**Syllabus for Certificate Courses**

**CHE05CC09 – PREPARATION AND EFFECTIVE MARKETING OF HAND WASH**

**Unit 1 : Introduction (3 hrs)**

Cleansing Agents: Introduction, Chemistry, synthesis and applications of cleansing agents, cleansing action, detergents and surfactants, washing action of detergents, types of detergents, eco-friendly detergents Types of surfactants-cationic and anionic surfactants. Introduction of natural and synthetic colour, perfume and essential oils.

**Unit 2 : Preparation of various house hold products (3 hrs)**

Soap oil, Washing soap, Detergents, Liquid blue, Dettol - Raw materials, their function, safety concern and Preparation, Hand Sanitizer, White Phenyl: Chemistry of disinfectants, Chemistry of Raw materials, Preparation description of White phenyl. Floor tile cleaner: Natural and synthetic, Raw materials, their function, safety concern and Preparation.

**Unit 3: Basic ideas of Marketing (6 hrs)**

Marketing- Meaning- Marketing Vs Selling- Functions of marketing-Features of modern marketing concept- Analyzing consumer behaviour - Market segmentation-Utility creation- New product Development- Branding- Labeling-promotion-Pricing- Product Life Cycle- Pricing strategies during the introduction stage of a product

**Unit 4: Practical session (18 hrs)**

Hands on training in the synthesis of Hand wash and its effective marketing.

References:

1. Philip Kotler, Kevin Lane Keller,*“Marketing Management”* (15e), Pearson India Education Services PvtLtd
2. V S Ramaswamy& S Namakumari, *“Marketing Management”* (Latest Edition)- McGraw Hill Education (India) Private Limited, NewDelhi
3. Small scale industries and house hold industries in developing economy by Shetty M.C.
4. Manufacture of perfume cosmetics and detergents by Prasad Giri Raj
5. Industrial chemistry by B.K.Sharma
6. Flavours & Essential oils, Industries SBP Board
7. Perfumes soaps & cosmetics by Poucher.
8. Manufacture of perfumes, cosmetics and detergents by Giriraj Prasad
9. Manufacture of perfumes, cosmetics and detergents by Prasad.
10. A Text Book of Quantitative Inorganic Analysis Including Elementary Instrumental Analysis: A.I. Vogel (Third Ed.).
11. Vogel’s text book of Qualitative Chemical Analysis (Longman ELBS Edition)
12. Vogel’s text book of Quantitative Analysis (Longman ELBS Edition)

**CHE05CC08 - Hands on Training in Software Tools for Scientific Graphing and Molecular Modelling**

**Module 1**

**Chemical Databases**:- Pubchem, Search chemicals by name, molecular formula, structure, and other identifiers. Find chemical and physical properties, biological activities, safety and toxicity information, literature citations and more.

**Module 2**

Searching and downloading research papers using keywords in Scopus, Science direct, google scholar, and Sci-hub, Introduction to End Note and its applications

**Module 3**

**Origin:-** Introduction, download and installation process, basic features like Scientific graphing, drawing various 2D &3D plots, Data analysis, signal processing, curve fitting, peak analysis, error bar, conversion of graph to various file format like

JPEG, GIF, PNG etc

**Module 4**

**ChemDraw Ultra:-** Introduction, download and installation process, Drawing various simple and complex chemical structures, nomenclature generation, conversion of name into molecular structure, calculation of physical properties such as density, molecular weight, molecular formula, refractive index from structural formula.  1H, 13C NMR prediction from molecular structure, Drawing structure of bigger molecules such as proteins, carbohydrates, and RNA/DNA, bio arts, use of templates.

**REFERENCES**

1. Jamal Raiyn and Anwar Rayan, “How Chemicals’ Drawing and Modeling Improve Chemistry Teaching in Colleges of Education”, World Journal of Chemical Education, 2015, Vol. 3, No. 1, 1-4
2. K. I. Ramachandran, G Deepa and K Namboori, “Computational Chemistry and Molecular Modeling – Principles and Applications”, Springer-Verlag, Berlin, Heidelberg, 2008, ISBN-13 978-3-540-77302-3.
3. Donald W Rogers, “Computational Chemistry Using PC”, Wiley, (2003).
4. Prof. Dr. Stefan Bienz, “Short Manual to the Chemical Drawing Program ChemDraw”
5. Taylor Cornell and Geoffrey Hutchison, “Avogadro: Molecular Editor and Visualization
6. Phillip M. Edwards Origin 7.0:  Scientific Graphing and Data Analysis Software
7. Sunghwan Kim, Paul A. Thiessen, Evan E. Bolton\* , Jie Chen, Gang Fu, Asta Gindulyte, Lianyi Han, Jane He, Siqian He, Benjamin A. Shoemaker, Jiyao Wang, Bo Yu, Jian Zhang and Stephen H. Bryant, “PubChem Substance and Compound databases”
8. Amy Butros and Sally Taylor, “managing information: evaluating and selecting citation management sofrtware, a look at endnote, refworks, mendeley and zotero”
9. Baraa Rayan and Anwar Rayan, “Avogadro Program for Chemistry Education: To What Extent can Molecular Visualization and Three-dimensional Simulations Enhance Meaningful Chemistry Learning?
10. Arvin Moser, “ACD/ChemSketch Quick Start Guide”, <http://www.acdlabs.com/chemsketch/>

