



Bucket of Skill Enhancement Course for Chemistry

Credit: 02 each

Sr	Course Code	Course Name	Credit	L	T	P
1	BCH301	IT Skills for Chemists	02	2	0	0
2	BCH302	Basic Analytical Chemistry	02	2	0	0
3	BCH303	Chemical Technology & Society	02	2	0	0
4	BCH304	Chemo informatics	02	2	0	0
5	BCH305	Business Skills for Chemists	02	2	0	0
6	BCH401	Intellectual Property Rights	02	2	0	0
7	BCH402	Analytical Clinical Biochemistry	02	2	0	0
8	BCH403	Green Methods in Chemistry	02	2	0	0
9	BCH404	Pharmaceutical Chemistry	02	2	0	0
10	BCH405	Chemistry of Cosmetics & Perfumes	02	2	0	0
11	BCH406	Pesticide Chemistry	02	2	0	0
12	BMT306	PYTHON LAB	02	0	0	4
13	BMT307	MATLAB	02	0	0	4
14	BMT308	Latex Lab	02	0	0	4
15	BMT309	Operating System: Linux	02	1	0	2



BCH304: IT SKILLS FOR CHEMISTS

L – T – P: 2 – 0 – 0

Credit: 02

Course Description:

This course deal with Mathematics, Computer programming, Hands On, Introductory writing activities, Handling numeric data, Numeric modeling, Statistical analysis, Presentation.

Course Learning Outcome:

After reading this course student will be able to have knowledge of

CO1: Mathematics, Numerical curve fitting,

CO2: Computer programming, Introductory writing activities,

CO3: Handling numeric data, Numeric modeling,

CO4: Statistical analysis, Presentation.

UNIT- 1

1. Mathematics

Fundamentals, mathematical functions, polynomial expressions, logarithms, the exponential function, units of a measurement, interconversion of units, constants and variables, equation of a straight line, plotting graphs. Uncertainty in experimental techniques: Displaying uncertainties, measurements in chemistry, decimal places, significant figures, combining quantities.

Uncertainty in measurement: types of uncertainties, combining uncertainties. Statistical treatment. Mean, standard deviation, relative error. Data reduction and the propagation of errors. Graphical and numerical data reduction.

UNIT- 2

2. Numerical curvefitting:

The method of least squares (regression). Algebraic operations on real scalar variables (e.g. manipulation of van der Waals equation in different forms). Roots of quadratic equations analytically and iteratively (e.g. pH of a weak acid).

Numerical methods of finding roots (Newton-Raphson, binary –bisection, e.g. pH of a weak acid not ignoring the ionization of water, volume of a van der Waals gas, equilibrium constant expressions).

Differential calculus: The tangent line and the derivative of a function, numerical differentiation (e.g., change in pressure for small change in volume of a vander Waals gas, potentiometric titrations).

Numerical integration (Trapezoidal and Simpson's rule, e.g. entropy/enthalpy change from heat capacity data).

UNIT – 3

3. Computer programming:

Constants, variables, bits, bytes, binary and ASCII formats, arithmetic expressions, hierarchy of operations, inbuilt functions. Elements of the BASIC language.

BASIC keywords and commands. Logical and relative operators. Strings and graphics. Compiled versus interpreted languages. Debugging. Simple programs using these concepts. Matrix addition and multiplication. Statistical analysis.

BASIC programs for curve fitting, numerical differentiation and integration (Trapezoidal rule, Simpson's rule), finding roots (quadratic formula, iterative, Newton-Raphson method).

HANDS ON

4. Introductory writing activities: Introduction to word processor and structure drawing (Chem Sketch) software. Incorporating chemical structures, chemical equations, and expressions from chemistry (e.g. Maxwell-Boltzmann distribution law, Bragg's law, van der Waals equation, etc.) into word processing documents.

5. Handling numeric data: Spreadsheet software (Excel), creating a spreadsheet, entering and formatting information, basic functions and formulae, creating charts, tables and graphs. Incorporating tables and graphs into word processing documents. Simple calculations, plotting graphs using a spreadsheet (Planck's distribution law, radial distribution curves for hydrogenic orbitals, gas kinetic theory- Maxwell-Boltzmann distribution curves as function of temperature and molecular weight), spectral data, pressure-volume curves of van der Waals gas (van der Waals Isotherms), data from phase equilibria studies. Graphical solution of equations.

