

# **SANKALCHAND PATEL UNIVERSITY VISNAGAR**

**Faculty of Science and Humanities**



**Structure, Teaching Scheme and Syllabus of  
B. Sc. Honours (Chemistry)  
Program Code: SC103  
With effect from: 2023-24**

# Semester-II

|                              |                                  |
|------------------------------|----------------------------------|
| <b>Branch Name:</b>          | B.Sc. Chemistry                  |
| <b>Program Code:</b>         | SC103                            |
| <b>Course Title:</b>         | Organic Chemistry-II             |
| <b>Course Code:</b>          | 12-CHM203-1C                     |
| <b>Pre-requisite Course:</b> | Basic Chemistry up to 12 science |

#### Course Objectives:

- The capacity to job effectively and safely in a laboratory environment.
- Opportunities for student and faculty to interact with alumni and with professional chemists.
- To develop the fundamental analytical and industrial skills to work effectively in the different fields of chemistry.
- To develop idea for the new way of organic chemistry.

#### Teaching and Examination Scheme:

| Teaching Scheme (Hours per week) |              |               |        | Evaluation Scheme (Marks) |                       |                       |                       |               |
|----------------------------------|--------------|---------------|--------|---------------------------|-----------------------|-----------------------|-----------------------|---------------|
| Lecture (L)                      | Tutorial (T) | Practical (P) | Credit | Theory (Marks)            |                       | Practical (Marks)     |                       | Total (Marks) |
|                                  |              |               |        | University Assessment     | Continuous Assessment | University Assessment | Continuous Assessment |               |
| 3                                | -            | 2             | 4      | 50                        | 25                    | -                     | 25                    | 100           |

#### Course Contents:

| Unit | Topic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Total Hours | Weightage |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|
| 1    | <b>HALONITROARENES</b><br>Reactivity, Structure and nomenclature of amines, physical properties, Separation of a mixture of primary, secondary, tertiary amines, Structure feature effecting basicity of amines, Preparation of alkyl and arylamines (reduction of nitro compound, nitriles), reductive amination of aldehydic and ketonic compounds, Gabriel-phthalimide reaction, Hofmann bromamide reaction.                                                                                | 11          | 34%       |
| 2    | <b>REACTION MECHANISM</b><br>Fission of Co-Valent bond (Withatleast one example of each intermediates), Types of reagents, Types of organic reaction with mechanism. Substitution reactions (Nucleophilic&Electrophilic), Addition reactions (Nucleophilic&Electrophilic), Elimination reactions (E1 & E2)                                                                                                                                                                                     | 17          | 33%       |
| 3    | <b>AROMATIC HYDROCARBONS</b><br>Aromaticity: Hückel's rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: Effect of substituent groups, Determination of orientation, Classification of substituent groups, Orientation in disubstitutedbenzenes, halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directing effects of the groups. | 17          | 33%       |

#### Reference Books:

- Organic reaction and mechanism, P.S.Kalsi, New Age international Publishers.
- Text book of organic Chemistry, P.S.Kalsi, New Age international Publishers.
- Organic Chemistry Vol. I & II, S.M.Mukherji, S.P.Singh, R.P.Kapoor.
- Reaction mechanism in Organic Chemistry, S.M.Mukhergi, S.P.Singh. 3<sup>rd</sup>edn, Macmillan.
- Reaction Mechanism and Reagents in Organic Chemistry, Gurdeep R. Chatwal 4<sup>th</sup>edn, Himalaya Publication House.
- Organic Chemistry, T.W.GrahamSolomons, 4<sup>th</sup>edn, John Wiley, 1998.

### Chemistry Practical

#### List of Experiments:

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | <b>Organic Chemistry</b><br>1) Identification of an organic compound through the functional group analysis, Determination of melting point and boiling point, Preparation of suitable derivative.<br>2) Candidate should perform the analysis of at least 05 compounds.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 2. | <b>Volumetric Titrations</b><br>1) To determine the Normality, gram/liter and molarities of $\text{H}_2\text{C}_2\text{O}_4$ , $2\text{H}_2\text{O}$ and $\text{H}_2\text{SO}_4$ present in the solution mixture of $\text{H}_2\text{C}_2\text{O}_4$ , $2\text{H}_2\text{O}$ & $\text{H}_2\text{SO}_4$ by using X N NaOH and Y N $\text{KMnO}_4$ solutions.<br>2) To determine the Normality, gram/liter and molarity of $\text{H}_2\text{C}_2\text{O}_4$ , $2\text{H}_2\text{O}$ and $\text{K}_2\text{C}_2\text{O}_4$ present in the solution mixture of $\text{H}_2\text{C}_2\text{O}_4$ , $2\text{H}_2\text{O}$ & $\text{K}_2\text{C}_2\text{O}_4$ by using X N NaOH and Y N $\text{KMnO}_4$ solutions. |

#### Reference Books:

1. Vogel's textbook of quantitative chemical analysis, 6th Edition, J Mendham, R C Denney, J D Barnes, M J K Thomas.
2. Practical Chemistry, O P Pandey, D N Bajpai, S Giri.
3. An Advanced course in Practical Chemistry, Ghoshal, Mahapatra, Nad.

#### List of Open-Source Software/learning website:

1. <https://www.organic-chemistry.org>
2. <https://swayam.gov.in>
3. <https://nptel.ac.in>
4. <http://onlinelibrary.wiley.com>
5. [https://en.wikipedia.org/wiki/Main\\_Page](https://en.wikipedia.org/wiki/Main_Page)

**Course Learning Outcomes (CLO):** On completion of this course, the students will be able to:

| CLO  | Description                                                                                               | Bloom's Taxonomy Level           |
|------|-----------------------------------------------------------------------------------------------------------|----------------------------------|
| CLO1 | Learn and understand about reactivity, structure, nomenclature and properties of halonitroarenes.         | 1-Remembering<br>2-Understanding |
| CLO2 | Learn and understand about reaction mechanism, intermediates and nucleophilic substitution reaction.      | 1-Remembering<br>2-Understanding |
| CLO3 | Learn and understand about aromaticity in organic molecules.                                              | 1-Remembering<br>2-Understanding |
| CLO4 | Learn, understand and perform the organic spotting of unknown organic compound and volumetric titrations. | 2-Understanding<br>3-Applying    |

#### Mapping of CLOs with POs

| Course Learning Outcomes | Programme Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | Programme Specific Outcome (PSOs) |      |
|--------------------------|--------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|-----------------------------------|------|
|                          | 1                        | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | PSO1                              | PSO2 |
| CLO1                     | 2                        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | 2                                 |      |
| CLO2                     |                          | 1 |   |   | 3 |   |   |   |   |    |    | 2  |    |    |    |    |                                   | 1    |
| CLO3                     |                          |   |   |   |   |   |   | 2 |   |    |    |    |    |    |    |    |                                   |      |
| CLO4                     |                          |   | 2 |   |   |   |   |   |   |    | 1  |    |    |    |    |    |                                   |      |

3: High, 2: Medium, 1: Low

|                              |                                     |
|------------------------------|-------------------------------------|
| <b>Branch Name:</b>          | B.Sc. Chemistry                     |
| <b>Program Code:</b>         | SC103                               |
| <b>Course Title:</b>         | Inorganic and Physical Chemistry-II |
| <b>Course Code:</b>          | 12-CHM204-1C                        |
| <b>Pre-requisite Course:</b> | Basic Chemistry up to 12 science    |

### Course Objectives:

- Learn about some basic concepts of physical and inorganic chemistry.
- To develop the fundamental analytical and industrial skills to work effectively in the different fields of chemistry.
- To develop idea for the new way of physical and inorganic chemistry.

### Teaching and Examination Scheme:

| Teaching Scheme (Hours per week) |              |               |        | Evaluation Scheme (Marks) |                       |                       |                       |               |
|----------------------------------|--------------|---------------|--------|---------------------------|-----------------------|-----------------------|-----------------------|---------------|
| Lecture (L)                      | Tutorial (T) | Practical (P) | Credit | Theory (Marks)            |                       | Practical (Marks)     |                       | Total (Marks) |
|                                  |              |               |        | University Assessment     | Continuous Assessment | University Assessment | Continuous Assessment |               |
| 3                                | -            | 2             | 4      | 50                        | 25                    | -                     | 25                    | 100           |

### Course Contents:

| Unit | Topic                                                                                                                                                                                                                                                                                                                                                                                                                                             | Total Hours | Weightage |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|
| 1    | <b>CHEMICAL KINETICS</b><br>Introduction of following terms, Rate of reaction, Order of reaction, Molecularity. Rate equation for second order reaction. ( $a=b$ ) & ( $a \neq b$ ), Characteristics of second order reaction, Rate equation for third order reaction, Characteristics of third order reaction, Numerical.                                                                                                                        | 11          | 33%       |
| 2    | <b>COORDINATION COMPOUNDS</b><br>Definition, Nomenclature of Complex, Werner's theory and its experimental verification, Concept of Effective Atomic Numbers (E.A.N.) for Coordination Compounds, Limitations of Valence bond theory of transition metal complexes, An Elementary idea of (C.F.T.) Crystal field splitting of d-orbital in O and Td, Factors affecting to the crystal field splitting, Application of common complexes & chelates | 17          | 34%       |
| 3    | <b>NOBLE GASES COMPOUNDS</b><br>Introduction, Discovery of Noble gases: Occurrence, Isolation of Non-radioactive of Noble gases, Electronic configuration of Noble gases. Compound of Noble gases, Non real compounds prepared by different methods, True compounds: XeF <sub>2</sub> , XeF <sub>4</sub> , XeF <sub>6</sub> , XeOF <sub>2</sub> , XeO <sub>3</sub> , XeO <sub>2</sub> F <sub>2</sub> , XeO <sub>4</sub> , XeOF <sub>4</sub> .     | 17          | 33%       |

