by weight and standardize it by Na<sub>2</sub>CO<sub>3</sub></li><li>2. Preparation of 0.05 N solutions of H<sub>2</sub>SO<sub>4</sub> using density and percentage by weight and its standardization.</li><li>3. Provided 0.1 N solution of Acetic acid, Prepare 50 ml of 0.02N acetic acid.</li><li>4. Provided 0.1 N FAS solution, prepare 50 ml 0.05 N FAS and standardize it by K<sub>2</sub>MnO<sub>4</sub></li></ol>	20 Hrs
II	<ol style="list-style-type: none"><li>1. Prepare a working calibration curve using KMnO<sub>4</sub> Solution and determine concentration in the given unknown sample</li><li>2. Measure the optical density of series of solution of KMnO<sub>4</sub> and find the equations of line using least square method.</li><li>3. Measure the optical density of series of solution of K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and find the equations of line using least square method</li></ol>	20 Hrs

	4. Prepare a working calibration curve using $\text{CuSO}_4$ Solution and determine concentration of $\text{CuSO}_4$ in the given unknown sample	
<b>III</b>	<ol style="list-style-type: none"> <li>1. To determine the stability constant of Fe-5-Sulpho salicylic acid by Jobs method.</li> <li>2. Estimation of Na / K by using flame photometer.</li> <li>3. Estimate the water soluble poly-phenols / Catechin content in various samples of tea leaves.</li> <li>4. Estimate the amount of Tannic acid present in various samples of tea leaves</li> </ol>	<b>20 Hrs</b>
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Gurdeep Raj, Advanced Practical Inorganic Chemistry, Goel Publishing House, Meerut</li> </ol>		

**VSC-1 A : ( TITLE OF PAPER) - Cosmetics and perfumery**

Total Credits : 01 (Theory paper)

Total Contact Hours : 15 Hrs

Maximum Marks : 50

**Learning Objectives of the Course:**

1. aware about types of perfumes and their composition
2. Give knowledge about extraction method for perfumes
3. Aware about different cosmetic products
4. Impart knowledge about constituents of cosmetic
5. Give knowledge about essence

**Course Outcomes ( COs) :**

After completion of the course, students will be able to -

1. Classify the perfumes
2. Understand the constituent of perfumes
3. Preparation of perfumes
4. Constitutes of cosmetics
5. Method of preparing cosmetics
6. Prepare essence

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	<b>BASICS OF PERFUMES</b> Introduction to perfumes, history, classification of perfumes, the concept of aroma, types and physiological effects. Composition, formulation and working mechanism of perfume. Antiperspirants and deodorants: definition, working mechanism, composition, formulation chemistry and comparison. Introduction to perfumery chemicals: Natural sources, natural identical and synthetic compounds. Extraction methods of perfumery chemicals. Examples of some important perfumery chemicals (synthesis, properties and chemistry) <b>BASICS OF COSMETICS</b> Introduction to cosmetics: Definition, history and application. Cosmetology, Introduction to cosmeceutics. Anatomy of skin and hair with respective to cosmetology. Classification of cosmetics. Physiological effects of cosmetics. Cosmeceuticals: definition, classification, chemicals, mechanism of action. Chemistry of materials used in cosmeceuticals. Applications of essence in cosmetics and perfumery sector. <b>BASICS OF ESSENCE</b> Definition of Essence, Types of essence, extraction methods of essence, role of essence in skin care products, mechanism of essence in skin care products, applications of essence in perfume and cosmetics.	15 Hrs