UNIT - 4

6. Numeric modelling:

Simulation of pH metric titration curves. Excel functions LINEST and Least Squares. Numerical curve fitting, linear regression (rate constants from concentration-time data, molar extinction coefficients from absorbance data), numerical differentiation (e.g. handling data from potentiometric and pH metric titrations, pKa of weak acid), integration (e.g. entropy/enthalpy change from heat capacity data).

Statistical analysis: Gaussian distribution and Errors in measurements and their effect on data sets. Descriptive statistics using Excel. Statistical significance testing: The *t* test. The *F* test.

Presentation: Presentation graphics.

Reference Books:

- Mc Quarrie, D. A. *Mathematics for Physical Chemistry* University Science Books (2008).
- Mortimer, R. *Mathematics for Physical Chemistry*. 3rd Ed. Elsevier (2005).
- Steiner, E. *The Chemical Maths Book* Oxford University Press (1996).
- Yates, P. *Chemical calculations*. 2nd Ed. CRC Press (2007).
- Harris, D. C. *Quantitative Chemical Analysis*. 6th Ed., Freeman (2007) Chapters 3-5.
- Levie, R. de, *How to use Excel in analytical chemistry and in general scientific data analysis*, Cambridge Univ. Press (2001) 487 pages.
- Noggle, J. H. *Physical chemistry on a Microcomputer*. Little Brown & Co. (1985).
- Venit, S.M. *Programming in BASIC: Problem solving with structure and style*. Jaico Publishing House: Delhi (1996).



BCH305: BASIC ANALYTICAL CHEMISTRY

L – T – P: 2 – 0 – 0

Credit: 02

Course Description:

This course deal with Introduction, Analysis of soil, Analysis of water, Analysis of food products, Chromatography, Ion-exchange, Analysis of cosmetics, Suggested Applications, Suggested Instrumental demonstrations.

Course Learning Outcomes:

After reading this course student will be able to have knowledge of

CO1: Analysis of soil, Analysis of water, Analysis of food products,

CO2: Chromatography, Ion-exchange,

CO3: Analysis of cosmetics, Applications, Instrumental demonstrations.

UNIT - 1

1. Introduction: Introduction to Analytical Chemistry and its interdisciplinary nature. Concept of sampling. Importance of accuracy, precision and sources of error in analytical measurements. Presentation of experimental data and results, from the point of view of significant figures.

2. Analysis of soil: Composition of soil, Concept of pH and pH measurement, Complexometric titrations, Chelation, Chelating agents, use of indicators

a) Determination of pH of soil samples.

b) Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration.

UNIT - 2

3. Analysis of water: Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods.

a) Determination of pH, acidity and alkalinity of a water sample.

b) Determination of dissolved oxygen (DO) of a water sample.

4. Analysis of food products: Nutritional value of foods, idea about food processing and food preservations and adulteration.

a) Identification of adulterants in some common food items like coffee powder, asafoetida, chili powder, turmeric powder, coriander powder and pulses, etc.

b) Analysis of preservatives and coloring matter.

UNIT - 3

5. Chromatography: Definition, general introduction on principles of chromatography, paper chromatography, TLC etc.

a) Paper chromatographic separation of mixture of metal ion (Fe^{3+} and Al^{3+}).

b) To compare paint samples by TLC method.

6. Ion-exchange: Column, ion-exchange chromatography etc.

Determination of ion exchange capacity of anion / cation exchange resin (using batch procedure if use of column is not feasible).

7. Analysis of cosmetics: Major and minor constituents and their function

- a) Analysis of deodorants and antiperspirants, Al, Zn, boric acid, chloride, sulphate.
- b) Determination of constituents of talcum powder: Magnesium oxide, Calcium oxide, Zinc oxide and Calcium carbonate by complexometric titration.

UNIT - 4

8. Suggested Applications (Any one):

- a) To study the use of phenolphthalein in trap cases.
- b) To analyze arson accelerants.
- c) To carry out analysis of gasoline.

9. Suggested Instrumental demonstrations:

- a. Estimation of macro nutrients: Potassium, Calcium, Magnesium in soil samples by flame photometry.
- b. Spectrophotometric determination of Iron in Vitamin / Dietary Tablets.
- c. Spectrophotometric Identification and Determination of Caffeine and Benzoic Acid in Soft Drink.