### Reference Books:

1. Modern Inorganic Chemistry by G.F.Liporni, ELBS, 4<sup>th</sup>edn, colling Educational, 1983.
2. Inorganic Chemistry D.F.Shriver, P.W.Atkinss and C.H.Longford, 3<sup>rd</sup>edn, ELPS Oxford University Press, 1999.
3. Concise Inorganic Chemistry J.D.Lee, 5<sup>th</sup>edn.
4. Inorganic Chemistry, D.F.Shriver, P.W.Atkinss, 3<sup>rd</sup>edn, Oxford, 1999.
5. Advance Physical Chemistry by Gurdeepraj. 2. Physical Chemistry (Question and Answer) by R.N.Madan, G.D.Tuli,S.Chand.
6. Principal of Physical Chemistry by Puri, Sharma, Pathania.
7. Chemical Thermodynamics by R.P.Rastogi and R.R.Misra

### Chemistry Practical

#### List of Experiments:

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | <b>Inorganic Chemistry</b><br>1) Identification of unknown inorganic salt.<br>2) Candidate should perform the analysis of at least 05 compounds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 2. | <b>Volumetric Titrations</b><br>1) To determine the strength of NaOH and Na <sub>2</sub> CO <sub>3</sub> present in the solution mixture of NaOH & Na <sub>2</sub> CO <sub>3</sub> and to find out their percentage composition.<br>2) To determine the strength of NaHCO <sub>3</sub> and Na <sub>2</sub> CO <sub>3</sub> present in the solution mixture of NaHCO <sub>3</sub> & Na <sub>2</sub> CO <sub>3</sub> and to find out their percentage composition.<br>3) To determine the amount of Ca <sup>+2</sup> and Mg <sup>+2</sup> ion by EDTA solution from the mixture solution of CaCl <sub>2</sub> and MgCl <sub>2</sub> |

#### Reference Books:

1. Vogel's textbook of quantitative chemical analysis, 6th Edition, J Mendham, R C Denney, J D Barnes, M J K Thomas.
2. Practical Chemistry, O P Pandey, D N Bajpai, S Giri.
3. An Advanced course in Practical Chemistry, Ghoshal, Mahapatra, Nad.

#### List of Open-Source Software/learning website:

1. <https://swayam.gov.in>
2. <https://nptel.ac.in>
3. <http://onlinelibrary.wiley.com>
4. [https://en.wikipedia.org/wiki/Main\\_Page](https://en.wikipedia.org/wiki/Main_Page)

**Course Learning Outcomes (CLO):** On completion of this course, the students will be able to:

| CLO  | Description                                                                                             | Bloom's Taxonomy Level           |
|------|---------------------------------------------------------------------------------------------------------|----------------------------------|
| CLO1 | Learn and understand fundamentals of chemical kinetics                                                  | 1-Remembering<br>2-Understanding |
| CLO2 | Learn and understand basics of coordination compounds                                                   | 1-Remembering<br>2-Understanding |
| CLO3 | Learn and understand chemistry of noble elements                                                        | 2-Understanding                  |
| CLO4 | Learn, understand and perform the Inorganic spotting of unknown ionic compound and volumetric exercise. | 2-Understanding<br>3-Applying    |

#### Mapping of CLOs with POs

| Course Learning Outcomes | Programme Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | Programme Specific Outcome (PSOs) |      |
|--------------------------|--------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|-----------------------------------|------|
|                          | 1                        | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | PSO1                              | PSO2 |
| CLO1                     | 3                        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | 1                                 |      |
| CLO2                     |                          |   |   | 2 |   | 1 |   |   |   |    |    |    |    |    |    |    |                                   |      |
| CLO3                     |                          | 1 |   |   |   |   |   |   |   |    |    |    |    |    |    |    |                                   | 2    |
| CLO4                     |                          |   |   |   |   |   |   | 1 |   |    |    |    |    |    |    |    |                                   |      |

3: High, 2: Medium, 1: Low

|                              |                                                |
|------------------------------|------------------------------------------------|
| <b>Branch Name:</b>          | B.Sc. Chemistry                                |
| <b>Program Code:</b>         | SC103                                          |
| <b>Course Name:</b>          | Thermodynamics & Quantum Physics               |
| <b>Course Code:</b>          | 12-PHE202-1C                                   |
| <b>Pre-requisite Course:</b> | Basics Physics up to 12 <sup>th</sup> Science. |

**Course Objectives:**

- To understand the basic concept of Thermal Physics.
- To know the basic concept of Entropy and kinetic theory of gases.
- To understand the use of Schrödinger equations in various fields.

**Teaching and Examination Scheme:**

| Teaching Scheme (Hours per week) |              |               |        | Evaluation Scheme (Marks) |                       |                       |                       |               |
|----------------------------------|--------------|---------------|--------|---------------------------|-----------------------|-----------------------|-----------------------|---------------|
| Lecture (L)                      | Tutorial (T) | Practical (P) | Credit | Theory (Marks)            |                       | Practical (Marks)     |                       | Total (Marks) |
|                                  |              |               |        | University Assessment     | Continuous Assessment | University Assessment | Continuous Assessment |               |
| 3                                | -            | 2             | 4      | 50                        | 25                    | -                     | 25                    | 100           |

**Course content:**

| Unit | Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Total hours | Weightage |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|
| 1    | <b>Heat and Thermodynamics:</b><br>Characteristic functions, Enthalpy, The Helmholtz and Gibbs function, Two Mathematical Theorems, Maxwell's equations, The T-ds equations, Energy equation, The Thermal Expansivity, Compressibility, Joule-Kelvin effect (Porous plug Experiment), Liquefaction of Gases by Joule-Kelvin effect.<br><b>Kinetic Theory of Gases:</b><br>Maxwell's Distribution Law of Velocities, Deduction of Maxwell-Boltzmann law, Determination of the values of constants 'a' and 'b', | 15          | 34%       |
| 2    | <b>Co-ordinate Transformation:</b><br>Curvilinear Coordinates, Scale factors and basis vectors for orthogonal systems<br><b>Schrodinger Equations:</b><br>A free particle in one dimension, Generalization to three dimensions, The operator correspondence and the Schrodinger equation for a particle subject to forces, Normalization and Probability Interpretation, Non-Normalizable Wave functions and Box Normalization.                                                                               | 15          | 33%       |
| 3    | <b>Heat and Thermodynamics:</b> Second law of thermodynamics, Carnot's Theorem, Thermodynamic Scale of Temperature, Identity of perfect Gas Scale and Absolute Scale, Thermodynamics of Refrigeration.<br><b>Entropy:</b> Entropy, Change in entropy in a reversible process, Change of entropy in an Irreversible process, Principle of increase of entropy or degradation of energy, Formulation of the second law in terms of entropy, Entropy and second law.<br>Experimental Test of Maxwell's Law.      | 15          | 33%       |

**Basic Reference book:**

1. Heat Thermodynamics and Statistical Physics by Brijlal, Dr.Subrahmanyam, P.S.Hemne - S.Chand&Co.
2. University Physics by Sears, Zeemansky and Young. (6th Edition) Narosa Publication, New Delhi.
3. Quantum mechanics by Powell and Creaseman
4. Mathematical Physics by B.D.Gupta

### B. Physics Practical:

1. Bar pendulum: Determination of 'K' and 'g'
2. Newton's rings: Determination of R and wave length using sodium light.
3. Melde's Experiment.
4. Determination of self inductance 'L' of inductor.
5. Study of Transformer.
6. P-N Junction diode as Full wave rectifier.

### List of Open Source Software/learning website:

1. <https://www.youtube.com/watch?v=TnDCxw0y6YM>
2. <https://www.youtube.com/watch?v=3QMfZZs-Vm0>

**Course Learning Outcomes (CLO):** On completion of this course, the students will be able to:

| CLO  | Description                                                       | Bloom's Taxonomy Level |
|------|-------------------------------------------------------------------|------------------------|
| CLO1 | Describe the kinetic theory of gases.                             | 1 Remembering          |
| CLO2 | Discuss the Entropy                                               | 2 Understanding        |
| CLO3 | Illustrate the numerical part related to heat and thermodynamics. | 3 Applying             |
| CLO4 | Explain kinetic theory of Gases.                                  | 4 Analyzing            |
| CLO5 | Justify Schrödinger equation for free particle in one dimension.  | 5 Evaluating           |
| CLO6 | Design the refrigerator on the base of thermodynamics.            | 6 creating             |

### Mapping of CLOs with POs & PSOs

| Course Learning Outcomes | Programme Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | Programme Specific Outcome (PSOs) |      |
|--------------------------|--------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|-----------------------------------|------|
|                          | 1                        | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | PSO1                              | PSO2 |
| CLO1                     | 2                        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | 3                                 |      |
| CLO2                     |                          | 1 |   |   | 3 |   |   |   |   |    |    |    |    |    |    |    | 2                                 |      |
| CLO3                     |                          |   | 3 |   |   |   |   |   |   |    |    |    |    |    |    |    | 2                                 |      |
| CLO4                     |                          | 2 |   |   |   |   |   |   |   |    |    |    |    |    |    |    | 1                                 |      |
| CLO5                     |                          |   |   |   | 2 |   |   |   |   |    |    |    |    |    |    |    | 2                                 |      |
| CLO6                     | 3                        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | 2                                 |      |

3:high 2: medium 1: Low

|                              |                                                      |
|------------------------------|------------------------------------------------------|
| <b>Branch Name:</b>          | B.Sc. Chemistry                                      |
| <b>Program Code:</b>         | SC103                                                |
| <b>Course Name:</b>          | Metabolic Pathways of cell                           |
| <b>Course Code:</b>          | 12-BIE203-1C                                         |
| <b>Pre-requisite Course:</b> | Basics Biotechnology up to 12 <sup>th</sup> Science. |

**Course Objectives:**

- To understand the comprehensive action and performance of the enzyme and cell constituents of prokaryotes and eukaryotes.
- To get complete knowledge on types, function and control of enzymes.
- To understand metabolism of biomolecules like lipid, carbohydrate, amino acids.

