# Syllabus of 3-Year Degree/4-Year Honours in Chemistry

# Based on National Curriculum and Credit Framework for Undergraduate Programme With effect from 2023-24

**Kazi Nazrul University**

**Asansol, West Bengal**

# SEMESTER – I

COURSE TYPE: MAJOR

COURSE NAME: GENERAL CHEMISTRY–I

COURSE CODE: BSCCEMMJ101

<table>
<tr><td>Course Type: MAJOR</td><td colspan="2">Course Details: MJC-1</td><td colspan="2">L-T-P: 3-0-4</td></tr>
<tr><td rowspan="3">Credit: 5<br><br>3 (Theory) + 2 (Practical)</td><td rowspan="3">Full Marks: 100</td><td colspan="2">CA Marks</td><td colspan="2">ESE Marks</td></tr>
<tr><td>Practical</td><td>Theoretical</td><td>Practical</td><td>Theoretical</td></tr>
<tr><td>30</td><td>15</td><td>20</td><td>35</td></tr>
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On completion of this course, the students will be able to understand:

**Learning objectives:**

*1. Learning scientific theory of atoms, concept of wave function.*

*2. Elements in periodic table; physical and chemical characteristics, periodicity.*

*3. To predict the atomic structure, chemical bonding, and molecular geometry based on accepted models.*

*4. Identity of given element, relative size, charges of proton, neutron and electrons, and their assembly to form different atoms.*

*5. Physical and chemical characteristics of elements in various groups and periods according to ionic size, charge, etc. and position in periodic table.*

*6. Characterize bonding between atoms, molecules, interaction and energetics hybridization and shapes of atomic, molecular orbitals, bond parameters, bond- distances and energies.*

*7. Basic of organic molecules, structure, bonding, reactivity and reaction mechanisms.*

*8. Aromatic compounds and aromaticity, mechanism of aromatic reactions.*

*9. Understanding hybridization and geometry of atoms, 3-D structure of organic molecules, identifying chiral centers.*

*10. Electrophile, nucleophiles, free radicals, electronegativity, resonance, and intermediates along the reaction pathways.*

*11.Mechanism of organic reactions (effect of nucleophile/leaving group, solvent), substitution vs. elimination.*

**Syllabus:**

**1. Atomic Structure (8 Lectures)**

Bohr's theory, its limitations and atomic spectrum of hydrogen atom. Wave mechanics: de' Broglie equation, Heisenberg's Uncertainty Principle and its significance, Schrödinger's wave equation, significance of $\psi$ and $\psi^2$. Quantum numbers and their significance. Radial and angular wave functions for hydrogen atom. Radial and angular distribution curves. Shapes of s, p, d and f orbitals. Contour boundary and probability diagrams. Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau's principle and its limitations, Variation of orbital energy with atomic number.

**2. Periodic Table (7 Lectures)**

Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table. Ionization enthalpy, Successive ionization enthalpies and factors affecting ionization energy. Applications of ionization enthalpy. Electron gain enthalpy, trends of electron gain enthalpy. Electronegativity, Pauling, Mullikan, Allred-Rochow scales, electronegativity and bond order, partial charge, hybridization, group electronegativity. Sanderson electron density ratio.

**3. Chemical Bonding (10 Lectures)**

Covalent bond: Lewis structure, Valence Shell Electron Pair Repulsion Theory (VSEPR), Shapes of simple molecules and ions containing lone-and bond-pairs of electrons multiple bonding, sigma and pi-bond approach, Valence Bond theory, (Heitler-London approach). Hybridization containing s, p and s, p, d atomic orbitals, shapes of hybrid orbitals, Bents rule, Resonance and resonance energy, Molecular orbital theory. Molecular orbital diagrams of simple homonuclear and heteronuclear diatomic molecules, MO diagrams of simple tri and tetra-atomic molecules, e.g., $N_2$, $O_2$, $C_2$, $B_2$, $F_2$, CO, NO, and their ions; HCl, $BeF_2$, $CO_2$, $BF_3$ (idea of s-p mixing and orbital interaction to be given). Covalent character in ionic compounds, polarizing power and polarizability. Fajan rules, polarization. Ionic character in covalent compounds: Bond moment and dipole moment. ionic character from dipole moment and electronegativities. Metallic Bond: Qualitative idea of free electron model, Semiconductors, Insulators.