#### Reference books

- 1 Hilda Butler (editor), Dordrecht Poucher's Perfumes, Cosmetics, and Soaps  
Kluwer Academic Publishers 2010 Austria
  - 2 D.F. Williams Chemistry and Technology of the Cosmetics and Toiletries Industries  
Springer International Edition USA
  - 3 Anthony J. O'Lenick Jr.; Thomas G. O'Lenick Organic chemistry for cosmetic  
chemists Allured Publishing 2008 London
  - 4 Schueller and Romanowsk Beginning Cosmetic Chemistry Allured Pub Corp  
2009 London
  - 5 Barel AO, Paye M, Maibach Hi Handbook of cosmetic science and technology  
CRC Press 2014 USA
- 1) Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
  - 2) Cosmetics - Formulations, Manufacturing and Quality Control, .P.P. Sharma, 4<sup>th</sup> Edition,  
Vandana Publications Pvt. Ltd., Delhi.
  - 3) Text book of cosmeticology by Sanju Nanda & Roop K, Khar, Tata Publishers.

#### Web References :

1. <https://youtu.be/e-cLID1Ga5g?si=CGpPhdywljFM0hMU>
2. <https://youtu.be/V-bWm2FnVk4?si=I0IyHR4lhp0J5T8->
3. <https://youtu.be/gLBLOuDwqKY?si=cQ3D8KrtDQeGh857>
4. <https://youtu.be/3VcdyyC-nsw?si=sfB6NFaNtE6mgI5e>
5. <https://youtu.be/V-bWm2FnVk4?si=RlpP2nMZhCYsu51I>
6. <https://youtu.be/3bgTpf4U8Kk?si=MTYtkMq0N0KAKZ2v>
7. <https://youtu.be/s0I7ZsGqUhk?si=popfpJyB84Zb86PT>
8. [https://youtu.be/XD4g\\_9DKO0g?si=4NwJq374mpqoDE9S](https://youtu.be/XD4g_9DKO0g?si=4NwJq374mpqoDE9S)

<b>VSC-2 A : ( TITLE OF PAPER) - Cosmetics and perfumery</b>		
Total Credits : 01 (Practical paper)		Total Contact Hours : 30 Hrs
Maximum Marks : 50		
<b>Learning Objectives of the Course:</b>		
1 aware about types of perfumes and their composition		
6. Give knowledge about extraction method for perfumes		
7. Aware about different cosmetic products		
8. Impart knowledge about constituents of cosmetic		
9. Give knowledge about essence		
<b>Course Outcomes ( COs) :</b>		
After completion of the course, students will be able to -		
1. Classify the perfumes		
2. Understand the constituent of perfumes		
3. Preparation of perfumes		
4. Constitutes of cosmetics		
5. Method of preparing cosmetics		
6. Prepare essence		
Module No.	Topics / actual contents of the syllabus	Contact Hours
I	<b>PREPARATION OF PERFUMES AND COSMETICS</b> Six practicals should be carry out in laboratory Preparation of following using essence and perfumes: Talcum powder. Shampoo. Enamels. Face cream. Nail polish and nail polish remover. Hand wash Hand sanitizer Body lotion Tooth powder Tooth paste	30 Hrs
<b>Reference books</b>		
1 Hilda Butler (editor), Dordrecht Poucher's Perfumes, Cosmetics, and Soaps Kluwer Academic Publishers 2010 Austria		
2 D.F. Williams Chemistry and Technology of the Cosmetics and Toiletries Industries Springer International Edition USA		
3 Anthony J. O'Lenick Jr.; Thomas G. O'Lenick Organic chemistry for cosmetic chemists Allured Publishing 2008 London		
4 Schueller and Romanowsk Beginning Cosmetic Chemistry Allured Pub Corp		

2009 London

5 Barel AO, Paye M, Maibach HI Handbook of cosmetic science and technology CRC Press 2014 USA

4) Harry's Cosmetology, Wilkinson, Moore, Seventh Edition, George Godwin.

5) Cosmetics - Formulations, Manufacturing and Quality Control, .P.P. Sharma, 4<sup>th</sup> Edition, Vandana Publications Pvt. Ltd., Delhi.

6) Text book of cosmetology by Sanju Nanda & Roop K, Khar, Tata Publishers.