**Teaching and Examination Scheme:**

| Teaching Scheme (Hours per week) |              |               |        | Evaluation Scheme (Marks) |                       |                       |                       |               |
|----------------------------------|--------------|---------------|--------|---------------------------|-----------------------|-----------------------|-----------------------|---------------|
| Lecture (L)                      | Tutorial (T) | Practical (P) | Credit | Theory (Marks)            |                       | Practical (Marks)     |                       | Total (Marks) |
|                                  |              |               |        | University Assessment     | Continuous Assessment | University Assessment | Continuous Assessment |               |
| 3                                | -            | 2             | 4      | 50                        | 25                    | -                     | 25                    | 100           |

**Subject Contents:**

| Unit | Topic                                                                                                                                                                                                                                                                                                                                                                                             | Total Hours | Weightage |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|
| 1    | <b>Glucose Metabolism:</b><br>Glycolysis and fate of pyruvate (Alcohol and lactic acid fermentation), TCA cycle, Pentose phosphate pathway, Gluconeogenesis.<br><b>ETC &amp; Oxidative phosphorylation:</b><br>ETC of mitochondria, electron carriers, complexes of ETC, ATP generation coupled to electron transport                                                                             | 15          | 33%       |
| 2    | <b>Lipid metabolism:</b><br>Lipid oxidation (Beta Oxidation), Fatty acid biosynthesis<br><b>Amino acid metabolism:</b><br>transamination, Deamination, Urea cycle<br><b>Photosynthesis:</b><br>Photophosphorylation in plant (Light reaction), Carbohydrate synthesis coupled to photophosphorylation (Dark reaction or C3 cycle or Calvin cycle), C4 cycle                                       | 15          | 34%       |
| 3    | Basics of Enzyme: Enzyme as a biocatalyst, coenzyme, cofactor, Nomenclature and Classification of enzyme, Basic concept of enzyme substrate reaction.<br>Factor affecting on enzyme catalyze reaction<br>Overview of catalytic mechanisms of enzyme<br>Enzyme kinetics: M-M equation, Double reciprocal plot<br>Inhibition of enzyme<br>Regulations of enzymes-allosteric and Covalent regulation | 15          | 33%       |

**Text Books:** Lehninger Principles of Biochemistry, 4th Edition (Unit-2&3)  
Understanding Enzymes; Trevor Palmer (Unit-1)

**Reference Books:**

Biochemistry, U Satyanarayan  
Biochemistry, D. Voet and J.G. Voet.  
Biochemistry, Jain & Jain  
Enzymology, T. Devsena

**List of Open Source Software/learning website:**

<https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-bt17/>  
<https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-bt18/>  
<https://archive.nptel.ac.in/courses/102/103/102103091/>  
<https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2rAs1Puvga4LW93zMe83aA==>

**List of Experiments:**

- Estimation of Protein & Sugar
  - ✓ Quantification of protein using Biuret method/ Folin-Lowary assay/ Bradford's method
  - ✓ Estimation of Reducing Sugar by DNSA method/ Anthrone method
  - ✓ Estimation of blood glucose by glucose oxidase method
- To study activity of any enzyme under optimum conditions (Assaying of various enzymes):
  - ✓ Amylases
  - ✓ Phosphatases
  - ✓ Invertase
- Enzyme Kinetics: (Salivary amylase or other)
  - ✓ Effect of substrate concentration (Determination of  $K_m$  and  $V_{max}$ )
  - ✓ Determination of temperature optimum of the enzyme
  - ✓ Effect of pH on enzyme activity

**Course Learning Outcomes (CLO): On completion of this course, the students will be able to:**

| CLO  | Description                                                                                          | Bloom's Taxonomy Level                   |
|------|------------------------------------------------------------------------------------------------------|------------------------------------------|
| CLO1 | <b>Discuss on</b> biosynthesis and degradation of Biomolecules in different organisms.               | 2 Understanding                          |
| CLO2 | <b>Describe</b> structure, function of biomolecules.                                                 | 1 Remembering                            |
| CLO3 | <b>Understanding of</b> enzyme kinetics to <b>apply</b> for quantitative estimation of biomolecules. | 2 Understanding,                         |
| CLO4 | <b>Compare</b> between protein and lipid synthesis.                                                  | 3 Applying,<br>2 Understanding           |
| CLO5 | <b>Discuss</b> photosynthesis and <b>evaluate</b> carbohydrate synthesis by it.                      | 5,3, 4<br>Evaluate, Applying,<br>Analyze |
| CLO6 | <b>Design</b> the mechanism involved in biomolecule synthesis.                                       | 6 Creating                               |

**Mapping of CLOs with POs & PSOs**

| Course Learning Outcomes | Programme Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | Programme Specific Outcome (PSOs) |      |
|--------------------------|--------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|-----------------------------------|------|
|                          | 1                        | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | PSO1                              | PSO2 |
| CLO1                     | 2                        | 2 | 1 |   | 1 |   |   |   |   |    |    |    |    |    |    |    | 2                                 | 1    |
| CLO2                     | 1                        | 3 | 1 |   | 1 | 1 |   |   |   |    |    |    |    |    |    |    | 1                                 |      |
| CLO3                     | 2                        | 3 | 2 |   | 2 | 2 |   |   | 2 |    |    |    |    |    | 1  |    | 1                                 |      |
| CLO4                     | 1                        | 3 | 1 |   | 1 | 1 |   |   | 1 |    |    |    |    |    | 1  |    |                                   |      |
| CLO5                     |                          | 3 | 2 |   | 2 | 2 |   |   | 2 |    |    |    |    |    | 2  |    |                                   |      |
| CLO6                     | 3                        | 3 | 3 |   | 3 | 3 |   |   | 3 |    |    |    |    |    | 3  |    |                                   |      |

3: High, 2: Medium, 1: Low

|                              |                                                    |
|------------------------------|----------------------------------------------------|
| <b>Branch Name:</b>          | B.Sc. Chemistry                                    |
| <b>Program Code:</b>         | SC103                                              |
| <b>Course Name:</b>          | Partial Differentiation & Complex Number           |
| <b>Course Code:</b>          | 12-MDC228-1C                                       |
| <b>Pre-requisite Course:</b> | Basics Mathematics up to 12 <sup>th</sup> Science. |

**Course Objectives:**

- To understand the applications of De'Moivre's theorem and Complex number.
- To understand the concept of Sequence and series.
- To be able to understand the partial differential equations.
- To understand Idea of linear homogeneous functions, Euler's theorem

**Teaching and Examination Scheme:**

| Teaching Scheme (Hours per week) |              |               |        | Evaluation Scheme (Marks) |                       |                       |                       |               |
|----------------------------------|--------------|---------------|--------|---------------------------|-----------------------|-----------------------|-----------------------|---------------|
| Lecture (L)                      | Tutorial (T) | Practical (P) | Credit | Theory (Marks)            |                       | Practical (Marks)     |                       | Total (Marks) |
|                                  |              |               |        | University Assessment     | Continuous Assessment | University Assessment | Continuous Assessment |               |
| 3                                | -            | 2             | 4      | 50                        | 25                    | -                     | 25                    | 100           |

**Subject Contents:**

| Unit | Topic                                                                                                                                                                                                                                                                                                                                           | Total Hours | Weightage |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|
| 1    | Partial Differentiation: Definition of partial derivative involving two variables only up to first and second order. Idea of linear homogeneous functions, Euler's theorem (statement only) and its application, Use of partial derivatives in problems relating to utility functions and cost minimization under constraints.                  | 11          | 24%       |
| 2    | (a) De'Moivre's theorem and its applications,<br>(b) Roots of a complex number<br>(c) Application of Expansion of $\sin n\theta, \cos n\theta, n \in \mathbb{N}$ in terms of sine and cosine of Multiples of $\theta$ .<br>(d) Expansion of $\sin n\theta, \cos n\theta$ and $\tan n\theta$ in terms of sine, cosine and tangent. Respectively. | 17          | 38%       |
| 3    | (a) Exponential, Circular and hyperbolic function, Logarithmic and inverse functions.<br>(b) Sequence and series: Definition of sequence, series. Definition of convergence Of sequence and series, partial sum. Application of comparison test, ratio test, Root test.                                                                         | 17          | 38%       |

**Text Books:**

1. Differential Calculus, by Shantinakaran.
2. Business Statistics, by SudhirPrakashan, Ahmedabad.

**Reference Books:**

1. Complex Variables and Application, by Ruel V. Churchill & James Ward Brown, McGraw-Hill Publishing Company, New Delhi.
2. Complex Analysis, by J.V.DESHPANDE, Tata McGRAW-Hill Publishing Co. Ltd. New Delhi.

**List of Open Source Software/learning website:**

1. <https://youtu.be/6X8Mae-5EAM>
2. [https://www.youtube.com/watch?v=\\_T7rcF1mrIw&list=PLT3bOBUU3L9iRoyhs8V1Io-xEsjfq4zI0](https://www.youtube.com/watch?v=_T7rcF1mrIw&list=PLT3bOBUU3L9iRoyhs8V1Io-xEsjfq4zI0)
3. [https://www.youtube.com/watch?v=JrEXsjr\\_Iak](https://www.youtube.com/watch?v=JrEXsjr_Iak)

### Practical

1. Application of De'Moivre's theorem.
2. Application of Expansion of  $\sin n\theta, \cos n\theta, n \in \mathbb{N}$  in terms of sine and cosine of Multiples of  $\theta$ .
3. Application of Expansion of  $\sin n\theta, \cos n\theta$  and  $\tan n\theta$  in terms of sine, cosine and tangent Respectively.
4. Application of Sequence and series.
6. Application of Partial differential equation.