Reference Books:

- Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. *Instrumental Methods of Analysis*. 7th Ed. Wadsworth Publishing Co. Ltd., Belmont, California, USA, 1988.
 - Skoog, D.A. Holler F.J. & Nieman, T.A. *Principles of Instrumental Analysis*, Cengage Learning India Ed.
 - Skoog, D.A.; West, D.M. & Holler, F.J. *Fundamentals of Analytical Chemistry 6th Ed.*, Saunders College Publishing, Fort Worth (1992).
 - Harris, D. C. *Quantitative Chemical Analysis*, W. H. Freeman.
 - Dean, J. A. *Analytical Chemistry Notebook*, McGraw Hill.
 - Day, R. A. & Underwood, A. L. *Quantitative Analysis*, Prentice Hall of India.
 - Freifelder, D. *Physical Biochemistry 2nd Ed.*, W.H. Freeman and Co., N.Y. USA (1982).
 - Cooper, T.G. *The Tools of Biochemistry*, John Wiley and Sons, N.Y. USA. (1977).
 - Vogel, A. I. *Vogel's Qualitative Inorganic Analysis 7th Ed.*, Prentice Hall.
 - Vogel, A. I. *Vogel's Quantitative Chemical Analysis 6th Ed.*, Prentice Hall.
 - Robinson, J.W. *Undergraduate Instrumental Analysis 5th Ed.*, Marcel Dekker, Inc., New York (1995).
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BCH306: CHEMICAL TECHNOLOGY AND SOCIETY

L – T – P: 2 – 0 – 0

Credit: 02

Course Description:

This course deals with Chemical Technology, Scaling, energy from Natural Sources, Nucleic acids.

Course Learning Outcomes:

After reading this course student will be able to have knowledge of

CO1: distillation , extraction and other techniques.

CO2: Scaling, Energy resources and Nucleic acids.

UNIT - 1

1. Chemical Technology

Basic principles of distillation, solvent extraction, solid-liquid leaching and liquid-liquid extraction, separation by absorption and adsorption. An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation. columns, extruders, pumps, mills, emulgators.

UNIT - 2

2. Scaling

Exploration of societal and technological issues from a chemical perspective. Chemical and scientific literacy to better understand topics like air and water (and the trace materials found in them that are referred to as pollutants).

UNIT- 3

3. Energy from Natural Sources

(i.e. solar and renewable forms), from fossil fuels and from nuclear fission; materials like plastics and polymers and their natural analogues, proteins.

UNIT - 4

4. Nucleic acids, and molecular reactivity and inter conversions from simple examples like combustion to complex instances like genetic engineering and the manufacture of drugs.

Reference Books:

John W. Hill, Terry W. Mc Creary & Doris K. Kolb, *Chemistry for changing times* 13thEd.



BCH307: CHEMOINFORMATICS

L – T – P: 2 – 0 – 0

Credit: 02

Course Description:

This course deals with Introduction of Chemo informatics, Representation of molecules and chemical reactions, Searching chemical structures, Applications and Hands-on Exercises.

Course Learning Outcomes: After reading this course student will be able to have

CO1: knowledge of Chemo informatics,

CO2: Representation of molecules and chemical reactions,

CO3: chemical structures, Applications.

UNIT - 1

1. Introduction to Chemo informatics: History and evolution of chemo informatics, Use of chemo informatics, Prospects of chemo informatics, Molecular Modelling and Structure elucidation.

UNIT - 2

2. Representation of molecules and chemical reactions: Nomenclature, Different types of notations, SMILES coding, Matrix representations, Structure of Molfiles and Sd files, Libraries and tool kits, Different electronic effects, Reaction classification.

UNIT - 3

3. Searching chemical structures: Full structure search, sub-structure search, basic ideas, similarity search, three-dimensional search methods, basics of computation of physical and chemical data and structure descriptors, data visualization.

UNIT - 4

4. Applications: Prediction of Properties of Compounds; Linear Free Energy Relations; Quantitative Structure-Property Relations; Descriptor Analysis; Model Building; Modeling Toxicity; Structure-Spectra correlations; Prediction of NMR, IR and Mass spectra; Computer Assisted Structure elucidations; Computer Assisted Synthesis Design, Introduction to drug design; Target Identification and Validation; Lead Finding and Optimization; Analysis of HTS data; Virtual Screening; Design of Combinatorial Libraries; Ligand-Based and Structure Based Drug design; Application of chemo informatics in Drug Design.

