

**Syllabus
for
(Open Elective Course)**

Open elective courses offered by the Department of Chemistry for other Departments of the University.

Course Code	Course Title	Course Type	Maximum Marks			Credit Distribution			Credit	Total Credits
			Internal*	Final	Total	L	T	P		
CHM001	Biomolecules	Open Elective	25	25	50	2	0	0	2	2
CHM002	Nanoscience and Polymers	Open Elective	25	25	50	2	0	0	2	2
CHM003	Essential oils, Perfumery, and Aromatherapy	Open Elective	25	25	50	2	0	0	2	2
CHM004	Industrial Inorganic Chemistry	Open Elective	25	25	50	2	0	0	2	2
CHM051	Chemistry in Everyday Life	Open Elective	25	25	50	2	0	0	2	2
CHM052	Life and Contributions of Some Famous Scientists	Open Elective	25	25	50	2	0	0	2	2
CHM053	Skin and Hair Care Products	Open Elective	25	25	50	2	0	0	2	2
CHM054	Qualitative Examination of Food Stuffs	Open Elective	50	50	100	3	0	0	3	3

*(Midterm 15 marks +Assignment 5 marks + Attendance 5 marks)

Open Elective Course
Course Title: Biomolecules
Course Code: CHM001

Credits = 2
M.M. = 50
L T P=2 0 0

Course Learning Outcomes: After completion of this course, the students will be able to:

CLO 1:	Understand structure and function of biomolecules such as carbohydrates, proteins, and vitamins
CLO 2:	Decipher the role of micronutrients and biologically important molecules

Unit I: Organic Biomolecules

Carbohydrates: Classification (aldoses and ketoses), monosaccharide (glucose and fructose), oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen), Importance of carbohydrates.

Proteins: Elementary idea of amino acids, polypeptides, proteins, Functions of proteins.

Vitamins: Classification and functions.

Unit II: Bio-inorganic Chemistry

Evidence regarding the presence of inorganic elements in biological systems, Biochemical role of calcium and magnesium, Biological role of Haemoglobin, Myoglobin and Vitamin B₁₂, Elementary idea of Nitrogen fixation.

Books Recommended:

1. Organic Chemistry by I. L. Finar Vol-II, ELBS Publications. 6th Edn.; 2002.
2. Bio-organic Chemistry J. Rohr, Springer, 2000.
3. Bio-organic Chemistry. A Chemical Approach to Enzyme Action, Herrmann Dugas Springer, 3rd Edn.; 1999.
4. Bio-inorganic Chemistry -An introduction; Ochai, Allyn and Bacon; Abbe books, 1977.

Reference Books

5. Inorganic Bio-chemistry, Eichhorn; —Vol. 1 & 2; Elsevier, 1973.
6. Inorganic Chemistry – Puri, Sharma and Kalia. Milestone publishers, 32nd Edn.; 2014
7. Introduction to Bioorganic Chemistry and Chemical Biology. D. V. Vranket and Gregory Weiss; Taylor and francis. 1st Edn.; 2012.
8. Bio-inorganic Chemistry ; K. Hussain Reddy; New Age International (P) Ltd; 1st Edn.; 2009

Open Elective Course
Course Title: Nanoscience and Polymers
Course Code: CHM002

Credits =2

M.M. = 50

L T P=2 0 0

Course Learning Outcomes: After completion of this course, the students will be able to:

CLO 1:	Gain basic knowledge about nanomaterials
CLO 2:	Learn applications of some basic polymers

Unit I: Nanotechnology

Introduction to Nanoscience and Nanotechnology, Idea of size, Nanotechnology in Nature.
Properties of materials at nanoscale: Optical, electrical and magnetic properties.
Common application of Nanoscience in agriculture, medicine, water treatment and food packaging

Unit II: Polymers and their Applications

Introduction and classification of polymers, importance of polymers over other materials
Common uses of some polymers
Polyethylene
Polyvinyl chloride
Teflon
Rubber
Polyamide,
Polyacrylonitrile

Books Recommended:

1. Nanotechnology, J. Ramsden, Elsevier, 1st E dn.; 2011.
2. Nanotechnology Importance and Application, Fulekar, I K International Publishing House, 2010.
3. Springer Handbook of Nanotechnology, B. Bhushan (Editor), 3rd Edn.; 2010.

Reference Books

4. Essentials of Nanotechnology. J Ramsden, 2009.
5. Nanotechnology Fundamentals and Applications, Manasi Karkare, I K International Publishing House, 2008.
6. Introduction to Nanoscale Science and Technology, M. Ventra, S, Evoy, J.R. Heflin. Springer; 2004.

Open Elective Course
Course Title Essential Oils, Perfumery, and Aromatherapy
Course Code: CHM003

Credits =2
M.M. = 50
L T P=2 0 0

Course Learning Outcomes: After completion of this course, the students will be able to:

CLO 1:	Acquire knowledge about essential oils, their extraction through different techniques like hydrodistillation and steam distillation. They will also learn about various analytical techniques like gas chromatography mass spectrometry.
CLO 2:	Learn about the role of essential oils and other fragrance chemicals in various types of alcoholic and non-alcoholic perfumes. They will also learn about various fragrance notes like top note, middle note and base note.