**Course Learning Outcomes (CLO): On completion of this course, the students will be able to:**

| CLO  | Description                                                                                                             | Bloom's Taxonomy Level       |
|------|-------------------------------------------------------------------------------------------------------------------------|------------------------------|
| CLO1 | Use De'Moivre's theorem and solve its applications.                                                                     | 3 Applying                   |
| CLO2 | Discuss Expansion of $\sin n\theta, \cos n\theta$ and $\tan n\theta$ in terms of sine, cosine and tangent Respectively. | 2 Understanding              |
| CLO3 | Create various sequence and series and Find either it is converge or diverge.                                           | 6 Creating,<br>1 Remembering |
| CLO4 | Solve partial differential equation by using Euler's Theorem.                                                           | 3 Applying                   |
| CLO5 | Define of partial derivative involving two variables                                                                    | 1 Remembering                |
| CLO6 | Problems relating to utility functions and cost minimization under constraints Using Partial differential equations.    | 3 Applying                   |

### Mapping of CLOs with POs & PSOs:

| Course Learning Outcomes | Programme Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | Programme Specific Outcome (PSOs) |      |
|--------------------------|--------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|-----------------------------------|------|
|                          | 1                        | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | PSO1                              | PSO2 |
| CLO1                     |                          | 2 |   | 1 | 1 |   | 1 |   | 2 |    |    |    |    |    |    |    | 1                                 | 1    |
| CLO2                     | 1                        | 1 |   | 1 |   |   |   |   | 1 |    |    |    |    |    |    |    | 2                                 |      |
| CLO3                     |                          | 2 | 3 | 1 | 1 |   |   |   | 1 | 1  |    |    |    |    |    |    |                                   | 1    |
| CLO4                     | 2                        | 1 |   | 1 | 1 |   |   |   |   |    |    |    |    |    |    |    |                                   |      |
| CLO5                     |                          | 1 |   | 1 | 1 |   |   |   | 1 |    |    |    |    |    |    |    |                                   |      |
| CLO6                     |                          | 1 |   | 1 | 1 |   |   |   | 1 |    |    |    |    |    |    |    |                                   |      |

3: High, 2: Medium, 1: Low

|                              |                                |
|------------------------------|--------------------------------|
| <b>Branch Name:</b>          | B.Sc. Chemistry                |
| <b>Program Code:</b>         | SC103                          |
| <b>Course Name:</b>          | Microbial Growth and Nutrition |
| <b>Course Code:</b>          | 12-MDC231-1C                   |
| <b>Pre-requisite Course:</b> | --                             |

**Course Objective:**

- 1.To learn the basic and fundamental aspects of Physiology and Metabolism
- 2.To understand the nutritional requirements of various microbes and effects of various chemical and physical conditions on bacterial cell
- 3.To understand the nutritional uptake and transport mechanisms of microbes
- 4.To understand the metabolic pathways of the microorganisms on the basis of their source of energy and nutrition

| Teaching Scheme (Hours per week) |                 |                  |        | Evaluation Scheme (Marks) |                          |                          |                          |                  |
|----------------------------------|-----------------|------------------|--------|---------------------------|--------------------------|--------------------------|--------------------------|------------------|
| Lecture<br>(L)                   | Tutorial<br>(T) | Practical<br>(P) | Credit | Theory (Marks)            |                          | Practical (Marks)        |                          | Total<br>(Marks) |
|                                  |                 |                  |        | University<br>Assessment  | Continuous<br>Assessment | University<br>Assessment | Continuous<br>Assessment |                  |
| 3                                | -               | 2                | 4      | 50                        | 25                       | -                        | 25                       | 100              |

**Subject Contents:**

| Unit | Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Total<br>Hours | Weightage |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------|
| 1    | <p><b>(A) Chemo lithotrophic and Phototrophic Metabolism</b></p> <ul style="list-style-type: none"> <li>•Introduction to aerobic and anaerobic chemolithotrophy with an example each. Hydrogenoxidation (definition and reaction), Methanogenesis (definition and reaction),</li> <li>•Introduction to phototrophic metabolism-groups of phototrophic microorganisms, anoxygenic vs. oxygenic photosynthesis with reference to photosynthesis in green bacteria, purple bacteria and cyanobacteria.</li> </ul> <p><b>(B) Nutrient uptake and Transport</b></p> <ul style="list-style-type: none"> <li>• Passive and facilitated diffusion</li> <li>• Primary and secondary active transport, concept of uniport, symport and antiport</li> <li>• Group translocation</li> </ul> | 15             | 33%       |
| 2    | <p><b>A) Chemo heterotrophic Metabolism-Aerobic Respiration</b></p> <p>Concept of aerobic respiration, anaerobic respiration and fermentation Sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway TCA cycle Electron transport chain: components of respiratory chain</p> <p><b>B) Chemo heterotrophic Metabolism- Anaerobic respiration &amp; fermentation</b></p> <p>Anaerobic respiration with special reference to dissimilatory nitrate reduction (Denitrification; nitrate /nitrite and nitrate /ammonia respiration; fermentative nitrate reduction), Fermentation-Alcohol fermentation and Pasteur effect; Lactate fermentation (homo fermentative and hetero fermentative pathways)</p>                                                                 | 15             | 33%       |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |     |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|
| 3 | <b>Microbial Growth and Effect of Environment on Microbial Growth:</b> <ul style="list-style-type: none"> <li>Definitions of Microbial Growth, Mathematical Expressions of Microbial Growth, Steps in the Cell Division Process of <i>E.coli</i>, Normal Growth Cycle of Bacteria, Methods for the Measurement of microbial growth, Batch culture, Continuous culture, generation time and specific growth rate, synchronous growth, diauxic growth curves</li> <li>Microbial growth in response to environment-Temperature (psychrophiles, mesophiles, thermophiles, extremophiles, thermotolerants, psychrotrophs), pH (acidophiles, alkaliphiles), solute and water activity (halophiles, xerophiles, osmophilic), Oxygen (aerobic, anaerobic, microaerophilic, facultative aerobe, facultative anaerobe)</li> <li>Microbial growth in response to nutrition and energy—Autotrophy &amp; Heterotrophy, Basic Concepts of Chemotrophy and Phototrophy with suitable examples.</li> </ul> | 15 | 34% |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|

### **List of Experiments for PAPER: MICROBIAL PHYSIOLOGY AND METABOLISM:**

1. Study and plot the growth curve of *E.coli* and Calculations of generation time and specific growth rate of bacteria from the graph plotted with the given data,
2. Enumeration of bacteria by Standard Plate Count
3. Effect of temperature on growth of *E.coli*
4. Effect of pH on growth of *E.coli*
5. Effect of carbon and nitrogen sources on growth of *E.coli*
6. Effect of salt on growth of *E.coli*
7. Demonstration of the thermal death time and decimal reduction time of *E.coli*

#### **Text Books:**

1. Michael Pelczar, text book of microbiology, 5th ed.
2. Madigan MT, and Martinko JM (2014). Brock Biology of Microorganisms. 14<sup>th</sup> edition. Prentice Hall International Inc.
3. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. Mc Graw Hill Higher Education

#### **Reference Books:**

1. Moat AG and Foster JW. (2002). Microbial Physiology. 4th edition. John Wiley & Sons
2. Reddy SR and Reddy SM. (2005). Microbial Physiology. Scientific Publishers India
3. Gottschalk G. (1986). Bacterial Metabolism. 2nd edition. Springer Verlag
4. Stanier RY, Ingraham JI, Wheelis ML and Painter PR. (1987). General Microbiology. 5th edition, McMillan Press.

#### **List of Open Source Software/learning website:**

<https://onlinecourses.swayam2.ac.in>  
<https://archive.nptel.ac.in/courses>  
<https://onlinecourses.nptel.ac.in>  
<https://www.coursera.org>

### **Course Learning Outcomes (CLO): On completion of this course, the students will be able to:**

| CLO  | Description                                                                                                                                                     | Bloom's Taxonomy Level                         |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| CLO1 | Understand the growth pattern of bacteria isolated from different environment and understand the effects of various cultivation conditions on bacterial growth. | 1 Remembering<br>2 Understanding               |
| CLO2 | Measure the microbial growth with direct and indirect methods.                                                                                                  | 1 Remembering<br>2 Understanding<br>3 Applying |

|      |                                                                                                                                                                                                                                                                                       |                                                |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| CLO3 | Classify the microorganisms by comparing their physical and nutritional requirements.                                                                                                                                                                                                 | 2 Understanding<br>4 Analyze                   |
| CLO4 | Understand and discuss various mechanisms for regulation of biochemical pathways and transport mechanisms so that it can be applied.                                                                                                                                                  | 1 Remembering<br>2 Understanding<br>3 Apply    |
| CLO5 | Understand nutrition uptake and transport mechanisms in the microorganisms and different nutritional requirements so that student can justify the diversity of microbes in various habitats.                                                                                          | 1 Remembering<br>2 Understanding<br>5 Evaluate |
| CLO6 | Understand the various metabolic pathways in different organisms like chemolithotrophy, chemoheterotrophy and phototrophy and extremophiles so that its knowledge can be applied for finding solutions for environmental problems and bioenergy generation and enzyme technology etc. | 2 Understanding<br>3 Applying<br>6 create      |

### Mapping of CLOs with Pos& PSOs

| Course Learning Outcomes | Programme Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | Programme Specific Outcome (PSOs) |      |
|--------------------------|--------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|-----------------------------------|------|
|                          | 1                        | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | PSO1                              | PSO2 |
| CLO1                     | 1                        | 1 |   |   | 1 |   |   |   |   |    |    |    |    |    |    |    | 1                                 | 2    |
| CLO2                     | 2                        | 2 |   |   | 1 |   |   |   |   |    |    |    |    |    |    |    | 1                                 |      |
| CLO3                     |                          | 3 |   |   | 2 |   |   |   |   |    |    |    |    |    |    |    |                                   |      |
| CLO4                     | 3                        | 3 |   |   | 2 |   |   |   |   |    |    |    |    |    |    |    | 1                                 | 1    |
| CLO5                     | 2                        | 2 |   |   | 3 | 2 |   |   |   |    |    |    |    |    |    |    |                                   |      |
| CLO6                     | 3                        | 3 | 1 | 1 | 3 | 3 |   |   | 3 |    |    |    | 1  |    |    |    |                                   |      |

1: low 2: medium 3: High

|                              |                   |
|------------------------------|-------------------|
| <b>Branch Name:</b>          | B.Sc. Chemistry   |
| <b>Program Code:</b>         | SC103             |
| <b>Course Name:</b>          | Digital Marketing |
| <b>Course Code:</b>          | 12MDC226-1C       |
| <b>Pre-requisite Course:</b> | -                 |

