



**Sarvodaya Kelavani Samaj managed,
Shri Manibhai Virani and Smt. Navalben Virani Science College
(Autonomous)**

(Affiliated to Saurashtra University, Rajkot)

Re-Accredited at 'A' Level by NAAC

STAR college Scheme & Status by MST-DBT

UGC-College with Potential for Excellence (CPE)

UGC-DDU KAUSHAL Kendra

GAAA –Grade A-1 by KCG, Government of Gujarat

GPCB-Government of Gujarat approved Environment Audit Center

Nodal Center for capacity building by GSBTM

Department of Chemistry

B.Sc. Chemistry

Value Added Course (VAC)

Department of Chemistry

Part III

Skill Enhancement Course (SEC) – I - Value Added Course (VAC)

For the students admitted from A.Y. 2021-2022 & onwards

Offered by: Department of Chemistry, Faculty of Science	Offered to:(Please mark <input checked="" type="checkbox"/> as applicable)	
	<input checked="" type="checkbox"/>	Students across the University other than the offering department.
	<input type="checkbox"/>	Students across the University including the offering department. (The course should not be a part of regular curriculum of the offering department.)
Semester : II –V (3 year programs) / VII (4 year programs)		
Course Code	Course Title	Course Credit and Hours
	Formulation of Detergents & Toiletries	1 Credit - 4 hrs / wk

Objective of the course:

1. Student should be able to understand the basic concept of surface active agents.
2. Understand the basic theory and role of additives in the formulation of cleansing agents and their role in day to day life of humans
3. Students will be able to develop the raw materials and formulation of the soap.
4. Students will be able to develop the raw materials and formulation of the detergents.
5. Student should be able to understand the basic concept of toiletries and their formulation with vast applications.

Course outcomes (Target Skills):

6. Skill development to perform the formulation of soap, detergent and other cleansing agent.
7. Skill development to assess the quality of soap and detergent.

Justification and references for the course (Mapping with NSDC/NSQF/Sector Skill Council/Regional needs/any other) :

- The Value added course based on formulation of Detergents & Toiletries belongs to area of Home care, Personal care and industrial hygiene are offered by various government and non-government institutes. Students will be able to do their own business by improving their skills.
- **Reference:**
 1. <http://www.ihpcia.org/>
 2. <http://www.dcmsme.gov.in/All%20Associations/Product%20Base%20Associations/Soap%20&%20Toiletries%20Associations.html>

Course Description:

The course enables the students to understand the information about surface active agents. To enable the students to understand the importance of additives in the formulation of soaps and detergents. The course provides the complete formulation process of soap, detergents and toiletries both in solid as well as liquid phase

The course aims to address SDG-1: No Poverty.

Course Content	Hours
Module-I: Surface active agents	3 hrs
<ul style="list-style-type: none">• Introduction,• Classification and role of surface active agents - emulsifiers, foaming agents,• Antifoaming agents, concept of HLB - Hydrophile Lipophile Balance.	
Module-II : Additive agents	3 hrs
<ul style="list-style-type: none">• Chemistry, composition, characteristics, role and applications of oil paints, water paints (emulsion paints), varnishes, lacquers and wax polishes.	
Module-III : Soaps	3 hrs
<ul style="list-style-type: none">• Introduction, composition, characteristics, role and applications of soaps, formulation process of soaps - both liquid and solid.	
Module-IV : Detergents	3 hrs
<ul style="list-style-type: none">• Introduction, composition, characteristics, role and applications of soaps, formulation process of detergents - both liquid and solid.	
Module-V : Toiletries	3 hrs
<ul style="list-style-type: none">• Introduction, composition, characteristics, role and applications of toiletries like liquid dish-wash and domestic toilet cleaners. Formulation process of liquid dish-wash and domestic toilet cleaners.	

Suggested laboratory experiments / other activities: (25 Hrs)

1. Preparation of liquid hand-wash: Gel type - transparent.
2. Preparation of liquid hand-wash: Cream type - opaque.
3. Preparation of liquid dish-wash.
4. Preparation of domestic glass cleaner.
5. Preparation of domestic toilet cleaner.
6. Preparation of liquid detergent.
7. Preparation of tiles cleaner
8. Preparation of rust remover
9. Preparation of drainage cleaner
10. Preparation of shower gel & shampoo.