Unit I: Essential Oils and their Extraction

Essential oils, chemical composition, methods of extraction, hydrodistillation, steam distillation, Solvent Extraction, CO₂ Extraction, Maceration, Enfleurage, Cold Press Extraction. Analytical methods for essential oil analysis; Gas chromatography mass spectrometry. Economically important essential oils, their quality profile and market value.

Unit II: Value Addition of Essential Oils

Role of essential oils in perfumery. National and international markets. Ingredients used for the preparation of alcoholic and non-alcoholic perfumes. Solid and gel perfumes. Basic techniques of essential oil blending, base note, middle note and top notes. Use of following essential oils in perfumery: lavender, rosemary, ylangylang, geranium, rose, lemon, orange, vanilla, patchouli, vetiver, clarysage, basil, bergamot, cardamom, clove oil, eucalyptus, fennel, frankincense, ginger, jasmine, lemon grass.

Use of essential oils in aromatherapy, classification of aromatherapy; Cosmetic, massage, medical and olfactory aromatherapies.

Books Recommended:

1. Handbook Of Essential Oils Science Technology And Applications; Baser K H C, Taylor & Francis, 3rd Edn; 2020.
2. Essential Oils for Beginners: The Guide to Get Started with Essential Oils and Aromatherapy, Althea Press (26 September 2013).

Open Elective Course
Course Title: Industrial Inorganic Chemistry
Course Code: CHM004

Credits =2

M.M. = 50

L T P=2 0 0

Course Learning Outcomes: After completion of this course, the students will be able to

CLO 1:	Learn about chemical classification in terms of applications; fertilizers and important silicon based compounds
CLO 2:	Learn about inorganic solids in terms of their applications

Unit I: Primary Inorganic Materials and Mineral Fertilizers

Introduction; Importance of the chemical industry; Primary inorganic materials; Bulk and commodity chemicals; Fine and speciality chemicals

Mineral fertilizers; Nitrogen fertilizers, ammonium nitrate and urea; Phosphorous containing fertilizers

Industry important organo-silicon compounds; industrial silicone products

Unit II: Inorganic Solids

Inorganic solid, zeolites and catalysts, inorganic fibers; Construction materials; Enamel and ceramics

Fillers - synthetic and natural, applications; Metallic hard materials

Inorganic pigments; TiO₂, lithopone, ZnS, ZnO and Fe₂O₃; Corrosion protection pigments; Luminescent and magnetic pigments

Books Recommended:

1. Industrial Inorganic Chemistry by K H Buechel, H -H Moretto, P Woditsch; Wiley-VCH 2nd Edn;
2. Inorganic Chemistry: An Industrial and Environmental Perspective by T W Swaddle, AP 1997.

Open Elective Course
Course Title: Chemistry in Everyday Life
Course Code: CHM051

Credits =2
M.M. = 50
L T P=2 0 0

Course Learning Outcomes: After completion of this course, the students will be able to:

CLO 1:	Understand how drugs are important in everyday life of human society
CLO 2:	Acquire the knowledge of importance of preservatives in food industries

Unit I: Medicines and their Use

Chemicals in medicines: Introduction and classification of drugs: Analgesics, Tranquilizers, Antiseptics, Disinfectants, Antimicrobials, Antifertility drugs, Antibiotics, Antacids, Some lifesaving drugs: Epinephrine Hydrochloride (Adrenaline), Dexamethazone Sodium phosphate, Meperidine Hydrochloride (Pethidine), Diazepam, Aspirin, Drug addiction.

Unit II: Chemicals for Food Preservation

Preservatives: Need for preservatives, Classification and types, Natural preservatives.

Artificial sweetening agents: Classification, types and their effects, Common uses of sweetening agents.

Antioxidants: Classification and types, Natural antioxidants and applications.

Books Recommended:

1. DRUGS A Very Short Introduction; Oxford University Press; 2001
2. Pharmacology: An Introduction to Drugs; Michael C. Gerald; Prentice Hall; 1974
3. The Chemistry of Food; Jan Velisek; Willey Blackwell; 2014

Open Elective Course
Course Title: Life and Contributions of Some Famous Scientists
Course Code: CHM052

Credits =2
M.M. = 50
L T P=2 0 0

Prerequisites:

Course Learning Outcomes: After completion of this course, the students will be able to:

CLO 1:	Reveal the sacrifices and contribution of scientists during early periods of sciences
CLO 2:	Struggle and contributions of modern scientists in chemistry and physics

Unit I: Early Science and Scientists (Scientific

Introduction to Science.

Hippocrates as an inspiration source of science.

Aristotle: Early life and contributions.

Avicenna, and Jabir ibn Hayyan: Works and scientific contributions.

Copernicus and Galileo: Science of stars and telescopic discoveries.