**Course Objectives:**

- To understand the basic concept of Digital Marketing.
- To understand the concept of Web Design.
- To know about Domain Registration and Hosting

**Teaching and Examination Scheme:**

| Teaching Scheme (Hours per week) |                 |                  |        | Evaluation Scheme (Marks) |                          |                          |                          |                  |
|----------------------------------|-----------------|------------------|--------|---------------------------|--------------------------|--------------------------|--------------------------|------------------|
| Lecture<br>(L)                   | Tutorial<br>(T) | Practical<br>(P) | Credit | Theory (Marks)            |                          | Practical (Marks)        |                          | Total<br>(Marks) |
|                                  |                 |                  |        | University<br>Assessment  | Continuous<br>Assessment | University<br>Assessment | Continuous<br>Assessment |                  |
| 3                                | -               | 2                | 4      | 50                        | 25                       | -                        | 25                       | 100              |

**Subject Contents:**

| Unit | Topic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Total Hours | Weightage |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|
| 1    | <b>Introduction to Digital Marketing.</b> <ul style="list-style-type: none"> <li>• What is marketing?</li> <li>• What is digital marketing?</li> <li>• Why are people going online?</li> <li>• Key concepts of digital marketing</li> <li>• Benefits of digital marketing</li> <li>• How digital marketing evolved</li> <li>• Who's using digital marketing?</li> <li>• How traditional and digital media differ?</li> <li>• Understand the future of digital marketing</li> <li>• What is search engine?</li> <li>• Types of search engine</li> <li>• How search engine works?</li> <li>• Why is google the world's best search engine?</li> <li>• Tools required in digital marketing</li> <li>• What is advertising?</li> <li>• What is online advertising?</li> <li>• What is Ad Words?</li> <li>• Career scope in Digital Marketing</li> </ul> | 11          | 25%       |
| 2    | <b>Website Design Guidelines.</b> <ul style="list-style-type: none"> <li>• What is Website?</li> <li>• What is www?</li> <li>• What are the different types of website?</li> <li>• Web page vs website</li> <li>• Difference between blog vs website</li> <li>• Components of website</li> <li>• Purpose of creating websites</li> <li>• How to build a web page?</li> <li>• Web design vs web development</li> <li>• What makes a website user-friendly?</li> <li>• Dynamic vs Static website</li> </ul>                                                                                                                                                                                                                                                                                                                                           | 11          | 25%       |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |    |     |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|
|   | <ul style="list-style-type: none"> <li>What are responsive websites?</li> </ul> <b>Domain Registration and Hosting</b> <ul style="list-style-type: none"> <li>What is domain &amp; sub domain name?</li> <li>Parts of domain name</li> <li>How to choose a domain name?</li> <li>What is Protocol?</li> <li>What is IP address</li> <li>What is web hosting?</li> <li>How to buy domain and hosting?</li> <li>Costs of a domain name</li> </ul> <b>Word Press Website Creation</b> <ul style="list-style-type: none"> <li>What is Word Press?</li> <li>Understanding Word Press and it's functioning?</li> <li>Features of Word Press</li> <li>Sites built with Word Press</li> </ul>                                                                                |    |     |
| 3 | <b>Search Engine Optimization</b> <ul style="list-style-type: none"> <li>Introduction and Understanding of SEO?</li> <li>How Search Engine works?</li> <li>Basics of SEO</li> <li>On-Page SEO vs Off-Page SEO</li> <li>What is the main purpose of using keyword in SEO?</li> <li>Some important SEO tools</li> <li>What is google my business?</li> </ul> <b>Keyword Research and Planning</b> <ul style="list-style-type: none"> <li>What is Keywords?</li> <li>Types of Keywords</li> <li>Why is keyword research important?</li> <li>Understanding your target market</li> <li>What is Keyword Density, and does it matter?</li> <li>Know what your people want</li> <li>How to use google keyword planner?</li> <li>How to do the business analysis?</li> </ul> | 11 | 25% |
| 4 | <b>Google Analytics</b> <ul style="list-style-type: none"> <li>Introduction of Google Analytics</li> <li>Data Analysing with Google Analytics</li> <li>Checking User Behavior</li> <li>Tracking Traffic from Different Source</li> <li>Using Analytics Date for Retargeting</li> </ul> <b>Google AdSense</b> <ul style="list-style-type: none"> <li>Money Making with AdSense</li> <li>Easy Steps for AdSense</li> <li>How to Approve AdSense Account</li> <li>Placing Ads to Website</li> </ul>                                                                                                                                                                                                                                                                     | 12 | 25% |

**Reference /Readings Books:**

- Digital Marketing; by Vandana Ahuja; Oxford University Press
- Internet Marketing and e-Commerce; by Ward Hanson; Cengage
- Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World; by Chuck Hemann Ken Burbary; Que Publishing
- The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns; by Ian Dodson; Wiley publication

**List of Open Source Software/learning website:**

1. <https://www.youtube.com/watch?v=evRg1B9ya94>
2. [https://www.youtube.com/watch?v=ghZZB\\_7HFS8](https://www.youtube.com/watch?v=ghZZB_7HFS8)
3. [https://www.youtube.com/watch?v=spf\\_AhwMT\\_k](https://www.youtube.com/watch?v=spf_AhwMT_k)
4. <https://www.youtube.com/watch?v=TP-fvp1REls>

**List of Experiments:**

**Note:** The experiment list provided beneath is for reference only. The course teacher may change/formulate it as per his/her methodology and requirement.

1. Domain registration and hosting.
2. Design and development of word press website.
3. SEO tools.
4. Keyword planner tools.
5. Google analytics tools.
6. Google AdSense.

**Course Learning Outcomes (CLO):** On completion of this course, the students will be able to:

| CLO  | Description                                                      | Bloom's Taxonomy Level |
|------|------------------------------------------------------------------|------------------------|
| CLO1 | <b>Describe</b> digital marketing.                               | 1 Remembering          |
| CLO2 | <b>Discuss</b> the knowledge on the different types of website.  | 2 Understanding        |
| CLO3 | <b>Use</b> Data Analysing with Google Analytics.                 | 3 Applying             |
| CLO4 | <b>Explain</b> Tracking Traffic from Different Source.           | 4 Analysing            |
| CLO5 | To know Google AdSense to <b>Justify</b> the application of its. | 5 Evaluating           |
| CLO6 | <b>Create</b> website for digital marketing.                     | 6 creating             |

**Mapping of CLOs with POs & PSOs:**

| Course Learning Outcomes | Programme Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | Programme Specific Outcome (PSOs) |      |
|--------------------------|--------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|-----------------------------------|------|
|                          | 1                        | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | PSO1                              | PSO2 |
| CLO1                     |                          | 2 |   | 1 | 3 |   |   |   | 2 | 1  |    |    | 3  |    |    |    | 1                                 |      |
| CLO2                     |                          | 2 | 2 | 2 | 1 |   | 1 | 2 | 2 | 1  |    |    | 2  |    |    |    |                                   |      |
| CLO3                     |                          | 2 |   |   | 3 |   |   |   |   | 2  |    |    |    |    |    |    |                                   |      |
| CLO4                     |                          | 1 |   | 2 | 1 |   |   |   |   | 2  |    |    |    |    |    | 2  |                                   |      |
| CLO5                     | 2                        | 2 |   |   | 1 | 2 |   |   | 3 | 1  |    |    |    |    |    |    |                                   |      |
| CLO6                     |                          | 2 | 2 | 2 | 1 |   | 1 | 2 | 2 | 1  |    |    | 2  |    |    |    |                                   |      |

**3: High, 2: Medium, 1: Low**

|                              |                    |
|------------------------------|--------------------|
| <b>Branch Name:</b>          | B.Sc. Chemistry    |
| <b>Program Code:</b>         | SC103              |
| <b>Course Name:</b>          | Cyber Security-II  |
| <b>Course Code:</b>          | 12-MDC227-1C       |
| <b>Pre-requisite Course:</b> | Basics of computer |

**Course Objectives:**

1. Graduates will have solid basics in Mathematics, Programming, Computer Network, Network, Security, Cyber Security fundamentals and advancements to solve technical problems.
2. To be able to understand the basic concepts related to E-Commerce and digital payments. They will become familiar with various digital payment modes and related cyber security aspects, RBI guidelines and preventive measures against digital payment frauds.
3. To be able to understand the basic security aspects related to Computer and Mobiles. They will be able to use basic tools and technologies to protect their devices.

**Teaching and Examination Scheme:**

| Teaching Scheme (Hours per week) |              |               |        | Evaluation Scheme (Marks) |                       |                       |                       |               |
|----------------------------------|--------------|---------------|--------|---------------------------|-----------------------|-----------------------|-----------------------|---------------|
| Lecture (L)                      | Tutorial (T) | Practical (P) | Credit | Theory (Marks)            |                       | Practical (Marks)     |                       | Total (Marks) |
|                                  |              |               |        | University Assessment     | Continuous Assessment | University Assessment | Continuous Assessment |               |
| 3                                | -            | 2             | 4      | 50                        | 25                    | -                     | 25                    | 100           |

**Subject Contents:**

| Unit | Topic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Total Hours | Weightage |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|
| 1    | <b>E-Commerce and Digital Payments</b><br>Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats, E-Commerce security best practices, Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in unauthorized banking transactions. Relevant provisions of Payment Settlement Act, 2007. | 22          | 50%       |
| 2    | <b>Digital Devices Security, Tools and Technologies for Cyber Security</b><br>End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Anti-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions.                                                                                                                                                                                                      | 23          | 50%       |

**Reference Books:**

1. "Cyber Security (with CD): Understanding Cyber Crimes, Computer Forensics and Legal Perspectives" by Nina Godbole, SunitBelapure.
2. "Cyber Laws & Information Technology" by Dr.Jyoti Rattan
3. Cyber Crimes & laws by Taxman and Technology decoded by N.S.Nappani.
4. Avi Silberschatz, Greg Gagne, and Peter Baer Galvin Operating System Concepts John Wiley & Sons, Inc.
5. Computer Forensics: Computer Crime Scene Investigation by John R. Vacca.
6. Robert M Slade, "Software Forensics: Collecting Evidence from the Scene of a Digital Crime", Tata McGraw Hill, Paperback, 1st Edition, 2004.