**4. Basics of Organic Chemistry (20 Lectures)**

**Organic Compounds:** Classification and nomenclature, concept of hybridization, orbital pictures of bonding and shapes of molecules, calculation of formal charges and double bond equivalent.

**Electronic displacements:** Inductive effect, electromeric effect, resonance, hyperconjugation, mesomeric effect, bond polarizability, steric effect, steric inhibition of resonance.

**Reactive intermediates:** Method of generation, shape and relative stability of carbocations, carbanions, free radicals, carbenes, nitrenes, arynes, energy profile diagrams, electrophilic/ nucleophilic behaviour of reactive intermediates (elementary idea).

**Introduction to organic reactions:** Electrophiles and nucleophiles, hemolytic and heterolytic bond cleavage, homogenic and heterogenic bond formation, addition, elimination ($E_1$, $E_2$, $E_{1CB}$ etc.) and substitution ($SN^1$, $SN^2$, $SN^i$ etc.) reactions, curly arrow rules in representation of mechanistic steps.

**Stereochemistry**: Concept of asymmetry; Stereoisomerism; Conformations and configurations; Flying-wedge, Fischer, Sawhorse and Newman projection formulae and their interconversions; nomenclature D/L, R/S, E/Z

**Practical:**

Qualitative analysis of organic special element N, S, Cl, Melting point, Functional group detection $-NH_2$, $-NO_2$, $-CONH_2$, phenolic-OH, -COOH, >C=O, -CHO and derivative preparation.

**Recommended Books :**


1. R. L. Dutta and G. S. De, Inorganic Chemistry, Pt – I, 7th Edn, 2013, The New Book Stall, 2013.
2. R. Sarkar, General and Inorganic Chemistry, Pt- I, 2nd Edn, Books & Allied (P) Ltd, 2009.
3. A. K. Das, Fundamental Concepts of Inorganic Chemistry, (Vol. 1-3), 2nd Edn, CBS Publisher, 2012.
4. D. F. Shriver, P. W. Atkins and C. H. Langford, Inorganic Chemistry, Oxford University Press, New York, 1990.
5. J. E. Huheey, E. A. Keiter and R. L. Keiter, Inorganic Chemistry: Principles of Structure and Reactivity, 4th Edn, Pearson Education, India, 2006.

