

B.Sc. CHEMISTRY

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	25UCHVAC1	Value Added Course - I	30	-	-	100	100
Course Title ChemSafe Laboratory							

SYLLABUS		
Unit	Contents	Hours
I	Chemical Handling and Storage 1.1. Hazard Communication- Chemical labeling and GHS pictograms. 1.2. Chemical Handling Procedure – Proper techniques for transferring and mixing chemicals, Guidelines for using flammable, corrosive and reactive chemicals. 1.3. Storage of Chemicals- Segregation of chemicals by compatibility (acids, bases, oxidizers), safe storage practices and labeling	6
II	Laboratory Safety 2.1. Basics of laboratory safety – importance of safety in a chemical laboratory, understanding laboratory hazards - physical, chemical and biological, Common accidents and preventive measures. 2.2. Safety Equipment and their uses - Good laboratory Practices (GLP) -personal protective equipment (PPE) - gloves, goggles and lab coats, Emergency safety equipment - fire extinguishers, eyewash stations, safety showers. 2.3. Safety Regulations and Standards – national and international safety guidelines – OSHA and MSDS.	6
III	Laboratory Techniques and Best Practices 3.1. Handling Laboratory Glassware and Equipment – Common types of glassware and their proper use, maintenance and safe handling of lab equipment. 3.2. Minimizing Risks During Experiments - Techniques to avoid contamination and spills. Working in fume hoods and glove boxes. 3.3. Avoiding Common Errors - Calibrating instruments, checking for leaks, equipment malfunctions.	6
IV	Ethical laboratory Practices and Emergency Response 4.1. Ethical laboratory Practices – Environmental responsibilities in handling chemicals, maintaining accurate lab records and ensuring reproducibility. 4.2. Chemical Waste Disposal – types of chemical wastes (inorganic, organic, hazardous and non-hazardous), proper waste segregation and disposal techniques. 4.3. Emergency preparedness – fire safety protocols, Evacuation plans and incident reporting.	6
V	Experiential Learning 5.1. Activity - Case studies and Problem-solving 5.2. Activity - Analysis of real - life lab accidents and lessons learned 5.3. Activity - Industrial Visit	6

Text Book(s):
1. Benjamin R. Sveinbjornsson and Sveinbjorn Gizurarson, Hand Book on Laboratory Safety, Elsevier Publications, 2022. https://doi.org/10.1016/B978-0-323-99320-3.00005-7 .
Reference Book(s):
1. Muhammad Raza Shah, Safety in the Chemical Laboratory and Industry: A Practical Guide, Elsevier Publications, 2023. https://doi.org/10.1016/C2021-0-02411-1 .
Web Resource(s):
1. https://archive.nptel.ac.in/courses/103/106/103106071/ .

Course Outcomes:	
Upon successful completion of this course, the students will be able to	
CO1	Recall the ethical laboratory practices and demonstrate emergency preparedness.
CO2	Know the procedures for the safe handling and storage of chemicals.
CO3	Apply advanced safety techniques to ensure safety in the chemical laboratories.
CO4	Distinguish between inorganic, organic, hazardous and non-hazardous chemical wastes.
CO5	Analyze the various chemical laboratory accidents and their causes.

Scheme of Valuation:

Theory Examination: 60 Marks, Assignment / Case Study / Field Visit / Industrial Visit: 40 Marks

Course Coordinators: 1. Dr. M. Syed Ali Padusha
2. Dr. M. Anwar Sathiq

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
V	25UCHVAC2	Value Added Course - II	30	-	-	100	100
Course Title		Distillation Techniques and Paper Chromatography					

SYLLABUS		
Unit	Contents	Hours
I	Distillation techniques: Principle, role of Raoult's law and Dalton's law, types - simple, fractional, steam, vacuum, air sensitive vacuum, short path, zone distillations - applications	6
II	Paper Chromatography: Principle, types of paper chromatography, R_f - value, factors affecting R_f - value, types of forces involved, techniques - choice of filter paper, choice of solvent, sample application, development of chromatogram, ascending, descending, disc development, drying, location of the spots and locating reagents.	6
III	Distillation techniques Practical i) Distillation of aniline by simple distillation ii) Separation of ethanol and methanol by fractional distillation iii) Separation of orange oil by vacuum distillation	6
IV	Paper Chromatography Practical - I i) Separation of components present in the commercial ink. ii) Separation of mixture of indicators. (Alizarin red, methyl orange) iii) Separation of metallic ions of group I.	6
V	Paper Chromatography Practical - II i) Separation of mixture of amino acids (Glutamic acid, lysine, aspartic acid) ii) Separation of D - Glucose and lactose in a mixture	6