**List of Open-Source Software/learning website:**

1. <https://swayam.gov.in>
2. <https://nptel.ac.in>
3. [https://en.wikipedia.org/wiki/Main\\_Page](https://en.wikipedia.org/wiki/Main_Page)

**List of Experiment**

| Sr. No | Experiments                                                                                                      |
|--------|------------------------------------------------------------------------------------------------------------------|
| 1      | Configuring security settings in Mobile Wallets and UPIs.                                                        |
| 2      | Checklist for secure net banking.                                                                                |
| 3      | Setting, configuring and managing three password policy in the computer (BIOS, Administrator and Standard User). |
| 4      | Setting and configuring two factor authentication in the Mobile phone.                                           |
| 5      | Security patches management and updates in Computer and Mobiles.                                                 |
| 5      | Managing Application permissions in Mobile phone.                                                                |
| 6      | Installation and configuration of computer Anti-virus.                                                           |
| 7      | Installation and configuration of Computer Host Firewall.                                                        |
| 8.     | Wi-Fi security management in computer and mobile.                                                                |

**Course Learning Outcomes (CLO): On completion of this course, the students will be able to:**

| CLO  | Description                                                                                                                | Bloom's Taxonomy Level        |
|------|----------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| CLO1 | Understand the broad set of technical, social & political aspects of Cyber Security.                                       | 2 Understanding               |
| CLO2 | Appreciate the vulnerabilities and threats posed by criminals, terrorist and nation states tonational infrastructure.      | 2 Understanding               |
| CLO3 | Understand the importance of ethical hacking tool.                                                                         | 2 Understanding               |
| CLO4 | Implementing ethical hacking tools in an organization.                                                                     | 3Applying                     |
| CLO5 | Apply security principles to system design.                                                                                | 3 Applying                    |
| CLO6 | Apply methods for authentication, access control, intrusion detection and prevention andconduct research in Cyber Security | 3 Analysing and<br>3 Applying |

**Mapping of CLOs with POs & PSOs:**

| Course Learning Outcomes | Programme Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | Programme Specific Outcome (PSOs) |      |
|--------------------------|--------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|-----------------------------------|------|
|                          | 1                        | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | PSO1                              | PSO2 |
| CLO1                     | 1                        | 1 | 1 |   | 2 |   |   |   | 1 | 2  |    |    |    |    |    | 2  | 1                                 |      |
| CLO2                     |                          | 2 |   |   |   | 2 |   |   | 2 |    | 1  | 1  |    |    | 1  |    |                                   |      |
| CLO3                     |                          |   | 1 |   |   |   |   |   | 1 | 2  |    |    |    |    |    | 2  |                                   | 1    |
| CLO4                     |                          | 1 | 2 |   |   | 1 | 2 |   | 2 |    |    |    | 1  |    | 2  |    |                                   |      |
| CLO5                     | 1                        | 1 |   |   | 2 | 1 |   | 2 |   |    |    |    |    |    | 1  |    |                                   | 1    |
| CLO6                     | 1                        |   |   |   | 1 | 1 | 2 | 2 |   |    |    |    |    |    | 1  |    |                                   |      |

**3: High, 2: Medium, 1: Low**

|                              |                                                                        |
|------------------------------|------------------------------------------------------------------------|
| <b>Branch Name:</b>          | B.Sc. Chemistry                                                        |
| <b>Program Code:</b>         | SC103                                                                  |
| <b>Course Name:</b>          | Basic English - II                                                     |
| <b>Course Code:</b>          | 12-AEC202-1C                                                           |
| <b>Pre-requisite Course:</b> | Basics English Grammar and Composition up to 12 <sup>th</sup> Science. |

### Course Objectives:

- To inculcate human values among the students through poems and prose.
- To create an interest in literature and to develop language skills.
- The students will become familiar with formal vocabulary that is common in academic texts.

### Teaching and Examination Scheme:

| Teaching Scheme (Hours per week) |                 |                  |        | Evaluation Scheme (Marks) |                          |                          |                          |                  |
|----------------------------------|-----------------|------------------|--------|---------------------------|--------------------------|--------------------------|--------------------------|------------------|
| Lecture<br>(L)                   | Tutorial<br>(T) | Practical<br>(P) | Credit | Theory (Marks)            |                          | Practical (Marks)        |                          | Total<br>(Marks) |
|                                  |                 |                  |        | University<br>Assessment  | Continuous<br>Assessment | University<br>Assessment | Continuous<br>Assessment |                  |
| 2                                | -               | -                | 2      | 25                        | 25                       | -                        | -                        | 50               |

### Subject Contents:

| Unit | Topic                                                                                                                                                                                                                                                                                                             | Total<br>Hours | Weightage |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------|
| 1    | <b>VOCABULARY&amp;GRAMMARLINK</b><br>Regular Verbs' meanings with past and past participle forms, One Word Substitutes, Modal Auxiliaries, Imperatives, Antonyms, Synonyms.                                                                                                                                       | 9              | 30%       |
| 2    | <b>SPEAKING</b><br><b>Public Speaking:</b><br>(Teacher has to give Tips to the students about How to deliver speech in front of public)<br><b>Speeches:</b> Reservation System in India, Elections, Importance of Reading, Science & Technology, Indian culture & Western culture (or more than these topics)     | 6              | 20%       |
| 3    | <b>READING&amp;WRITING</b><br>Translate the <b>Accident/Incident</b> Paragraphs given by your teacher from the English News Papers (Teacher has to give small paragraphs at least 5 to 6 paragraphs or more than that for the entire semester based on especially from the pages no. 3 & 4 of The Times of India) | 6              | 20%       |
| 4    | <b>TEXT</b><br><b>Fantasy</b> a collection of short stories edited by V Sasikumar ( <b>Orient Black Swan</b> ) Lesson 6 to 10                                                                                                                                                                                     | 9              | 30%       |

### Text Books:

1. Fantasy a collection of short stories edited by V Sasikumar (Orient Black Swan)
2. Easy to learn English grammar by Dr. Jayesh Patel

### Reference Books:

1. Very Useful Verbs book (Enka Publication)
2. Contemporary English Grammar Structure & Composition
3. Murphy R. Intermediate English Grammar (New Delhi: Cambridge University)
4. The Art of Public Speaking by Vijay Kumar.
5. The Times of India/The Indian Express
6. Business Correspondence and Report Writing by R.C Sharma & Krishna Mohan.

**List of Open Source Software/learning website:**

1. englishpage.com
2. epaper.timesofindia.com
3. epaperindianexpress.com
4. <https://www.youtube.com/watch?v=QdAgyD4xhY>

**Course Learning Outcomes (CLO): On completion of this course, the students will be able to:**

| CLO  | Description                                                                            | Bloom's Taxonomy Level |
|------|----------------------------------------------------------------------------------------|------------------------|
| CLO1 | Use context clues to <b>find</b> the meaning of a word and/or phrase in a reading text | 1 Remembering          |
| CLO2 | Express their ideas in group <b>discussions</b> .                                      | 2 Understanding        |
| CLO3 | <b>Use</b> appropriate note-taking styles for reading and listening texts.             | 3 Applying             |
| CLO4 | <b>Identify</b> the types of words in the sentence.                                    | 4 Analyzing            |
| CLO5 | <b>Explain</b> sentences using collocation words.                                      | 2 Understanding        |
| CLO6 | <b>Use</b> cohesion mechanisms to distinguish different ideas.                         | 3 Applying             |

**Mapping of CLOs with Pos & PSOs**

| Course Learning Outcomes | Programme Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | Programme Specific Outcome (PSOs) |      |
|--------------------------|--------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|-----------------------------------|------|
|                          | 1                        | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | PSO1                              | PSO2 |
| CLO1                     | 3                        |   |   |   |   | 2 |   |   |   |    | 2  |    |    |    |    | 3  | 1                                 |      |
| CLO2                     |                          | 2 |   |   | 2 |   | 1 |   |   | 2  |    | 1  |    |    | 2  |    |                                   |      |
| CLO3                     |                          |   | 3 |   |   |   |   | 1 |   |    |    |    | 3  |    |    | 2  |                                   |      |
| CLO4                     |                          | 2 |   |   |   |   | 3 |   |   |    |    | 2  |    |    |    |    |                                   |      |
| CLO5                     |                          |   |   |   | 2 |   |   |   |   | 2  |    |    |    |    | 3  |    |                                   |      |
| CLO6                     | 1                        |   |   |   |   | 1 |   |   |   |    | 1  |    |    |    |    | 2  |                                   |      |

3:High, 2:Medium, 1:Low

|                              |                         |
|------------------------------|-------------------------|
| <b>Branch Name:</b>          | B.Sc. Chemistry         |
| <b>Program Code:</b>         | SC103                   |
| <b>Course Name:</b>          | National Service Scheme |
| <b>Course Code:</b>          | 12-VAC101-1C            |
| <b>Pre-requisite Course:</b> | -                       |

**Course Objectives:**

- To understand the basic concept of NSS Regular Activities.
- To understand the Important of Soft Skills.
- To be able to understand the Leadership Skill, Communication Skill and Report Writing Skills.