6. N. N. Greenwood and A. Earnshaw, Chemistry of the Elements, 2nd Edn, Elsevier, India, 2005.
7. J. D. Lee, Concise Inorganic Chemistry, 5th Edn, Oxford University Press, 1999.
8. F. A. Cotton, G. Wilkinson, C. M. Murillo and M. Bochmann, Advanced Inorganic Chemistry, 6th Edn, John Wiley and Sons, Inc., New York, 1999.
9. F.A. Carey and R.J. Sundberg, Advanced Organic Chemistry Part A and Part B, 4th Edn., Plenum Press, New York, 2001.
10. M. B. Smith, March's Advanced Organic Chemistry 8th Edition, Wiley.
11. T. H. Lowry and K.C. Richardson, Mechanism and Theory in Organic Chemistry, 3rd Edn., Harper and Row, New York, 1998.
12. H. Neurath, The Proteins: Composition, Structure and Function, Vols. 1-5, Academic Press, New York, 1963.
13. T. W. G. Solomons, C. B. Fryhle and S. A. Snyder, Organic Chemistry, 12th Edition, Wiley.
14. M. Loudon and J. Parise, Organic Chemistry 6th Edition, Mc Millan Learning.
15. J. Clayden, N. Greeves, S. Warren and P. Wothers, Organic Chemistry, Oxford University Press, Oxford, 2001.
16. P. Sykes, A Guide to Mechanism in Organic Chemistry 6th Edition, Orient Longman.
17. D. Nasipuri, Stereochemistry of Organic Compounds, 2nd Edn, Wiley Eastern, New Delhi, 1993.
18. E. L. Eliel, S.H. Wilen and L.N. Mander, Stereochemistry of Organic Compounds, John Wiley & Sons, New York, 1994.
19. N. Tewari, Organic Chemistry, A Modern Approach Volume 1 & 2, Mc Graw Hill Education.
20. R. T. Morrison and R. N. Boyd, Organic Chemistry 6th Edition, Prentice Hall of India.
21. L. Finar, Organic Chemistry, Vol I, 6th Edn., Addison Wesley Longmann, London, 1998.
22. A. K. Nad, B. Mahapatra & A. Ghosal, An Advanced Course in Practical Chemistry, New Central, 2007.
23. S. Ghosh, M. Das Sharma, D. Majumdar and S. Manna, Chemistry in Laboratory, Santra Publication Pvt. Ltd.
24. Vogel's Text Book of Practical Organic Chemistry 5th Edn. Longman.

COURSE TYPE: MINOR

COURSE NAME: GENERAL CHEMISTRY–I

COURSE CODE: BSCCEMMN101

| Course Type: **MINOR** | Course Details: MNC-1 | | | L-T-P: **3-0-4** | |
|---|---|---|---|---|---|
| | | CA Marks | | ESE Marks | |
| Credit: **5** | Full Marks: **100** | Practical | Theoretical | Practical | Theoretical |
| **3 (Theory) + 2 (Practical)** | | **30** | **15** | **20** | **35** |

*** Syllabus of Minor Paper (GENERAL CHEMISTRY–I, COURSE CODE: BSCCEMMN101) is same as the Major Paper (GENERAL CHEMISTRY-I, COURSE CODE: BSCCEMMJ101).**

COURSE TYPE: SEC

COURSE NAME: INDUSTRIAL CHEMISTRY (SEC-1)

COURSE CODE: BSCCEMSE101

| Course Type: **SEC (Theoretical)** | Course Details: SEC-1 | | | L-T-P: **2-1-0** | |
|---|---|---|---|---|---|
| | | CA Marks | | ESE Marks | |
| Credit: **3** | Full Marks: **50** | Practical | Theoretical | Practical | Theoretical |
| | | | **15** | | **35** |

On completion of this course, the students will be able to understand:

**Learning objectives:**

1. *Understanding to the chemistry of paints, varnishes and dyes.*
2. *Preparation and uses of various compounds including KMnO4, CaC2, alloy steels etc.*
3. *Understanding the chemistry of ceramics.*
4. *Concepts of corrosion: cause and prevention.*
5. *Various fire-extinguishers and their chemical contents.*

**Syllabus:**

**Paints (8 Lectures)**

Paints, Varnishes and Synthetic Dyes: Primary constituents of a paint, binders and solvents for paints. Oil based paints, latex paints, baked-on paints (alkyd resins). Constituents of varnishes. Formulation of paints and varnishes. Synthesis of Methyl orange, Congo red, Malachite green, Crystal violet.

**Electrochemical and Electro-thermal Industries (3 Lectures)**

Preparation and use of Potassium permanganate, hydrogen peroxide, synthetic graphite, calcium carbide, carborundum, alloy steels

**Ceramics (4 Lectures)**

Refractories, pottery, porcelain, glass, fibre glass

**Rusting of Iron and Steel (3 Lectures)**

Cause and prevention of corrosion

**Industrial Safety and Fire Protection (4 Lectures)**

Flash point, fire extinguishers – foam, carbon dioxide, sprinkler system, inert gases.