**Web References :**

1. <https://youtu.be/e-cLID1Ga5g?si=CGpPhdywIjFM0hMU>
2. <https://youtu.be/V-bWm2FnVk4?si=I0IyHR4Ihp0J5T8->
3. <https://youtu.be/gLBLOuDwqKY?si=cQ3D8KrtDQcGh857>
4. <https://youtu.be/3VcdyyC-nsw?si=sfB6NFaNtE6mgI5e>
5. <https://youtu.be/V-bWm2FnVk4?si=RlpP2nMZhCYsu51I>
6. <https://youtu.be/3bgTpf4U8Kk?si=MTYtkMq0N0KAKZ2v>
7. <https://youtu.be/s0I7ZsGqUhk?si=popfpJyB84Zb86PT>
8. [https://youtu.be/XD4g\\_9DKO0g?si=4NwJq374mpqoDE9S](https://youtu.be/XD4g_9DKO0g?si=4NwJq374mpqoDE9S)

<b>VSC-1 B : ( TITLE OF PAPER) - Jam, Jelly, Sauce And Ketchups</b>		
Total Credits : 01 (Theory paper)		Total Contact Hours : 15 Hrs
Maximum Marks : 50		
<b>Learning Objectives of the Course:</b>		
<ul style="list-style-type: none"> <li>i) Know the colours and preservatives used in the edible items</li> <li>ii) Know the technique of preparing jam jelly and ketchups</li> <li>iii) Aware of the different methods for checking quality and purity of these items</li> </ul>		
<b>Course Outcomes ( COs) :</b>		
After completion of the course, students will be able to –		
<ul style="list-style-type: none"> <li>i) The use of colors and preservatives in jam jelly and ketchups</li> <li>ii) To prepare different jams and jelly</li> <li>iii) To estimate sugar and pectin in Jam/jelly</li> </ul>		
<b>Module No.</b>	<b>Topics / actual contents of the syllabus</b>	<b>Contact Hours</b>
<b>I</b>	<b>Food safety education and training:</b> introduction, need for education and training, Food Safety and Standards Authority in India (FSSAI): Introduction, functions & duties, provisions for food products Food laws and regulations: Prevention of food adulteration act (PFA act) - introduction, features of act, implementation Essential Commodity Act (ECA) - Fruit Product Order (FPO), Vegetable Oil Product Order, Export act, Bureau of Indian Standards Act (BIS), Agmark, ISI mark, ISO, FAO, WHO <b>JAM, JELLY, MARMALADE :</b> Introduction Jam, Jelly, Marmalade, Definition of Jam and Jelly, Difference between Jam and Jelly. Colloidal System in Jelly, Chemistry of Jam making, Structure of Pectins, Colors and Preservatives used in jams, jellies and marmalades	<b>15 Hrs</b>
Reference books		
1 Hilda Butler (editor), Dordrecht Poucher's Perfumes, Cosmetics, and Soaps Kluwer Academic Publishers 2010 Austria 2 D.F. Williams Chemistry and Technology of the Cosmetics and Toiletries Industries Springer International Edition USA 3 Anthony J. O'Lenick Jr.; Thomas G. O'Lenick Organic chemistry for cosmetic chemists Allured Publishing 2008 London		

- 4 Schueller and Romanowsk Beginning Cosmetic Chemistry Allured Pub Corp  
2009 London
- 5 Barel AO, Paye M, Maibach Hi Handbook of cosmetic science and technology CRC  
Press 2014 USA