**Teaching and Examination Scheme:**

| Teaching Scheme (Hours per week) |                 |                  |        | Evaluation Scheme (Marks) |                          |                          |                          |                  |
|----------------------------------|-----------------|------------------|--------|---------------------------|--------------------------|--------------------------|--------------------------|------------------|
| Lecture<br>(L)                   | Tutorial<br>(T) | Practical<br>(P) | Credit | Theory (Marks)            |                          | Practical (Marks)        |                          | Total<br>(Marks) |
|                                  |                 |                  |        | University<br>Assessment  | Continuous<br>Assessment | University<br>Assessment | Continuous<br>Assessment |                  |
| -                                | -               | 4                | 2      | -                         | -                        | 25                       | 25                       | 50               |

**Subject Contents:**

| Unit | Topic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Total<br>Hours | Weightage |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------|
| 1    | <b>NSS Regular Activities and Special Camping Programme</b> <ul style="list-style-type: none"> <li>NSS Regular Activities – A Detailed Study</li> <li>Adoption of villages, Contracting Village / Area Leader, Identification of Problems</li> <li>Adoption of Slums, NSS Volunteers for Slums Work</li> <li>Some Suggestions for Selecting of Slums</li> <li>Objective and Contribution of the Special Camping Programs</li> <li>Suggestive List of Activities During Special Camping</li> <li>Environment Enrichment and Conservation</li> <li>Health, Family and Nutrition Program, Social Service program</li> </ul> | 30             | 50%       |
| 2    | <b>NSS Programmes and Soft Skills</b> <ul style="list-style-type: none"> <li>Soft Skills – Basic Concepts</li> <li>Importance of Soft Skills</li> <li>Leadership Skills, Communication Skills and Writing Skills as Part of Soft Skills Development</li> <li>Report Writing On the Basis of Your Institutional Activities</li> <li>Basic Concepts and Components</li> <li>Various NSS Programmes and Activities</li> <li>National Calamities and National Emergencies, Urban Projects and Rural Projects</li> <li>Institutional Work Campus Work , Orientation of NSS Volunteers</li> </ul>                              | 30             | 50%       |

**Reference Books:**

- 1) National Service Scheme manual – 1998 and 2006
- 2) Principles and Practices of Management by L.M. Prasad

**List of Open Source Software/learning website:**

1. <https://nss.nic.in>

|                              |                                                |
|------------------------------|------------------------------------------------|
| <b>Branch Name:</b>          | B.Sc. Chemistry                                |
| <b>Program Code:</b>         | SC103                                          |
| <b>Course Name:</b>          | Instrumentation Measurement and analysis       |
| <b>Course Code:</b>          | 12-SEC206-1C                                   |
| <b>Pre-requisite Course:</b> | Basics Physics up to 12 <sup>th</sup> Science. |

### Course Objectives:

- To know application of various measurement instruments.
- To understand the working of practical appliances.
- To be able to know use various appliances in physics practical.

### Teaching and Examination Scheme:

| Teaching Scheme (Hours per week) |                 |                  |        | Evaluation Scheme (Marks) |                          |                          |                          |                  |
|----------------------------------|-----------------|------------------|--------|---------------------------|--------------------------|--------------------------|--------------------------|------------------|
| Lecture<br>(L)                   | Tutorial<br>(T) | Practical<br>(P) | Credit | Theory (Marks)            |                          | Practical (Marks)        |                          | Total<br>(Marks) |
|                                  |                 |                  |        | University<br>Assessment  | Continuous<br>Assessment | University<br>Assessment | Continuous<br>Assessment |                  |
| 2                                | -               | -                | 2      | 25                        | 25                       | -                        | -                        | 50               |

### Subject Contents:

| Unit | Topic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Total<br>Hours | Weightage |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------|
| 1    | <b>Vernier Calipers:</b><br>Introduction, Theory, Figure, Description of the instrument, Detail study of Least count, Errors, Positive Error, Negative Error, Determination of Magnitude of Positive and Negative Errors.<br><b>Micrometer Screw:</b><br>Introduction, Theory, Figure, Description of the instrument, Definition of pitch and its Determination, study of least counts, Meaning of the Error and explanation of positive and negative Errors, Determination of positive and Negative Errors, Method of taking observation with the help of micrometer screw.<br><b>Spherometer:</b><br>Introduction, Theory, Figure, Description of the instrument, to determine the pitch of the screw, To Determine the Least count of the Spherometer, Zero Error, Derivation of Formula for the Radius of Curvature Of Curved Surface. | 15             | 50%       |
| 2    | <b>Wheastone Bridge:</b><br>Introduction, Theory with Figure, The Figure of Meter Bridge used in Laboratory, Construction of Meter Bridge.<br><b>Construction of Galvanometer:</b><br>Introduction, Theory, Sensitivity and Figure of merit of Galvanometer.<br><b>Ammeter, Voltmeter, and Ohmmeter:</b><br>Understanding the structure of the ammeter, voltmeter, and ohmmeter. Learning how to use those meters and using them to measure the current, voltage, and resistance of an electric circuit.                                                                                                                                                                                                                                                                                                                                   | 15             | 50%       |

### Text Books:

1. Experimental book for Physics.

### Reference Books:

1. Experimental book for Physics.

### List of Open Source Software/learning website:

1. [http://www.allaboutcircuits.com/vol\\_1/chpt\\_8/1.html](http://www.allaboutcircuits.com/vol_1/chpt_8/1.html)

**Course Learning Outcomes (CLO):** On completion of this course, the students will be able to:

| CLO  | Description                                                    | Bloom's Taxonomy Level |
|------|----------------------------------------------------------------|------------------------|
| CLO1 | Describe the instruments used in physics practicals.           | 1 Remembering          |
| CLO2 | Discuss the construction of various measuring devices.         | 2 Understanding        |
| CLO3 | Compare the Vernier calipers, Micrometer screw and Spherometer | 3 Applying             |
| CLO4 | Explain the various measuring devices.                         | 4 Analyzing            |
| CLO5 | Discuss the working of various measuring devices.              | 2 Understanding        |
| CLO6 | Usage of the various meters in laboratory.                     | 3 Applying             |

### Mapping of CLOs with POs & PSOs

| Course Learning Outcomes | Programme Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | Programme Specific Outcome (PSOs) |      |
|--------------------------|--------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|-----------------------------------|------|
|                          | 1                        | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | PSO1                              | PSO2 |
| CLO1                     | 2                        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | 2                                 | 2    |
| CLO2                     |                          |   | 2 |   |   |   |   |   |   |    |    |    |    |    |    |    |                                   |      |
| CLO3                     |                          |   | 3 |   |   |   |   |   |   |    |    |    |    |    |    |    |                                   |      |
| CLO4                     | 1                        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | 2                                 | 2    |
| CLO5                     |                          |   |   |   | 2 |   |   |   |   |    |    |    |    |    |    |    | 1                                 | 1    |
| CLO6                     |                          |   |   |   | 1 |   |   |   |   |    |    |    |    |    |    |    | 3                                 | 3    |

**3: High, 2: Medium, 1: Low**

|                              |                                             |
|------------------------------|---------------------------------------------|
| <b>Branch Name:</b>          | B.Sc.Chemistry                              |
| <b>Program Code:</b>         | SC103                                       |
| <b>Course Title:</b>         | Chemistry of Cosmetics and Hygiene Products |
| <b>Course Code:</b>          | 12-SEC207-1C                                |
| <b>Pre-requisite Course:</b> | -                                           |

**Course Objectives:**

- The capacity to job effectively and safely in a laboratory environment.
- Opportunities for student and faculty to interact with alumni and with professional chemists.
- To develop the fundamental analytical and industrial skills to work effectively in the different fields of chemistry.
- To develop idea for the new way of green synthesis.

**Teaching and Examination Scheme:**

| Teaching Scheme (Hours per week) |              |               |        | Evaluation Scheme (Marks) |                       |                       |                       |               |
|----------------------------------|--------------|---------------|--------|---------------------------|-----------------------|-----------------------|-----------------------|---------------|
| Lecture (L)                      | Tutorial (T) | Practical (P) | Credit | Theory (Marks)            |                       | Practical (Marks)     |                       | Total (Marks) |
|                                  |              |               |        | University Assessment     | Continuous Assessment | University Assessment | Continuous Assessment |               |
| 2                                | -            | -             | 2      | 25                        | 25                    | -                     | -                     | 50            |

**Course Contents:**

| Unit | Topic                                                                                                                                                                                                                                                       | Total Hours | Weightage |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|
| 1    | <b>Introduction of cosmetics &amp; Hygiene products</b><br>Introduction, requirements/function and characteristics of the following products: Shampoo, Anti-sunburn lotion, Face-powders, Lipsticks, Talcum powder, Cold-creams, Hair dyes, .Essential oils | 15          | 50%       |
| 2    | <b>Chemistry of cosmetics</b><br>Chemical synthesis of : Shampoo, Anti-sunburn lotion, Face-powders, Lipsticks, Talcum powder, Cold-creams, Hair dyes.                                                                                                      | 15          | 50%       |

**Reference Books:**

1. Pharmaceutics and cosmetics by Gupta-Gupta (A Pragati Edition)
2. Text book of cosmetics Garud-Sharma-Garud (A Pragati Edition)

**List of Open-Source Software/learning website:**

1. <http://www.chemistryexplained.com/Co-Di/Cosmetic-Chemistry.html>
2. <https://www.slideshare.net/tanujanauiyal/cosmetics-chemistry-by-dr-tanuja-nauiyal>
3. <https://www.tutorialsduniya.com/notes/chemistry-of-cosmetics-perfumes-notes/>

**Course Learning Outcomes (CLO): On completion of this course, the students will be able to:**

| CLO  | Description                                            | Bloom's Taxonomy Level       |
|------|--------------------------------------------------------|------------------------------|
| CLO1 | Introduction and importance of cosmetics.              | 2 Understanding              |
| CLO2 | Requirements and uses of cosmetics and essential oils. | 2 Understanding              |
| CLO3 | Industrial synthesis of cosmetics.                     | 3Applying<br>2 understanding |

**Mapping of CLO with PO and PSO**

| Course Learning Outcomes | Program Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    |    |    | PSOs |      |
|--------------------------|------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|------|------|
|                          | 1                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | PSO1 | PSO2 |
| CLO1                     | 1                      |   |   |   | 2 |   |   |   |   |    |    |    |    |    | 2    | 1    |
| CLO2                     |                        |   | 2 |   |   |   |   |   |   |    | 1  |    |    |    | 2    |      |
| CLO3                     | 2                      |   |   |   |   |   | 1 |   |   |    |    |    |    |    | 3    | 2    |

3:High, 2:Medium, 1:Low

|                              |                                                      |
|------------------------------|------------------------------------------------------|
| <b>Branch Name:</b>          | B.Sc. Chemistry                                      |
| <b>Program Code:</b>         | SC103                                                |
| <b>Course Name:</b>          | Biocomputing                                         |
| <b>Course Code:</b>          | 12-SEC208-1C                                         |
| <b>Pre-requisite Course:</b> | Basics Biotechnology up to 12 <sup>th</sup> Science. |

### Course Objectives:

- To understand basics of computer and roll of computer in scientific educations well as in daily life.
- To understand applications of computer in learning like ICT, report writing and research writing.
- To understand the components of computer to enhance students' knowledge and interest to deal with many aspects of computer related finding job.