**Recommended Books :**

1. G. T. Austin, Shreve's Chemical Process Industries, Mc Graw Hills, 5th Edition.
2. Jain, P.C. & Jain, M. Engineering Chemistry Dhanpat Rai & Sons, Delhi.
3. B.K. Sharma & H.Gaur, Industrial Chemistry, Goel Publishing House, Meerut 1996.
4. E.Stocchi, Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK 1990.

COURSE TYPE: MD

COURSE NAME: PHYSICAL SCIENCE

COURSE CODE: BSCCEMMD101

| Course Type: **MD (Theoretical)** | Course Details: MDC-1 | | | L-T-P: **3-0-0** | |
|---|---|---|---|---|---|
| Credit: **3** | Full Marks: **50** | CA Marks | | ESE Marks | |
| | | Practical | Theoretical | Practical | Theoretical |
| | | | **15** | | **35** |

On completion of this course, the students will be able to understand:

**Learning objectives (*Chemistry Part only):**

*1. Laws of thermodynamics and concepts of entropy, enthalpy, internal energy, reversible, irreversible processes.*

*2. Understand the concept of system, variables, heat, work, and their relations.*

*3. Concept of heat of reactions and use of equations in calculations of bond energy, enthalpy, etc.*

*4. Familiarization with various states of matter.*

*5. Physical properties of each state of matter and laws related to describe the states.*

*6. Understanding Maxwell distribution, mean-free path, kinetic energies.*

*7. Behaviour of real gases, its deviation from ideal behaviour, equation of state, isotherm, and law of corresponding states.*

*8. Liquid state and its physical properties related to temperature and pressure variation.*

*9. Solids, lattice parameters and different types of solid structures.*

*10. Understand the basics of chemical kinetics: determination of order, molecularity, theories of reaction rates, determination of rate of opposing/parallel/chain reactions with suitable examples, application of steady state kinetics.*

**Syllabus (*Chemistry Part Only):**

**UNIT-II**

**1. Thermodynamics Laws (8 Lectures)**

Thermal Equilibrium and zeroth law, first law, reversible and irreversible work, criteria of ideal gas, isothermal and adiabatic expansions, Joule-Thomson effect (derivation excluded); Thermochemistry: Hess's law and its application.

Second law and its elementary interpretation, Carnot cycle and theorems, Clausius inequality, concept of free energy and entropy, criteria of spontaneity.

**2. States of Matter (10 Lectures)**

a) *Gaseous State* - Ideal gas equation, derivation of gas laws, Maxwell's speed and energy distributions (derivation excluded); distribution curves; different types of speeds and their significance, concept of equipartition principle, van der Waals equation. Virial equation, Boyle temperature, critical constants, law of corresponding states, specific heats and their ratios, vapour density, limiting density, abnormal vapour density, frequency of binary collisions; mean free path.

b) *Liquid State* – Viscosity of fluids, temperature and pressure dependence, determination of relative viscosity of liquids. Surface energy and surface tension of liquids, determination of relative surface tension of liquids, temperature dependence.

c) *Solid State* – Unit cell, Bravais lattice, crystal system, Miller indices, Bragg's equation and its application, packing of simple cube, body centred cube and face centred cube.

**3. Chemical Kinetics (5 Lectures)**

Rate law, order and molecularity of reactions, first and second order reactions, average life period, opposing (first order opposed by first order), consecutive and parallel reactions (first order), concept of steady state and rate determining step concept of Arrhenius activation energy. Catalysis, autocatalysis, enzyme catalyst, catalyst poison.