**Web References :**

1. <https://youtu.be/e-cLID1Ga5g?si=CGpPhdywljFM0hMU>
2. <https://youtu.be/V-bWm2FnVk4?si=l0IyHR4lhp0J5T8->
3. <https://youtu.be/gLBLOuDwqKY?si=cQ3D8KrtDQeGh857>
4. <https://youtu.be/3VcdyyC-nsw?si=sfB6NFaNtE6mgI5e>
5. <https://youtu.be/V-bWm2FnVk4?si=RlpP2nMZhCYsu51I>
6. <https://youtu.be/3bgTpf4U8Kk?si=MTYtkMq0N0KAKZ2v>
7. <https://youtu.be/s017ZsGqUhk?si=popfpJyB84Zb86PT>
8. [https://youtu.be/XD4g\\_9DKO0g?si=4NwJq374mpqoDE9S](https://youtu.be/XD4g_9DKO0g?si=4NwJq374mpqoDE9S)

<b>VSC-2 B : ( TITLE OF PAPER) - Jam, Jelly,Sauce And Ketchups</b>		
Total Credits : 01 (Practical paper)		Total Contact Hours : 30 Hrs
Maximum Marks : 50		
<b>Learning Objectives of the Course:</b>		
<ul style="list-style-type: none"> <li>iv) Know the colours and preservatives used in the edible items</li> <li>v) Know the technique of preparing jam jelly and ketchups</li> <li>vi) Aware of the different methods for checking quality and purity of these items</li> </ul>		
<b>Course Outcomes ( COs) :</b>		
After completion of the course, students will be able to –		
<ul style="list-style-type: none"> <li>iv) The use of colors and preservatives in jam jelly and ketchups</li> <li>v) To prepare different jams and jelly</li> <li>vi) To estimate sugar and pectin in Jam/jelly</li> </ul>		
<b>Module No.</b>	<b>Topics / actual contents of the syllabus</b>	<b>Contact Hours</b>
<b>I</b>	<ul style="list-style-type: none"> <li>1. To prepare Mix Fruit Jam using colors and preservatives and seal in Jars/Bottles.</li> <li>2. To Prepare Strawberry Jam and seal in Jars/Bottles</li> <li>3. To prepare Pineapple Jam and seal in Jars/Bottles.</li> <li>4. To prepare Grape Jelly and seal in Jars/Bottles.</li> <li>5. To prepare Guava Jelly and seal in Jars/Bottles.</li> <li>6. Estimation of sugar in Jam and jelly</li> <li>7. estimation of pectin in jam</li> </ul>	<b>30 Hrs</b>
<b>Reference books</b>		
<ul style="list-style-type: none"> <li>1 Hilda Butler (editor), Dordrecht Poucher's Perfumes, Cosmetics, and Soaps Kluwer Academic Publishers 2010 Austria</li> <li>2 D.F. Williams Chemistry and Technology of the Cosmetics and Toiletries Industries Springer International Edition USA</li> <li>3 Anthony J. O'Lenick Jr.; Thomas G. O'Lenick Organic chemistry for cosmetic chemists Allured Publishing 2008 London</li> <li>4 Schueller and Romanowsk Beginning Cosmetic Chemistry Allured Pub Corp 2009 London</li> <li>5 Barel AO, Paye M, Maibach Hi Handbook of cosmetic science and technology CRC Press 2014 USA</li> </ul>		
<b>Web References :</b>		
<ul style="list-style-type: none"> <li>1. <a href="https://youtu.be/c-cLID1Ga5g?si=CGpPhdywIjFM0hMU">https://youtu.be/c-cLID1Ga5g?si=CGpPhdywIjFM0hMU</a></li> </ul>		

2. <https://youtu.be/V-bWm2FnVk4?si=I0lyHR4lhp0J5T8->
3. <https://youtu.be/gLBLOuDwqKY?si=cQ3D8KrtDQeGh857>
4. <https://youtu.be/3VedyyC-nsw?si=sfB6NFaNtE6mgI5e>
5. <https://youtu.be/V-bWm2FnVk4?si=RlpP2nMZhcYsu51I>
6. <https://youtu.be/3bgTpf4U8Kk?si=MTYtkMq0N0KAKZ2v>
7. <https://youtu.be/s0I7ZsGqUhk?si=popfpJyB84Zb86PT>
8. [https://youtu.be/XD4g\\_9DKO0g?si=4NwJq374mpqoDE9S](https://youtu.be/XD4g_9DKO0g?si=4NwJq374mpqoDE9S)