### Teaching and Examination Scheme:

| Teaching Scheme (Hours per week) |              |               |        | Evaluation Scheme (Marks) |                       |                       |                       |               |
|----------------------------------|--------------|---------------|--------|---------------------------|-----------------------|-----------------------|-----------------------|---------------|
| Lecture (L)                      | Tutorial (T) | Practical (P) | Credit | Theory (Marks)            |                       | Practical (Marks)     |                       | Total (Marks) |
|                                  |              |               |        | University Assessment     | Continuous Assessment | University Assessment | Continuous Assessment |               |
| 2                                | -            | -             | 2      | 25                        | 25                    | -                     | -                     | 50            |

### Subject Contents:

| Unit | Topic                                                                                                                                                                                                                                                                                                                                   | Total Hours | Weightage |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|
| 1    | <b>History, development and types of computers:</b> General awareness of computer systems – hardware and software (CPU and other peripheral devices, computer arithmetic, computer logic<br>Programming languages – machine language, assembly language, higher level languages<br>graphics, statistical packages – MINITAB, MATLAB etc | 15          | 50%       |
| 2    | <ul style="list-style-type: none"> <li>✓ Concepts of internet.</li> <li>✓ Applications of internet in society</li> <li>✓ Concept of HTML, HTTP, URL, Domain, Search engine</li> <li>✓ Computer and Internet in Biotechnology</li> </ul>                                                                                                 | 15          | 50%       |

### Reference Books:

1. Computers Today: D. H. Sanders
2. Developing Bioinformatics Computer Skills C. Gibas and P. Jamback.

### List of Open Source Software/learning website:

<https://en.wikipedia.org/wiki/Biocomputing>  
<https://medium.com/lansaar/what-is-biocomputing-82671bb381bd>  
<https://sofiabio.medium.com/biocomputing-in-a-nutshell-d27bc9a4827c>

**Course Learning Outcomes (CLO):** On completion of this course, the students will be able to:

| CLO  | Description                                                                                                                  | Bloom's Taxonomy Level     |
|------|------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| CLO1 | <b>Discuss</b> history of computer.                                                                                          | 2 Understanding            |
| CLO2 | <b>Describe</b> and <b>compare</b> hardware components and software components of computer.                                  | 1 Remembering<br>4 Analyze |
| CLO3 | <b>Categorize</b> and <b>Illustrate</b> internet concept, its components.                                                    | 3 Applying<br>4 Analyze    |
| CLO4 | <b>Use</b> basic knowledge of computer and utilize it in improving education.                                                | 3 Applying,                |
| CLO5 | <b>Evaluate</b> available programming languages and statistical softwares and create new softwares for statistical analysis. | 5 Evaluate,<br>6 Creating  |
| CLO6 | <b>Design</b> softwares, which can help in understanding structure of biomolecules.                                          | 6 Creating                 |

### Mapping of CLOs with POs & PSOs

| Course Learning Outcomes | Programme Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | Programme Specific Outcome (PSOs) |      |
|--------------------------|--------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|-----------------------------------|------|
|                          | 1                        | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | PSO1                              | PSO2 |
| CLO1                     |                          |   |   |   |   |   |   |   |   | 3  |    |    |    |    | 1  |    | 1                                 | 2    |
| CLO2                     | 2                        | 2 | 1 |   | 1 | 2 |   |   |   | 3  |    |    |    |    | 1  |    |                                   |      |
| CLO3                     |                          | 1 | 1 |   | 1 | 2 |   |   | 2 | 3  |    |    |    |    | 2  |    | 1                                 |      |
| CLO4                     | 3                        | 3 | 3 |   | 1 | 3 |   |   | 2 | 3  |    |    |    |    | 3  |    |                                   |      |
| CLO5                     | 3                        | 3 | 3 |   | 2 | 3 |   |   | 3 | 3  |    |    |    |    | 3  |    |                                   | 1    |
| CLO6                     | 3                        | 3 | 3 |   | 2 | 3 |   |   | 3 | 3  |    |    |    |    | 3  |    |                                   |      |

3: High, 2: Medium, 1: Low

|                              |                                         |
|------------------------------|-----------------------------------------|
| <b>Branch Name:</b>          | B.Sc. Chemistry                         |
| <b>Program Code:</b>         | SC103                                   |
| <b>Course Name:</b>          | Business Mathematics-II                 |
| <b>Course Code:</b>          | 12-SEC209-1C                            |
| <b>Pre-requisite Course:</b> | Basic maths of 12 <sup>th</sup> Science |

**Course Objectives:**

- To understand co-ordinate points, Intersection of two lines, equation of straight line.
- To understand basic concept of center of gravity.
- To understand basic concept of slope.

**Teaching and Examination Scheme:**

| Teaching Scheme (Hours per week) |              |               |        | Evaluation Scheme (Marks) |                       |                       |                       |               |
|----------------------------------|--------------|---------------|--------|---------------------------|-----------------------|-----------------------|-----------------------|---------------|
| Lecture (L)                      | Tutorial (T) | Practical (P) | Credit | Theory (Marks)            |                       | Practical (Marks)     |                       | Total (Marks) |
|                                  |              |               |        | University Assessment     | Continuous Assessment | University Assessment | Continuous Assessment |               |
| 2                                | -            | -             | 2      | 25                        | 25                    | -                     | -                     | 50            |

**Subject Contents:**

| Unit                                                    | Topic                                                                                                                                                                                                                                     | Total Hours  | Weightage              |                                                         |                                 |  |  |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------------|---------------------------------------------------------|---------------------------------|--|--|
| 1                                                       | Centre of Gravity, Moment of Inertia:<br>Centre of Gravity, Centre of gravity of a continuous distribution of matter.<br>Moment of Inertia.                                                                                               | 15           | 50%                    |                                                         |                                 |  |  |
| 2                                                       | Co-ordinateGeometry:<br>Co-ordinate of a point, slope and intercepts of a line joining two points,<br>equation of a straight line, Derive the different forms of equation of a straight<br>line.                                          | 15           | 50%                    |                                                         |                                 |  |  |
|                                                         | <table><tr><td><math>y = mx + c</math></td><td><math>y - y_1 = m(x - x_1)</math></td></tr><tr><td><math>\frac{y - y_1}{y_1 - y_2} = \frac{x - x_1}{x_1 - x_2}</math></td><td><math>\frac{x}{a} + \frac{y}{b} = 1</math></td></tr></table> | $y = mx + c$ | $y - y_1 = m(x - x_1)$ | $\frac{y - y_1}{y_1 - y_2} = \frac{x - x_1}{x_1 - x_2}$ | $\frac{x}{a} + \frac{y}{b} = 1$ |  |  |
| $y = mx + c$                                            | $y - y_1 = m(x - x_1)$                                                                                                                                                                                                                    |              |                        |                                                         |                                 |  |  |
| $\frac{y - y_1}{y_1 - y_2} = \frac{x - x_1}{x_1 - x_2}$ | $\frac{x}{a} + \frac{y}{b} = 1$                                                                                                                                                                                                           |              |                        |                                                         |                                 |  |  |

**Text Books:**

1. HSC, Gujarat State Board.

**Reference Books:**

1. Integral Calculus, Shanti Narayan, Dr.P.K.Mittal, S.Chand

**List of Open Source Software/learning website:**

1. <https://www.youtube.com/watch?v=nV3QffaUs4E&list=PLDN15nk5uLiAJn1kT4QtkOexxs3TC9hD>
2. <https://www.youtube.com/watch?v=YeJXJ9GcNsI>
3. <https://www.youtube.com/watch?v=NrKTfWghvI0>

**Course Learning Outcomes (CLO):** On completion of this course, the students will be able to:

| CLO  | Description                                                              | Bloom's Taxonomy Level |
|------|--------------------------------------------------------------------------|------------------------|
| CLO1 | <b>Describe</b> Centre of Gravity.                                       | 1 Remembering          |
| CLO2 | <b>Explain</b> Moment of Inertia.                                        | 4 Analyzing            |
| CLO3 | <b>Illustrates</b> slope of line.                                        | 3 Applying             |
| CLO4 | <b>Describe</b> equation of a straight line.                             | 1 Remembering          |
| CLO5 | <b>Discuss</b> Centre of gravity of a continuous distribution of matter. | 2 Understanding        |

**Mapping of CLOs with POs & PSOs:**

| Course Learning Outcomes | Programme Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | Programme Specific Outcome (PSOs) |      |
|--------------------------|--------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|-----------------------------------|------|
|                          | 1                        | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | PSO1                              | PSO2 |
| CLO1                     | 1                        | 1 |   | 1 | 1 |   |   |   | 2 |    |    |    |    |    |    |    | 1                                 |      |
| CLO2                     |                          | 1 |   |   | 1 |   |   |   | 1 |    |    |    |    |    |    |    |                                   |      |
| CLO3                     | 1                        | 1 |   | 1 |   |   | 1 |   |   | 1  |    |    |    |    |    |    |                                   | 1    |
| CLO4                     |                          | 1 |   | 1 | 1 |   | 1 |   | 2 |    |    |    |    |    |    |    |                                   |      |
| CLO5                     | 1                        |   |   | 2 | 1 |   |   |   | 2 |    |    |    |    |    |    |    | 1                                 |      |

3: High, 2: Medium, 1: Low