**Recommended Books :**


1. S. R. Palit, Elementary Physical Chemistry; Book Syndicate Private Limited.
2. P. C. Rakshit, Physical Chemistry; Sarat Book Distributers.
3. Dr. A. K. Mondal, Degree Bhouto O Sadharan Rasayan; Sarat Book Distributers.
4. A. Ghoshal, Sadharan O Bhouto Rasayan;: Books and Allied (P) Ltd.
5. K. L. Kapoor, A Text Book of Physical Chemistry (Vol. 1 & 5), Macmillan India Limited, New Delhi.
6. P. C. Rakshit (Revised by S.C. Rakshit), Physical Chemistry, Sarat Book Distributers, Kolkata.
7. A. Bahl, B.S. Bahl and G.D. Tuli, Essentials of Physical Chemistry, S Chand Publications.
8. Pahari and Pahari, Problems on Physical Chemistry, New Central Book Agency (P) Ltd.
9. A. Ghoshal, Numerical Problems on Physical Chemistry, Books and Allied (P) Ltd.

# SEMESTER – II

COURSE TYPE: MAJOR

COURSE NAME: GENERAL CHEMISTRY–II

COURSE CODE: BSCCEMMJ201

| Course Type: **MAJOR** | Course Details: MJC-2 | | | L-T-P: **3-0-4** | |
|---|---|---|---|---|---|
| | | CA Marks | | ESE Marks | |
| Credit: **5** | Full Marks: **100** | Practical | Theoretical | Practical | Theoretical |
| **3 (Theory) + 2 (Practical)** | | **30** | **15** | **20** | **35** |

On completion of this course, the students will be able to understand:

**Learning objectives:**

*1. Physical properties and related laws of gas and liquid states are described.*

*2. Understanding Kinetic model of gas and its properties.*

*3. Maxwell distribution, mean-free path, kinetic energies.*

*4. Behaviour of real gases, its deviation from ideal behaviour, equation of state, isotherm, and law of corresponding states.*

*5. Liquid state and its physical properties related to temperature and pressure variation.*

*6. Properties of liquid as solvent for various household and commercial use.*

*7. Understand the basics of chemical kinetics: determination of order, molecularity, theories of reaction rates, determination of rate of opposing/parallel/chain reactions with suitable examples, application of steady state kinetics, Steady-state approximation.*

**Syllabus :**

**1. Acid-Base and Ionic Equilibrium (12 Lectures)**

Brönsted Lowry's concept, co-solvating agents, differentiating and leveling effect, Theory of solvent system, Lux Flood concept, Lewis concept- Stability of the adduct (Drago-Wayland equation), change of bond length parameter in adduct formation, -acidity of the ligands, synergistic effect, Usanovich's concept. Strength of hydracids and oxyacids, different factors in determining acid-base strength: steric effects (B- and F-strain), salvation,

H-bonding; Hard and Soft acid base (HSAB) principle: classification and characteristic, hardness and frontier molecular orbital (FMO), Non-aqueous solvent (liq. $NH_3$, liq. $SO_2$). Ionic Equilibria: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono-, di- and tri-protic acids Ostwald's dilution law, pH, buffer solution and buffer capacity, Henderson equation, hydrolysis and hydrolysis constant of salts, indicators: acid-base and its function, Hammett acidity function

**2. Redox Potential and Redox Equilibria (10 Lectures)**

Some basic aspects of redox reactions, equivalent weights of oxidants and reductants, ion-electron method of balancing redox reactions, complimentary and noncomplimentary redox reactions, overpotential, electron and atom transfer in redox reactions, Standard redox potentials, sign convention, Nernst equation, electrochemical series, formal potential and its importance in analytical chemistry; Redox potential: effect of complex formation, effect of precipitation, effect of pH change, EMF Diagram (Latimer, Frost), thermodynamic aspects of disproportionation and comproportionation reactions, redox potential and equilibrium constants, redox titration and redox indicators, function of Zimmermann Reinhardt (ZR) solution

**3. Chemical Kinetics – I (8 Lectures)**

Introduction, reaction rate and extent of reaction, order and molecularity; kinetics of zero, first, second, fractional and pseudo-first order reactions; determination of order of reaction, opposing, consecutive and parallel reactions (first order), concept of steady state and rate determining step, chain reaction: elementary idea, illustrations with $H_2$-$Br_2$ and $H_2$-$O_2$ reactions. Temperature dependence of reaction rate, Arrhenius equation.