Pedagogic tools:

1. Chalk and Talk
1. PPT and Videos.
2. Assignment
3. Group discussion

Reference Books:

1. Surfactants and interfacial phenomena - Milton J. Rosen
2. Chemical formulation an overview of surfactant – based preparation used in everyday life – Tony Hargreave, Royal Society of Chemistry, 2003, ISBN: 0854046356
3. Cosmetic and Toiletry Formulations - Vol. 2, Ernest W. Flick, Noyes Publication

Suggested reading / E-resources

1. <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/synthetic-detergent>
2. <https://www.shaalaa.com/question-bank-solutions/give-two-differences-between-the-soap-and-synthetic-detergent-cleansing-age>

Suggested MOOCs:

1. <https://swayam.gov.in/explorer?searchText=chemistry>

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Semester : II –V (3 year programs) / VII (4 year programs)		
Course Code	Course Title	Course Credit and Hours
	Soil and water analysis	1 Credit - 4 hrs / wk

Objective of the course:

1. To assess the fertility status and to furnish soil test-based fertilizer recommendation to farmers for obtaining optimum yields.
2. To identify the soil problems if any.
3. To reclaim the problematic soils.
4. To implement soil test results for soil fertility management as per the requirement of crop.
5. To enhance their skills about water analysis.
6. To identify the elements, present in drinking water sample.
7. To determine physical parameters of Water.

Course outcomes (Target Skills):

1. Theoretical knowledge and practical demonstrations on various aspects of soil and water testing were provided to the trainees for the purpose of developing skill and self-entrepreneurship for economic upliftment.
2. To skill development to identify the health of soil.
3. Recognize the common physical, chemical and biological unit operations encountered in treatment processes.
4. Understanding the various types of soil samples carried out by soil Analysis.

Justification and references for the course (Mapping with NSDC/NSQF/Sector Skill Council/Regional needs/any other) :

- The Value added course based on soil and water analysis belongs to area of agriculture. Various types of courses from agriculture and farming sector are offering by Agriculture skill council of India (ASCI-SSC).

Reference:

The link of ASCI – <https://asci-india.com/nos-panel/uploadPDF/QP-Soil%20&%20Water%20Testing%20Lab%20Analyst6a50a7b24d6ea183fa410369f6cadb57.pdf>

Course Description:

The course is an introduction to the nature and properties of soils. Hands-on experience with current techniques for examining the types, numbers, activity and roles of soil and water with specific application to the carbon, nitrogen and sulfur cycle; soil and water quality. organic chemistry, focusing primarily on the basic principles to understand the fertility and reactivity of soil. The course also provides understanding of important soil, physical and chemical properties of water quality.

Course Content	Hours
Module-I: Water Analysis – Physical examination	3 hrs
pH, temperature, total dissolved solid, suspended solid, acidity, alkalinity, colour, taste, smell, turbidity, hardness of water.	
Module-II: Water Analysis – Nonmetallic inorganic constitutes	3hrs
chloride, sulphate, Sulphide, fluoride, phosphate, Sulphur, nitrate, nitrite, carbon dioxide, ammonia, cyanide.	
Module-III : Water Analysis – Mineral and Toxic Ions	3hrs
Mineral ions: calcium, magnesium, iron, sodium, silver, zinc, manganese. Toxic ions: lead, mercury, arsenic, beryllium, cadmium, chromium, copper, selenium.	
Module-IV : Soil Analysis-Physical Test	3hrs
Soil Texture, Water Holding Capacity, Bulk Density, Hydraulic Conductivity.	
Module-V : Soil Analysis- Chemical Test	3hrs
pH, Electrical Conductivity (EC), Organic Carbon ,Free Lime, macronutrients N, P, K, micronutrients Cu, Zn, Mg etc.	

Suggested laboratory experiments / other activities: (25 Hrs)

Soil analysis-Determination of:

1. Water holding capacity
2. Bulk density
3. Soil Reaction (pH)
4. Electrical Conductivity (EC)
5. Calcium Carbonate (CaCO_3) Free Lime
6. Nitrogen, Phosphorous, Potassium

Water analysis-Determination of:

1. pH
2. Electrical Conductivity (EC)
3. Carbonates & Bicarbonates
4. Calcium & Magnesium - EDTA Titrimetric Method
5. Chloride
6. Sulphate on Spectrophotometer

Pedagogic tools:

1. Chalk and Talk
1. PPT and Videos.
2. Assignment
3. Group discussion

Reference Books:

1. Instrumental Analysis, H H Willard, CBS Publishing Co.
2. Handbook of Water Analysis, Third Edition, Leo M.L. Nollet, Leen S. P. De Gelder, CRC Press, ISBN 9781439889640

Suggested reading / E-resources

1. https://www.researchgate.net/publication/40145472_Manual_for_Soil_and_Water_Analysis?enrichId=rgreq-47cc4c991773ee2340098e16adf15d0d-XXX&enrichSource=Y292ZXJQYWdlOzQwMTQ1NDcyO0FTOjU1MDcyNDIxODM1OTgxMEAxNTA4MzE0MjkzOTk4&el=1_x_2&_esc=publicationCoverPdf
2. <https://www.fao.org/publications/card/en/c/05290b67-4309-5b81-a893-69e1f8cdfdb1/>

Suggested MOOCs:

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Semester : II –V (3 year programs)		
Course Code	Course Title	Course Credit and Hours
	Surface Coating Techniques	1 Credit - 4 hrs / wk

Objective of the course:

1. Give an overview of various cleaning process for surface chemistry.
2. Train the student to formulate various electrolytes and to determine quality of electrolyte.
3. Be familiar with the different types of organic surface coating and inorganic surface coating
4. Discuss Formulation; Application; Properties of various additives like Solvent, Brighter and Emulsifiers.