**Syllabus for**

**CHE05CC12 – “GREEN METHODS FOR AN EVERGREEN EARTH”**

**Module I:** (3 hrs)

Introduction to Environmental pollution

Concepts and definition – Pollutant, contaminant, receptor and sink – Classification of pollutants – Global, regional, local, persistent and non-persistent pollutants.

**Module II**: (6 hrs)

Air Pollution and control measures

Need for clean air, Composition of air, Tropospheric pollution – Gaseous air pollutants –Hydrocarbons, oxides of sulphur, nitrogen and carbon – Global warming, greenhouse effect, acid rain – Particulates – Smog: London smog and photochemical smog – effects and control of photochemical smog – stratospheric pollution - depletion of ozone layer, chlorofluorocarbons - Automobile pollution. Control of air pollution – Alternate refrigerants.

Air pollution control measures – Gravitational settling chamber, fabric filter, wet scrubber, catalytic converters, stacks and chimneys, cyclone collectors, Cottrell electrostatic precipitator, extraction ventilator, zoning and green belt.

**Module III**: (9 hrs)

Water Pollution and control measures

Importance of water. Impurities in water, international standards for drinking water – cause of pollution – natural and anthropogenic – Marine water pollution – Underground water pollution. Source of water pollution – Industrial waste, Municipal waste, Agricultural waste, Radioactive waste, Petroleum, Pharmaceutical, heavy metal, pesticides, soaps and detergents. Types of water pollutants: Biological agents, physical agents and chemical agents Eutrophication - biomagnification and bioaccumulation. oil pollution in water.

Water quality parameters: DO, BOD, COD, alkalinity, hardness, chloride, fluoride and nitrate. Toxic metals in water and their effects:

Water treatment methods - Primary, secondary and tertiary methods - Aerobic and anaerobic oxidation - Sedimentation, coagulation, filtration, disinfection, desalination and ion exchange - USAB process and deep well injection.

**Module IV**: (9 hrs)

Soil Pollution and control measures

Soil pollution: Sources by industrial and urban wastes. Pollution due to plastics, pesticides, biomedical waste and e-waste (source, effects and control measures)

Control of soil pollution - Solid waste Management – Open dumping, landfilling, incineration, re-use,

reclamation, recycle, composting, non-degradable, degradable and biodegradable wastes. Hazardous waste.

**Module V**

Green chemistry: Green chemistry principles, need of green chemistry, examples.

References

1. A. K. Ahluwalia, Environmental Chemistry, The Energy and Resources Institute, 2017.

2. Balram Pani, Textbook of Environmental Chemistry, I. K. International Pvt Ltd, 2010.

**CHE 05 CC10: “Hands-on training in Polymer Processing” For the final year B.Sc Chemistry Students**

**Module I (8 hrs)**

Rubber and its classifications, Composition, collection and preservation of Rubber latex - Estimation of Dry Rubber Content (DRC) – Rubber Preservatives - Importance of ammonia as preservative - Test for latex - Concentration of latex by centrifuging.

**Module II (8 hrs)**

Principles of latex compounding techniques- Latex dipping – different vulcanization methods - Properties of vulcanizers. Composites, polymer nanocomposites

**Module III (8 hrs)**

Manufacturing methods: Dipping - Dipped goods - Gloves (Surgeon and household), Rubber band, Toy balloons - Calendering: Mats - Extrusion: Thin wires, Ball

**Module IV (6 hrs)**

Marketing of rubber products - Significance, steps and procedures in marketing - Use of Market research.

**References:**

1. V. R. Gowariker, Polymer Chemistry, New Age International Pvt Ltd., New Delhi, 2010.
2. R. Joseph, Practical Guide to Latex Technolgy, Smithers Rapra Technolgy Limited, 2013.