Text Book(s):
1. V. K. Srivastava and K. K. Srivastava, Introduction to Chromatography - Theory and Practice, 4 th Edition, S. Chand and Company, Pvt. Ltd., New Delhi, 1991.
2. B. S. Furniss, A.J. Hannaford, P.W.G. Smith, A.R. Tatchell, Vogel's Text Book of Practical Organic Chemistry, 5 th Edition, Pearson Publications, India, 2003.
3. R. Gopalan and K. S. Viswanathan, Analytical Methods, Universities Press, India, 2018.
Reference Book(s):
1. H. Kaur, Instrumental Methods of Chemical Analysis, 12 th Edition, Pragati Prakashan, Meerut, Uttar Pradesh, 2016.
2. B. K. Sharma, Instrumental Method of Chemical Analysis, Krishna Prakashan Media (P), Ltd, Meerut, Uttar Pradesh, 2014.
Web Resource(s):
1. https://www.youtube.com/watch?v=v1Lx_ZoV5w4
2. https://www.youtube.com/watch?v=Pir-DZeqp4U

Course Outcomes:	
Upon successful completion of this course, the students will be able to	
CO1	Well-verse in distillation theory and techniques.
CO2	Comprehend the basic principles of paper chromatography.
CO3	Design and optimize distillation systems.
CO4	Apply paper chromatographic techniques to separate mixtures.
CO5	Molecular migration maestro.

Course Coordinator(s): 1. Dr. K. Loganathan
2. Dr. M. Purushothaman

M.Sc. CHEMISTRY

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	25PCHVAC1	Value Added Course - I	30	-	-	100	100
Course Title DETECTION OF FOOD ADULTERATION AND ANALYSIS							

SYLLABUS		
Unit	Contents	Hours
I	Food Adulteration Adulteration - Definition, Types - Intentional, incidental, metallic and packaging hazard. Impact on Human Health. Prevention of Food Adulteration. Common adulterants in food Products: milk, cereals, pulses, spices, oils, beverages and sweets.	6
II	Food additives and Food safety management systems Food Additives - Definition, classification, role of additives - preservatives, emulsifiers, stabilizers, anti - oxidants and acidulants in processed foods. Safe levels of additive uses. Importance and application of food regulation in the Indian and Global context, responsibilities for maintaining and enforcing food safety FSSAI, Codex Alimentarius, HACCP, ISO 22000 series, TQM and codes of GMP. Auditing and accreditation (BIS, QCI and AGMARK).	6
III	Qualitative analysis of Adulterants Practical - I 1. Detection of water, detergent and starch in milk 2. Detection of mashed potatoes in ghee/butter 3. Detection of other oils in coconut oil	6
IV	Qualitative analysis of Adulterants Practical - II 1. Detection of iron filings in atta /maida /suji (rawa) 2. Detection of chicory powder in coffee powder 3. Detection of chalk powder in sugar and 4. Detection of sugar solution in honey.	6
V	Qualitative and Quantitative analysis of Additives Practical - III 1. Qualitative and Quantitative analysis of urea in milk. 2. Qualitative Test for Benzoic acid in fruit juice, jam / jellies / sauces - Phenol sulphuric acid test 3. Qualitative Test for Non-nutritive sweeteners (Saccharine and Cyclamate) – Sodium nitrite test.	6

Text Book(s):
1. Yogambal Ashok Kumar, "Theory of Bakery and Confectionery", PHI learning private Limited, New Delhi, (2009). 2. Food Safety and Standards Act, 2006. Bare ACT, November Commercial law publishers. (2020) 3. FSSAI, Manual of Methods of Analysis of Foods Instruction manual - part I, (2012) 4. FSSAI, DART (detect adulteration with rapid test), (2015) 5. FSSAI, Manual of Methods of Analysis of Foods, Food additives (cereals, pulses, fruits and vegetables, spices, oils and fats), Food Safety And Standards Authority Of India Ministry Of Health And Family Welfare, Government Of India, New Delhi (2016)
Reference Book(s):
1. Advisory no.: 2/ FSSAI / 2008. Advisory to the state health authorities on monitoring melamine contamination of foods. FSSAI, India 2. Garber E A E Detection of melamine using commercial enzyme-linked immune sorbent assay technology. J Food Protection 71 (3): 590 - 94. 2008. 3. U.D. Chavan and J.V. Patil. Industrial Processing of fruits and vegetables. Astral International Pvt. Ltd. New Delhi. 2013. 4. Bhuvaneswari. D and Kavitha. V, "Easy to Bake" Divakar Publications, Trichy, 2017. 5. A Laboratory Manual of Food Analysis, S. Sehgal, Wiley Publishers. 2019
Web Resource(s):
1. http://www.fssai.gov.in/Portals/0/Pdf/AdvisoryMelamineinFoods 2. https://youtu.be/DSKre3LkkIg 3. https://youtu.be/o05CbIp_Iec?si=TD_4Ys6AM-d8TRaH

Course Outcomes:	
Upon successful completion of this course, the students will be able to	
CO1	Acquire the knowledge on various food adulterants.
CO2	Interpret the importance and applications of food regulation.
CO3	Identify qualitatively the adulterants present in food in the chemical laboratories.
CO4	Analyze quantitatively the adulterants present in food in the chemical laboratories.
CO5	Estimate the additives present in the food sample.

Course Coordinator(s): 1. Dr. M. Syed Ali Padusha, 2. Dr. A. Zahir Husain
3. Dr. J. Sirajudeen, 4. Dr. J. Muneer Ahamath