**4. Properties of Fluids (15 Lectures)**

a) Properties of Gas - Maxwell's speed and energy distributions in one-, two- and three-dimensions, distribution curves, different types of speeds and their significance, principle of equipartition of energy and its application to calculate the classical limit of molar heat capacity of gases, Transport properties of gas, Thermal conductivity, Viscosity: mechanism, temperature and pressure dependence, relationship with mean free path. Collision of gas

molecules, collision diameter, collision number and mean free path, frequency of binary collision in same and different molecules, wall collision and rate of effusion.

Nature of imperfect gases with reference to van der Waals, Diterici and virial equations of state; Amagat's and Andrews' curves; continuity of states; critical constants; Boyle temperature; reduced equation of state. Vapour density and limiting density, intermolecular forces.

b) Properties of Liquids - Viscosity of liquids: principles of determination (falling sphere, Poiseuille's equation and Ostwald viscometer); temperature dependence, liquid crystal.

Surface energy and surface tension: temperature dependence; vapour pressure over a curved surface; conditions of convexity and concavity of meniscus; wetting. Principles of determination (capillary-rise and drop-weight methods).

**Practical:**

1. **$CO_3^{2-}$/$HCO_3^-$estimation**

Titration of $Na_2CO_3$ + $NaHCO_3$ mixture vs HCl using phenolphthalein and methyl orange indicators

2. **Hardness of Water**

To find the total hardness of water by EDTA titration

3. **Estimation of $Fe^{2+}$**

Titration of ferrous iron by $KMnO_4$/$K_2Cr_2O_7$

4. **Estimation of alkali content in antacid tablet**
5. **Surface tension of a liquid/solution by drop-weight/drop number.**
6. **Viscosity coefficient of a liquid/solution by Ostwald viscometer.**

**Recommended Books :**


1. R. L. Dutta and G. S. De, Inorganic Chemistry, Pt – I, 7th Edn, 2013, The New Book Stall, 2013.
2. R. Sarkar, General and Inorganic Chemistry, Pt- I, 2nd Edn, Books & Allied (P) Ltd, 2009.
3. A. K. Das, Fundamental Concepts of Inorganic Chemistry, (Vol. 1-3), 2nd Edn, CBS Publisher, 2012.

4. D. F. Shriver, P. W. Atkins and C. H. Langford, Inorganic Chemistry, Oxford University Press, New York, 1990.
5. J. E. Huheey, E. A. Keiter and R. L. Keiter, Inorganic Chemistry: Principles of Structure and Reactivity, 4th Edn, Pearson Education, India, 2006.
6. N. N. Greenwood and A. Earnshaw, Chemistry of the Elements, 2nd Edn, Elsevier, India, 2005.
7. J. D. Lee, Concise Inorganic Chemistry, 5th Edn, Oxford University Press, 1999.
8. F. A. Cotton, G. Wilkinson, C. M. Murillo and M. Bochmann, Advanced Inorganic Chemistry, 6th Edn, John Wiley and Sons, Inc., New York, 1999.
9. G. W. Castellan, Physical Chemistry, Narosa Publishing House, Calcutta, 1995.
10. K. L. Kapoor, A Text Book of Physical Chemistry (Vol. 1 & 5), Macmillan India Limited, New Delhi.
11. P. C. Rakshit (Revised by S.C. Rakshit), Physical Chemistry, Sarat Book Distributers, Kolkata.
12. Ira N. Levine, Physical Chemistry, PHI Learning Pvt. Ltd.
13. R. A. Alberty and R. J. Silbey, Physical Chemistry, John Wiley and Sons, Inc., New York, 1995.
14. D. A. McQuarrie and J. D. Simon, Physical Chemistry: A Molecular Approach, Viva Books Private Limited.
15. P. W. Atkins & Julio De Paula, Physical Chemistry, Eighth Edition, Oxford University Press, Oxford
16. P. W. Atkins & Julio De Paula, Elements of Physical Chemistry, Fifth Edition, Oxford University Press, Oxford
17. A. Bahl, B. S. Bahl and G. D. Tuli, Essentials of Physical Chemistry, S Chand Publications.
18. Pahari and Pahari, Problems on Physical Chemistry, New Central Book Agency (P) Ltd.
19. A. Ghoshal, Numerical Problems on Physical Chemistry, Books and Allied (P) Ltd.
20. A. K. Nad, B. Mahapatra & A. Ghosal, An Advanced Course in Practical Chemistry, New Central, 2007.
21. S. Ghosh, M. Das Sharma, D. Majumdar and S. Manna, Chemistry in Laboratory, Santra Publication Pvt. Ltd.