Reference Books:

Andrew R. Leach & Valerie, J. Gillet (2007) *An introduction to Cheminformatics*. Springer: The Netherlands.

Gasteiger, J. & Engel, T. (2003) *cheminformatics: A text-book*. Wiley-VCH.

Gupta, S. P. (2011) *QSAR & Molecular Modeling*. Anamaya Pub.: New Delhi.



BCH308: BUSINESS SKILLS FOR CHEMISTS

L – T – P: 2 – 0 – 0

Credit: 02

Course Objectives:

This course deals with Business Basics, Chemistry in Industry, Making money and Intellectual property.

Course Learning Outcomes:

After reading this course student will be able to have knowledge of

CO1: Business Basics,

CO2: Chemistry in Industry, Making money,

CO3: Intellectual property.

UNIT - 1

1. Business Basics

Key business concepts: Business plans, market need, project management and routes to market.

UNIT - 2

2. Chemistry in Industry

Current challenges and opportunities for the chemistry-using industries, role of chemistry in India and global economies.

UNIT - 3

3. Making money

Financial aspects of business with case studies

UNIT - 4

4. Intellectual property

Concept of intellectual property, patents.

Reference

www.rsc.org



BCH401: INTELLECTUAL PROPERTY RIGHTS

L – T – P: 2 – 0 – 0

Credit: 02

Course Description:

This course deals with Introduction to Intellectual Property, Copyrights, Trade Marks, Patents, Geographical Indications, Industrial Designs, Layout design of integrated circuits, Trade Secrets, Different International agreements, IP Infringement issue and enforcement.

Course Learning Outcomes:

After reading this course student will be able to have knowledge of

CO1: Introduction to Intellectual Property, Copyrights, Trade Marks, Patents, Geographical Indications,

CO2: Industrial Designs, Layout design of integrated circuits,

CO3: Trade Secrets, Different International agreements,

CO4: IP Infringement issue and enforcement.

UNIT - 1

1. Introduction to Intellectual Property:

Historical Perspective, Different Types of IP and importance of protecting IP.

2. Copyrights

Introduction, how to obtain, Differences from Patents.

3. Trade Marks

Introduction, how to obtain, Different types of marks – Collective marks, certification marks, service marks, Trade names, etc. Differences from Designs.

UNIT - 2

4. Patents

Historical Perspective, Basic and associated right, WIPO, PCT system, Traditional Knowledge, Patents and Healthcare – balancing promoting innovation with public health, Software patents and their importance for India.

5. Geographical Indications

Definition, rules for registration, prevention of illegal exploitation, importance to India.

6. Industrial Designs

Definition, how to obtain, features, International design registration.

7. Layout design of integrated circuits

Circuit Boards, Integrated Chips, Importance for electronic industry.

UNIT- 3

8. Trade Secrets

Introduction and Historical Perspectives, Scope of Protection, Risks involved and legal aspects of Trade Secret Protection.

9. Different International agreements

(a) World Trade Organization (WTO):

- (i) General Agreement on Tariffs & Trade (GATT), Trade Related Intellectual Property Rights (TRIPS) agreement
- (ii) General Agreement on Trade related Services (GATS)
- (iii) Madrid Protocol
- (iv) Berne Convention
- (v) Budapest Treaty

UNIT - 4

(b) Paris Convention

WIPO and TRIPS, IPR and Plant Breeders Rights, IPR and Biodiversity

10. IP Infringement issue and enforcement – Role of Judiciary, Role of law enforcement agencies – Police, Customs etc. Economic Value of Intellectual Property
– Intangible assets and their valuation, Intellectual Property in the Indian Context
– Various laws in India Licensing and technology transfer.

Reference Books:

- N.K. Acharya: *Textbook on intellectual property rights*, Asia Law House (2001).
- Manjula Guru & M.B. Rao, *Understanding Trips: Managing Knowledge in Developing Countries*, Sage Publications (2003).
- P. Ganguli, *Intellectual Property Rights: Unleashing the Knowledge Economy*, Tata McGraw-Hill (2001).
- Arthur Raphael Miller, Micheal H. Davis; *Intellectual Property: Patents, Trademarks and Copyright in a Nutshell*, West Group Publishers (2000).
- Jayashree Watal, *Intellectual property rights in the WTO and developing countries*, Oxford University Press, Oxford.