**This course will be available for the students from other faculty**

**GE/OE-2 : ( Title of Paper) Dairy chemistry**

Total Credits : 02

Total Contact Hours : 30 Hrs

Maximum Marks : 50

**Learning Objectives of the Course:**

- i) Aware importance of dairy products
- ii) Aware about constituent of milk and milk products
- iii) Give knowledge about different dairy process
- iv) Aware about different dairy products and their processes

**Course Outcomes ( COs) :**

After completion of the course, students will be able to -

- a) knowing importance of the subject from the point of rural economy.
- b) Knowing the composition of milk, its food & nutritive value
- c) understanding the Microbiology of the milk
- d) understanding various preservation and adulterants, various milk proteins and their role for the human body.
- e) knowing various milk products, their composition, manufacture and uses.

Module No.	Topics / actual contents of the syllabus	Contact Hours
<b>I</b>	<p><b>The chemistry of milk</b> Introduction, Definition, constituents of milk of different species such as cow, buffalo, goat, etc., Chemical composition of milk of Indian breed and foreign breeds of cow, factor affecting composition of milk, characteristics of milk of different mammals, physicochemical properties of milk, acidity, pH, density, specific gravity, color and flavor of milk, food and nutritive value of milk. Microbiology of milk, growth of microorganisms, stages of growth, product of microbial growth, destruction of microorganisms growth.</p> <p><b>Preservatives &amp; Adulterants in Milk</b></p> <p>Preservation of milk- Introduction, Common preservatives are used. Adulterants-Introduction, Modes of Adulteration and their detection such as skimming, the addition of separated milk,</p>	<b>10 Hrs</b>

	skim milk, Water, Starch and cane sugar	
II	<p><b>Common Dairy processes</b></p> <p>Cream separation- Basic principles, gravity creaming water dilution and centrifugal creaming method, construction of centrifugal separator, factors affecting the percentage of fat, speed of the machine, temp. of milk, rate of inflow amount of flushing water formation of separator slime Pasteurization of milk, flow sheet diagram, process of receiving milk, preheating filtration, clarification, cooling and storage raw milk, standardization, pasteurization, homogenization, packing and storage, uses of milk.</p>	10 Hrs
III	<p><b>Milk Products Cream, Butter, Cheese and Ice-Cream.</b></p> <p>1. Cream- Definition, Classification, Composition, Food &amp; Nutritive value, Physicochemical properties, Manufacture and uses of cream.</p> <p>2. Butter- Definition, Classification, Composition, Food &amp; nutritive value, Physicochemical properties, Manufacture and uses of Butter selection of milk/cream. Preheating of milk, Separating of milk, neutralization of cream, Pasteurization of cream, Cooking &amp; ageing, repending of cream, salting of butter, washing of butter, packaging &amp; Storage, use of butter</p>	10 Hrs
<p><b>Reference Books</b></p> <p>1) Outline of Dairy Technology- Oxford University press By- Sukumar De. (Edition- 1983) 75</p> <p>2) Dairy Chemistry and Animal Nutrition- M.M. Rai, Kalyani, Publishers, New Delhi 3rd Edition, 1980</p> <p>3) Fundamentals of Dairy Chemistry- B.H. Webb, A.H. Hohsson, J.A. Alford, CBB Publishers and Distributors.</p> <p>4) Milk and Milk Products- C.H. Eckles, H. Macy, Tata McGraw Hikk Publishing Company Ltd.</p> <p>5) Chemistry and Testing of Dairy Products- H.V. Atherton, J.A. New Lander, CBS, Publishers and Distributors.</p> <p>6) Dairy Microbiology, Dr. K.C. Mahanta Omsons Publication New Delhi</p>		



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