COURSE TYPE: MINOR

COURSE NAME: GENERAL CHEMISTRY–II

COURSE CODE: BSCCEMMN201

| Course Type: **MINOR** | Course Details: MNC-2 | | | L-T-P: **3-0-4** | |
|---|---|---|---|---|---|
| | | CA Marks | | ESE Marks | |
| Credit: **5** | Full Marks: **100** | Practical | Theoretical | Practical | Theoretical |
| **3 (Theory) + 2 (Practical)** | | **30** | **15** | **20** | **35** |

*** Syllabus of Minor Paper (GENERAL CHEMISTRY–II, COURSE CODE: BSCCEMMN201) is same as the Major Paper (GENERAL CHEMISTRY-II, COURSE CODE: BSCCEMMJ201).**

COURSE TYPE: SEC

COURSE NAME: PHARMACEUTICAL CHEMISTRY (SEC-2)

COURSE CODE: BSCCEMSE201

| Course Type: **SEC (Theoretical)** | Course Details: **SEC-2** | | | L-T-P: 2-**1-0** | |
|---|---|---|---|---|---|
| | | CA Marks | | ESE Marks | |
| Credit: **3** | Full Marks: **50** | Practical | Theoretical | Practical | Theoretical |
| | | | **15** | | **35** |

On completion of this course, the students will be able to understand:

**Learning objectives:**

1. *Understanding of different drug design and discoveries.*
2. *Different classes of drugs and their examples*
3. *Some knowledge about aerobic and anaerobic fermentation chemistry.*
4. *Some idea about production of various drug related components.*

**Syllabus :**

**1. Drugs & Pharmaceuticals (15 Lectures)**

What are drugs and why do we need new ones? Drug discovery and design, Sources of drugs and lead compounds, Natural sources, Drug synthesis, pharmacokinetics and pharmacodynamics? Introduction to drug action, Absorption, Distribution, Metabolism, Elimination, Solubility and drug design, The importance of water solubility, Salt formation, Structure–activity relationships (SARs), Lipophilicity, Electronic effects and steric effects.

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, lbuprofen); antibiotics (Chloramphenicol); antibacterial and antifungal agents (Sulphonamides; Sulphanethoxazol, Sulphacetamide, Trimethoprim); antiviral agents (Acyclovir), Central Nervous System agents (Phenobarbital, Diazepam), Cardiovascular (Glyceryltrinitrate), antilaprosy (Dapsone), HIV-AIDS related drugs (AZTZidovudine).

**2. Fermentation (5 Lectures)**

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.

**Recommended Books :**

1. G. L. Patrick, Introduction to Medicinal Chemistry, Oxford University Press, UK, 2013.
2. H. Singh & V.K. Kapoor, Medicinal and Pharmaceutical Chemistry, Vallabh Prakashan, Pitampura, New Delhi, 2012.