Course outcomes (Target Skills):

1. Decide the surface preparation methods suitable for different substrate materials
2. Understand the basic concept of electroplating & interpret testing & evaluation.-explain importance of electroplating & its applications
3. Student should ability to understand the fundamental principles of Paint and Coating Formulation via classification and film formation mechanisms.
4. Student should able to understand formulations of Electrolyte based on different processes.
5. Ability to handle various machineries and equipment used in laboratory as well as commercial scale.
6. Basic understanding of designing Solvent, Brighter and Emulsifiers for formulation of various electrolytes
7. Ability to understand testing methods for various electrolytes

Justification and references for the course (Mapping with NSDC/NSQF/Sector Skill Council/Regional needs/any other) :

- The Value added course based on surface coating to area of surface finishing. Various types of courses from surface finishing sector are offering by Paints and Coatings Skill Council of India (ASCI-SSC).

Reference:

<https://nsdcindia.org/sector-skill-councils>

Course Description:

The course provides basic information about theory and application of surface chemistry. To enable the students to understand the importance of Techniques of Surface Preparation for different substrata. The course introduces for highlights on different paint application techniques and its efficiency. The course introduces various Classifications of coatings, Mechanisms of film formation in surface coatings. The course emphasizes on Principles of Inorganic surface coating - Non-electric coatings, role of additive like Brightner, Solvent and Emulsifiers technology in electroplating techniques.

Course Content	Hours
Module-I: Surface coating	3 hrs
<ul style="list-style-type: none"> • Introduction • Objectives & applications of coating (on metal & non-metals) • Classification of surface coatings (inorganic & organic) • Preliminary treatment of surfaces. 	
Module-II : Organic surface coating:	3 hrs
<ul style="list-style-type: none"> • Chemistry, composition, characteristics, role and applications of <ul style="list-style-type: none"> ✓ Oil paint ✓ Water paint (emulsion paint) ✓ Varnishes ✓ lacquers ✓ Wax polishes. 	
Module-III : Inorganic surface coating - Electroplating:	3 hrs
<ul style="list-style-type: none"> • Theory and application of following electroplating techniques <ul style="list-style-type: none"> ✓ Copper ✓ Zinc ✓ Chrome ✓ Nickel ✓ Silver 	
Module-IV : Inorganic surface coating - Non-electric coatings:	3 hrs
<ul style="list-style-type: none"> • Theory, characteristics, special applications, and working techniques of <ul style="list-style-type: none"> ✓ Hot dipping ✓ metal spraying 	

<ul style="list-style-type: none"> ✓ Vacuum metalizing ✓ Vitreous coating. ✓ Anodizing 	
Module-V : Additive Agents for Surface Coatings:	3 hrs
<ul style="list-style-type: none"> • Introduction, role and classification of additives in surface coating processes • Role and application of following additives <ul style="list-style-type: none"> ✓ Brighter ✓ Solvents ✓ Emulsifiers. 	

Suggested laboratory experiments / other activities: (25 Hrs)

1. To prepare electrolyte and bath for Copper Electroplating.
2. To prepare electrolyte and bath for Zinc Electroplating.
3. To prepare electrolyte and bath for Chrome Electroplating.
4. To prepare electrolyte and bath for Nickel Electroplating.
5. To perform electroplating of Copper metal on given standard sample.
6. To perform electroplating of Zinc metal on given standard sample.
7. To perform electroplating of Nickel metal on given standard object.
8. Demonstrative Practical: To perform electroplating of Chrome metal on given sample.
9. To perform analysis of electrolyte for Copper Electroplating.
10. To perform analysis of electrolyte for Zinc Electroplating.
11. To perform analysis of electrolyte for Chrome Electroplating.
12. To perform analysis of electrolyte for Nickel electroplating.

Pedagogic tools:

1. Chalk and Talk
4. PPT and Videos.
5. Assignment
6. Group discussion

Reference Books:

1. Coatings materials and surface coatings - Arthur A. Tracton (Editor), CRC Press, Tailor & Fransis Group.
2. Engineering chemistry - R. Gopalan, D. Venkappayya, S. Nagarajan.
3. Chemistry in engineering and technology volume -1 & 2 – J.C. Kuriacose & J. Rajaram
4. Engineering chemistry – Jain & Jain Industrial hygiene and chemical safety – M. K. Fulekar.

Suggested reading / E-resources

1. https://www.youtube.com/watch?v=TuP9de_SK1A
2. <https://www.youtube.com/watch?v=7u54Hx9n3LY>

Suggested MOOCs:

1. https://onlinecourses.nptel.ac.in/noc20_me68/preview