**SYLLABUS FOR ADD ON COURSE, 2022-23**

**CHE 05 CC13: “Structural Elucidation of Organic Molecule ” For MSc Chemistry students**

**MODULE 1 (2 hr)**

**Introduction to structure elucidation**

Chemical methods and physical methods. Spectroscopic methods

**MODULE II (8 hr)**

**Ultraviolet and Infrared Spectrophotometry**

The electromagnetic spectrum. Absorption of light: Beer-Lambert Law. UV-Visible spectroscopy.

Introduction. Types of vibrations. Hydrogen bond. Polyatomic molecules. Characteristic absorption of different functional groups. FTIR spectrophotometer. Preparation of the sample. Interpretation of IR spectra.

**MODULE III (8 hr)**

**Introduction to Mass spectrometry**

Introduction. Instrumentation. Ionization methods. Types of ions. Determination of molecular masses. Fragmentation of positive ions. General rules of fragmentation of organic molecules. Analysis of the mass spectrum. Representative examples.

**MODULE IV (9 hr)**

**Introduction to Nuclear Magnetic Resonance spectroscopy**

Basic principles of nuclear magnetic resonance. Spectrophotometers. Effects of chemical shift that influence NMR. Intensities of the bands. Reference substances. Solvents. Spin-spin coupling. The coupling constant. Relation between chemical shift-molecular structure. Complex spectra. Homotopic, enantiotopic and diastereotopic groups. Stereoisomery and NMR. Proton couplings with other nuclei. Double resonance experiments. Spin decoupling. NOE effect (Nuclear Overhouser Effect): Proximity in the 1H-1H space. Magnetic resonance of 13C. Decoupling techniques. 13C quantitative analysis. DEPT experiments. Spectral correlations

**MODULE V (3 hr)**

**Practical applications of structure elucidation techniques**

**Course Coordinator: Dr. Jamsheena V, Assistant Professor, KAHM Unity Women’s College , Manjeri**

References

Spectrometric identification of organic compounds” R.M. Silverstein, F.X. Webster, D.J. Kiemle. (Wiley, 7th Edition). . Specific: • “Nuclear Magnetic Resonance and Spectroscopy” J. B. Lambert, E. P. Mazzola (Pearson) • “Spin Dynami

**SYLLABUS FOR CERTIFICATE COURSE**

**CHE05CC11-Molecular Visualization Softwares**

**Module 1**

**ACD ChemSketch**:- Introduction, download and installation process, Drawing various simple and complex chemical structures, conversion of name of molecule into its structure and vice versa, calculation of physical properties such as molecular weight, molecular formula, density, refractive index from structural formula, bond angles, bond lengths, dihedral angles.

**Module 2**

**Avogadro:-** Introduction, download and installation process, Drawing various simple and complex chemical structures, Sketch the molecule using avogadro and get the coordinates of the molecule, Single point energy calculation, Geometry optimization, Fundamental vibrational frequency analysis of different molecules, Conformational analysis of ethane and butane

**Module 3**

**PyMOL:-** **:-** Introduction, download and installation process, visualization of different kinds of molecules such as proteins, compounds, or molecules. export files into different formats. Perform various operations on structures such as removing atoms or residues, changing colors, labeling residues, and so on.

**REFERENCES**

1. K. I. Ramachandran, G Deepa and K Namboori, “Computational Chemistry and Molecular Modeling – Principles and Applications”, Springer-Verlag, Berlin, Heidelberg, 2008, ISBN-13 978-3-540-77302-3.
2. Donald W Rogers, “Computational Chemistry Using PC”, Wiley, (2003).
3. Taylor Cornell and Geoffrey Hutchison, “Avogadro: Molecular Editor and Visualization
4. Baraa Rayan and Anwar Rayan, “Avogadro Program for Chemistry Education: To What Extent can Molecular Visualization and Three-dimensional Simulations Enhance Meaningful Chemistry Learning?
5. Arvin Moser, “ACD/ChemSketch Quick Start Guide”, http://www.acdlabs.com/chemsketch/
6. Jamal Raiyn and Anwar Rayan, “How Chemicals’ Drawing and Modeling Improve Chemistry Teaching in Colleges of Education”, World Journal of Chemical Education, 2015, Vol. 3, No. 1, 1-4
7. DeLano, Warren L. "Pymol: An open-source molecular graphics tool." *CCP4 Newsl. Protein Crystallogr* 40.1 (2002): 82-92.
8. DeLano, W. L., & Bromberg, S. (2004). PyMOL user’s guide. *DeLano Scientific LLC*, *629*.
9. Seeliger, Daniel, and Bert L. de Groot. "Ligand docking and binding site analysis with PyMOL and Autodock/Vina." *Journal of computer-aided molecular design* 24.5 (2010): 417-422.

Gierut, Aleksandra M., et al. "PyLink: a PyMOL plugin to identify links." *Bioinformatics* 35.17 (2019): 3166-3168