BCH402: ANALYTICAL CLINICAL BIOCHEMISTRY

L – T – P: 2 – 0 – 0

Credit: 02

Course Description:

This course deals with Carbohydrates, Proteins, Enzymes, Lipids, Structure of DNA, Enzymes, Biochemistry of disease, Blood, Urine.

Course Learning Outcomes:

After reading this course student will be able to have knowledge of

CO1: Basic understanding of the structures, properties and functions of carbohydrates, lipids and proteins.

CO2: Structure of DNA, Enzymes, Biochemistry of disease, Blood, Urine.

UNIT - 1

1. Carbohydrates:

Biological importance of carbohydrates, Metabolism, Cellular currency of energy (ATP), Glycolysis, Alcoholic and Lactic acid fermentations, Krebscycle. Isolation and characterization of polysaccharides.

2. Proteins:

Classification, biological importance; Primary and secondary and tertiary structures of proteins: α -helix and β -pleated sheets, Isolation, characterization, denaturation of proteins.

UNIT - 2

3. Enzymes:

Nomenclature, Characteristics (mention of Ribozymes), Classification; Active site, Mechanism of enzyme action, Stereo specificity of enzymes, Coenzymes and cofactors, Enzyme inhibitors, Introduction to Bio catalysis: Importance in “Green Chemistry” and Chemical Industry.

UNIT - 3

4. Lipids:

Classification. Biological importance of triglycerides and phosphoglycerates and cholesterol; Lipid membrane, Liposomes and their biological functions and underlying applications. Lipoproteins. Properties, functions and biochemical functions of steroid hormones. Biochemistry of peptide hormones.

5. Structure of DNA (Watson - Crick Model) and RNA, Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation, Introduction to Gene therapy.

6. Enzymes:

Nomenclature, classification, effect of pH, temperature on enzyme activity, enzyme inhibition.

UNIT - 4

7. Biochemistry of disease: A diagnostic approach by blood/ urine analysis.

Blood: Composition and functions of blood, blood coagulation. Blood collection and preservation of samples. Anemia, Regulation, estimation and interpretation of datafor blood sugar, urea, creatinine, cholesterol and bilirubin.

8. Urine: Collection and preservation of samples. 6. Formation of urine. Composition and estimation of constituents of normal and pathological urine.

9. Practicals

Identification and estimation of the following:

1. Carbohydrates – qualitative and quantitative.
2. Lipids – qualitative.
3. Determination of the iodine number of oils.
4. Determination of the saponification number of oils.
5. Determination of cholesterol using Liebermann- Burchard reaction.
6. Proteins – qualitative.
7. Isolation of protein.
8. Determination of protein by the Biuret reaction.
9. Determination of nucleic acids

Reference Books:

- T.G. Cooper: Tool of Biochemistry.
- Keith Wilson and John Walker: Practical Biochemistry.
- Alan H Gowenlock: Varley's Practical Clinical Biochemistry.
- Thomas M. Devlin: Textbook of Biochemistry.
- Berg, J.M., Tymoczko, J.L. & Stryer, L. *Biochemistry*, W.H. Freeman, 2002.
- Talwar, G.P. & Srivastava, M. *Textbook of Biochemistry and Human Biology*, 3rd Ed. PHI Learning.
- Nelson, D. L. & Cox, M. M. *Lehninger's Principles of Biochemistry 7th Ed.*, W. H. Freeman.
- Mikes, O. *Laboratory Hand Book of Chromatographic & Allied Methods*, Elles Harwood Series on Analytical Chemistry, John Wiley & Sons, 1979.



BCH403: GREEN METHODS IN CHEMISTRY

L – T – P: 2 – 0 – 0

Credit: 02

Course Description:

This course deal with Introduction, Green Solvents, Surfactants for carbon dioxide, Rightfit pigment.

Course Learning Outcomes:

After reading this course student will be able to have knowledge of

CO1: Green Solvents,

CO2: Surfactants for carbon dioxide,

CO3: Right fit pigments.

UNIT - 1

1. Introduction: Definitions of Green Chemistry. Brief introduction of twelve principles of Green Chemistry, with examples, special emphasis on atom economy, reducing toxicity.