Unit II: Life and Work of Modern Scientists

Life and works of Antoine Lavoisier, Micheal Faraday, G. N. Lewis.

Life and works of Marie Curie, Rosland Franklin, Fritz Haber, Linus Pauling.

Life and works of Isaac Newton, Neils Bohr, Albert Einstein, Abdus Salaam, Ahmed Zewail.

Life and works of some famous national scientists: C. V. Raman, S. N. Bose, Meghnand Saha, Srinivasa Ramanujan, Rivalries, and politics in science.

Books Recommended:

1. The 100 Most Influential Scientists of All Time; Britannica Educational Publishing; 2010.
2. Great Physicists: The Life and Times of Leading Physicists from Galileo to Hawking ; William H. Cropper ;2004.
3. Humphry Davy: Science and Power, Cambridge University Press, Cambridge, David M. Knight; 2003.

Reference Books

4. Master Mind: The Rise and Fall of Fritiz Haber, the Nobel Laureate Who Launched the Age of Chemical Warfare, Harper Collins, New York, Baniel Charles; 2005.
5. Journey into Light: Life and Science of C. V. Raman; Oxford University Press; G. Venkataraman,; 1989.
6. Nucleus and Nation: Scientists, International Networks, and Power in India. University of Chicago Press; Robert S. Anderson 2010.

Open Elective Course
Course Title: Skin and Hair Care products
Course Code: CHM053

Credits =2
M.M. = 50
L T P=2 0 0

Course Learning Outcomes: After completion of this course, the students will be able to:

CLO 1:	Learn about the skin structure and various types of skin. They will also learn about principles of skin care formulations and building blocks of skin care products like face wash, cold cream, vanishing cream, sunscreens etc.
CLO 2:	Learn about the basic structure of hair and principles of formulation of various hair care products. They will also learn about the role of various herbs in hair care products.

Unit I: Skin Care Products

Skin: Basic structure and function of skin. Cosmetics and classification of cosmetics. Principles of formulation and building blocks of skin care products: Face wash, Moisturizing cream, Cold Cream, vanishing cream, sun-screens, and lotions. Sun protection, Classification of Sunscreens and SPF.

Role of herbs in skin care products: Essential oils, Aloe Vera, turmeric, Henna and amla.

Unit II: Hair Care Products

HAIR: Basic structure of hair. Hair growth cycle. Principles of formulation and building blocks of Hair care products: Conditioning shampoo, Hair conditioner, and anti-dandruff shampoo. Hair oils.

Role of herbs in hair care products: Amla, Hibiscus, Rosemary, Eucalyptus, Rose, Garlic and onion.

Books Recommended:

1. Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
2. Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4th Edn, Vandana Publications Pvt. Ltd., Delhi.
3. Text book of Cosmeticology by Sonja Nanda & Roop K. Char, Tata Publishers.

Reference Book

Open Elective Course
Course Title: Qualitative Examination of Food Stuffs
Course Code: CHM054

Credits =3

M.M. = 100

L T P

3 0 0

Course Learning Outcomes: After completion of this course, the students will be able to:

CLO 1:	Learn about various tests generally used in detecting the foreign additives in food samples
CLO 2:	Make them ready for various food testing laboratories and food industries

Unit I: Food Analysis-I

Milk: Constituents of milk, Qualitative examination: Physicochemical characteristics, preparation of sample for chemical examination, specific gravity of milk, Preparation of casein, Test for casein, Test for reducing sugars, Test for calcium and Phosphorous.

Unit II: Food Analysis-II

Cheese: Test for proteins, Grease spot test, Neumann's test.

Egg: Chemical tests for egg white, Chemical tests for egg yolk.

Meat: Test for myosin, Meat extract tests (Lead acetate and aldehyde tests with other tests if chemicals are available e.g; Xanthoproteic, Million Nasse's, Sakaguchi's tests)

Unit III: Food Analysis III

Wheat Flour: Preparation of gluten, Test for carbohydrates in the colloidal solution, Test for proteins in the gluten.

Bread: Preparation and qualitative examination.

Artificial sweeteners and

Determination of sugar content in beverages

Vitamin C determination by Indophenol Method

Sodium determination using ion-selective electrodes, Mohr titration, and test strips

Recommended Books:

1. Harding F, Editor. Milk quality. New York: Blackie Academic & Professional; 1995 Dec 31.
2. Rojas JA, Rosell CM, De Barber CB. Pasting properties of different wheat flour-hydrocolloid systems. Food hydrocolloids. 1999 Jan 1;13(1):27-33.
3. Hamelman J. Bread: a baker's book of techniques and recipes. John Wiley & Sons; 2021 April 6.
4. 3. Suzanne NS, Food analysis laboratory manual, Springer International Publishing 2017

Reference Books

5. Thom C, Fisk W. The book of cheese. Apple wood Books; 2007 Dec 15.
6. Kerth CR. The science of meat quality. Blackwell Publishing; 2013.
7. Sharma S. Experiments and techniques in biochemistry. Galgotia Publications; 2007.