UNIT - 2

2. Green Solvents, Green Chemistry and catalysis and alternative sources of energy, Green energy and sustainability.

UNIT - 3

3. The following Real-world Cases in Green Chemistry should be discussed:

- 1. Surfactants for carbon dioxide** – Replacing smog producing and ozone depleting solvents with CO₂ for precision cleaning and dry cleaning of garments.
2. Designing of environmentally safe marine antifoulant.

UNIT - 4

- 3. Rightfit pigment:** Synthetic azo pigments to replace toxic organic and inorganic pigments.
4. An efficient, green synthesis of a compostable and widely applicable plastic (poly lactic acid) made from corn.

4. Practicals

1. Preparation and characterization of biodiesel from vegetable oil.
2. Extraction of D-limonene from orange peel using liquid CO₂ prepared from dry ice.
3. Mechano chemical solvent free synthesis of azomethine.
4. Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper (II).

Reference Books:

- Anastas, P.T. & Warner, J.K. *Green Chemistry- Theory and Practical*, Oxford University Press (1998).
 - Matlack, A.S. *Introduction to Green Chemistry*, Marcel Dekker (2001).
 - Cann, M.C. & Connely, M.E. *Real-World cases in Green Chemistry*, American Chemical Society, Washington (2000).
 - Ryan, M.A. & Tinnes and, M. *Introduction to Green Chemistry*, American Chemical Society, Washington (2002).
 - Sharma, R.K.; Sidhwani, I.T. & Chaudhari, M.K. *Green Chemistry Experiments: A monograph* I.K. International Publishing House Pvt Ltd. New Delhi, Bangalore.
 - Lancaster, M. *Green Chemistry: An introductory text* RSC publishing, 2nd Edition.
 - Sidhwani, I.T., Saini, G., Chowdhury, S., Garg, D., Malovika, Garg, N. Wealth from waste: A green method to produce biodiesel from waste cooking oil and generation of useful products from waste further generated "A Social Awareness Project", *Delhi University Journal of Undergraduate Research and Innovation*, **1(1)**: 2015.
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BCH404: PHARMACEUTICAL CHEMISTRY

L – T – P: 2 – 0 – 0

Credit: 02

Course Description:

This course deals with Drugs & Pharmaceuticals, Antibiotics, Cardiovascular, Fermentation.

Course Learning Outcomes:

After reading this course student will be able to have knowledge of

CO1: Drugs & Pharmaceuticals,

CO2: Antibiotics,

CO3: Cardiovascular,

CO4: Fermentation.

UNIT - 1

1. Drugs & Pharmaceuticals

Drug discovery, design and development; Basic Retrosynthetic approach. Synthesis of the representative drugs of the following classes: analgesics agents, antipyretic agents, anti-inflammatory agents (Aspirin, paracetamol, ibuprofen).

UNIT - 2

2. Antibiotics (Chloramphenicol); antibacterial and antifungal agents (Sulphonamides; Sulphanethoxazol, Sulphacetamide, Trimethoprim); antiviral agents (Acyclovir), Central Nervous System agents (Phenobarbital, Diazepam),

UNIT - 3

3. Cardiovascular (Glyceryltrinitrate), antilaprosy (Dapsone), HIV-AIDS related drugs (AZT-Zidovudine).

UNIT - 4

4. Fermentation

Aerobic and anaerobic fermentation. Production of (i) Ethyl alcohol and citric acid, (ii) Antibiotics; Penicillin, Cephalosporin, Chloromycetin and Streptomycin, (iii) Lysine, Glutamic acid, Vitamin B2, Vitamin B12 and Vitamin C.

5. Practicals

1. Preparation of Aspirin and its analysis.
2. Preparation of magnesium bisilicate (Antacid).

Reference Books:

- G.L. Patrick: Introduction to *Medicinal Chemistry*, Oxford University Press, UK.
- Hakishan, V.K. Kapoor: *Medicinal and Pharmaceutical Chemistry*, Vallabh Prakashan, Pitampura, New Delhi.
- William O. Foye, Thomas L., Lemke, David A. William: *Principles of Medicinal Chemistry*, B.I. Waverly Pvt. Ltd. New Delhi.



BCH405: CHEMISTRY OF COSMETICS & PERFUMES

L – T – P: 2 – 0 – 0

Credit: 02

Course Objectives:

This course deals with a general study including preparation and uses of the following: Hair dye, Creams, Essential oils, 2-phenyl ethyl alcohol.

Course Learning Outcomes:

After reading this course student will be able to have knowledge of

CO1: preparation and uses of Hair dye, Creams, Essential oils, 2-phenyl ethyl alcohol.

CO2: preparation and uses of Creams,

CO3: preparation and uses of Essential oils,

CO4: preparation and uses of 2-phenyl ethyl alcohol.

UNIT - 1

1. A general study including preparation and uses of the following: Hair dye, hair spray, shampoo, suntan lotions, face powder, lipsticks, talcum powder, nail enamel,

UNIT - 2

2. Creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours.

UNIT - 3

3. Essential oils and their importance in cosmetic industries with reference to Eugenol, Geraniol, sandalwood oil, eucalyptus, rose oil,

UNIT - 4

4. 2-phenyl ethyl alcohol, Jasmone, Civetone, Muscone.

5. Practicals

1. Preparation of talcum powder.
2. Preparation of shampoo.
3. Preparation of enamels.
4. Preparation of hair remover.
5. Preparation of face cream.
6. Preparation of nail polish and nail polish remover.

Reference Books:

- E. Stocchi: *Industrial Chemistry*, Vol -I, Ellis Horwood Ltd. UK.
- P.C. Jain, M. Jain: *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi.
- Sharma, B.K. & Gaur, H. *Industrial Chemistry*, Goel Publishing House, Meerut (1996).



BCH406: PESTICIDE CHEMISTRY

L – T – P: 2 – 0 – 0

Credit: 02

Course Objectives:

This course deals with general introduction to pesticides, Structure Activity Relationship, Organophosphates, Quinones.

Course Learning Outcomes:

After reading this course student will be able to have knowledge of

CO1: pesticides,

CO2: Structure Activity Relationship of Organochlorines

CO3: Organophosphates,

CO4: Quinones.

UNIT - 1

1. General introduction to pesticides

(natural and synthetic), benefits and adverse effects, changing concepts of pesticides,

UNIT - 2

2. Structure Activity Relationship

Synthesis and technical manufacture and use of representative pesticides in the following classes: Organochlorines (DDT, Gammexene);

UNIT - 3

3. Organophosphates

(Malathion, Parathion); Carbamates (Carbofuran and carbaryl);

UNIT - 4

4. Quinones

(Chloranil), Anilides (Alachlor and Butachlor).

5. Practicals

1. To calculate acidity/alkalinity in given sample of pesticide formulations as per BIS specifications.
2. Preparation of simple organophosphates, phosphonates and thiophosphates

Reference Book:

- Cremllyn, R. *Pesticides. Preparation and Modes of Action*, John Wiley & Sons, New York, 1978.



BMT306: Python Programming Lab

L – T – P: 2 – 0 – 0

Credit: 02

Course Description: The course aims to equip the students with a comprehensive study of Python Programming.

The course includes Object-Oriented paradigm in Python programs, Python functions, Python exception handling mechanism.

Course learning Outcomes:

Upon successful completion of the course, the students should be able to:

CO1: Solve simple to advanced problems using Python language.

CO2: Develop logic of various programming problems using numerous data types and control structures of Python.

CO3: Implement different data structures using Python.

CO4: Implement modules and functions using Python.

CO5: Design and implement the concept of object-oriented programming structures.

CO6: Implement files handling.

List of Practical:

1. Write a program to add two numbers.
2. Write a program that declares 3 integers, determines and prints the largest and smallest in the group.
3. Write a program for factorial of a number.
4. Write a program to calculate simple interest.
5. Write a program to find that given year is leap year or not.
6. Write a program to implement linear search and binary search.
7. Write a program to find that given number is Armstrong or not.
8. Write a program to print Fibonacci Series.
9. Write a program to convert decimal number into binary numbers.
10. Python Program to find sum of array.
11. Write a program to find largest number of elements in array.
12. Write a program to check if a string is palindrome or not.
13. Maintain book record as per their serial numbers in library using dictionary.
14. Write a program to concatenate two dictionaries into one.
15. Perform following operations on dictionary 1) Insert 2) delete 3) change 4) update.

16. Write a program to calculate addition of two number using methods.
17. Program to calculate average of numbers using function.
18. Fibonacci series using recursion.
19. Write a program to create a module of factorial in Python.
20. Write A Program to Find the Area of a Rectangle Using Classes
21. Write A Program to Append, Delete and Display Elements of a List Using Classes
22. Write A Program to Create a Class and Compute the Area and the Perimeter of the Circle
23. Write A Program to Create a Class which Performs Basic Calculator Operations
24. Write A Program to Create a Class in which One Method Accepts a String from the User and another prints it.
25. Write A Program that Reads a Text File and Counts the Number of Times a Certain Letter Appears in the Text File.
26. Write A Program to Read a Text File and Print all the Numbers Present in the Text File.
27. Write a program for generation of pyramid.

Pyramid 1	Pyramid 2	Pyramid 3	Pyramid 4	Pyramid 5
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BMT307 : MATLAB Programming Lab

Credits: 2

LTP 004

The course aims to equip the students able to carry out simple numerical computations and analyses using MATLAB.

The course includes simple calculations using MATLAB

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to:

CO1: Understand the main features of the MATLAB development environment.

CO2: Write simple programs in MATLAB to solve scientific and mathematical problems.

CO3: Understand how to draw a basic graph application.

List of Practical:

1. Introduction to MATLAB.
2. Explain the main windows in MATLAB desktop.
3. Programming in MATLAB: Introduction, Branching statements, loops, functions, additional data types, arrays, inputs/outputs etc.
4. Program to display a Matrix
5. Program to Addition of matrix.
6. Basic graphic applications: Draw Curve, Refine the plot: Line pattern, color, and thickness, Draw multiple curves.

Recommended Books / Suggested Readings:

1. MATLAB: An Introduction with Applications, by Amos Gilat, 2nd edition, Wiley, 2004.
2. C.B. Moler, Numerical Computing with MATLAB, SIAM, 2004.



BMT308: Latex Lab

Credits: 2

LTP 004

Course Description: The course aims to equip the students with a comprehensive study of the LATEX.

The course includes Typesetting text, references.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to:

CO1: Structure the document with well familiarized documenting abilities.

CO2: Frame a research document for self or University.

List of Practical:

1. Installation of the software LaTeX
2. Understanding Latex compilation, Basic Syntax, Writing equations, Matrix, Tables
3. Page Layout –Titles, Abstract Chapters, Sections, References, Equation references, citation. List making environments Table of contents, Generating new commands, Figure handling numbering, List of figures, List of tables, Generating index.
4. Packages: Geometry, Hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tilez listing.
5. Classes: article, book, report, beamer, slides. IEEtran.
6. Applications to:
 - Writing Resume
 - Writing question paper
 - Writing articles/ research papers
 - Presentation using beamer.

Recommended Books / Suggested Readings:

1. Martin J. Erickson and Donald Bindner, A Student's Guide to the Study, Practice, and Tools of Modern Mathematics, CRC Press, Boca Raton, FL, 2011.
2. L. Lamport. LATEX: A Document Preparation System, User's Guide and Reference Manual. Addison-Wesley, New York, second edition, 1994.



BTM309: Operating Systems: Linux

LTP: 102

CREDIT: 02

Course Description: In this course student will be able learn about Basics of Linux, its applications.

Course Learning Objectives: After completion of this course students will be able to

CO1: understand Linux, its features

CO1: various tools utilized in Linux

CO3: Operate different functions, file directory management, library & system memory

Unit 1

Linux – The operating system: Linux history, Linux features, Linux distributions, Linux’s relationship to Unix, overview of Linux architecture, installation, startup scripts, system processes (an overview), Linux security.

Unit 2

The Ext2 and Ext3 file systems: General characteristics of the Ext3 file system, file permissions. User management: types of users, the powers of root, managing users (adding and deleting): using the command line and GUI tools.

Unit 3

Resource management in Linux: file and directory management, system calls for files process Management, signals, IPC: Pipes, FIFOs, System V IPC,

Unit – 4

Message queues, system calls for processes, memory management, library and system calls for memory.

Reference Books

1. Arnold Robbins, Linux Programming by Examples The Fundamentals, 2nd Ed., Pearson Education, 2008.
2. Cox K, Red Hat Linux Administrator's Guide, PHI, 2009.
3. R. Stevens, UNIX Network Programming, 3rd Ed., PHI, 2008.

Sumitabha Das, UNIX Concepts and Applications, 4th Ed., TMH, 2009