**Department of Electronics and Communication Engineering**
**Bhagat Phool Singh Mahila Vishwavidyalaya,**
**Khanpur Kalan (Sonepat), Haryana-131305**
**(A state university established by govt. of Haryana vides Act no. 31 of 2006)**
**www.bpswomenuniversity.ac.in**

| Course Structure for B. Tech First Semester (First Year) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **S. No** | **Cat** | **Course Code** | **Course Title** | **Hrs/Week** | | | **Total Credits** | **Internal Marks** | **External Marks** | **Total Marks** |
| | | | | **L** | **T** | **P** | | | | |
| **Subjects** | | | | | | | | | | |
| 1. | BSC | BSC-102 | Chemistry – I | 3 | 1 | 0 | 4 | 20 | 80 | 100 |
| 2. | BSC | BSC-103 | Mathematics–I (Calculus and Linear Algebra) | 3 | 1 | 0 | 4 | 20 | 80 | 100 |
| 3. | ESC | ESC-103 | Programming For Problem Solving | 3 | 0 | 0 | 3 | 20 | 80 | 100 |
| 4. | HSMC | HSMC-101 | English | 2 | 0 | 0 | 2 | 10 | 40 | 50 |
| **Labs** | | | | | | | | | | |
| 5. | HSMC | HSMC-101-P | English Language Lab | 0 | 0 | 2 | 1 | 10 | 40 | 50 |
| 6. | ESC | ESC-104-P | Workshop/ Manufacture Practices | 1 | 0 | 4 | 3 | 20 | 80 | 100 |
| 7. | ESC | ESC-103-P | Programming For Problem Solving Lab | 0 | 0 | 4 | 2 | 10 | 40 | 50 |
| 8. | BSC | BSC-102-P | Chemistry Lab | 0 | 0 | 2 | 1 | 10 | 40 | 50 |
| 9 | MC | MC-101 | Induction program | 3 Weeks | | | 0 | 0 | 0 | 0 |
| **Total** | | | | **12** | **2** | **12** | **20** | **120** | **480** | **600** |

**Note:**

1. Every student has to participate in the **MANDATORY INDUCTION PROGRAM OF ONE/THREE WEEK DURATION** at the start of regular teaching of first semester. It comprises physical activity, creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Deptt. Branch & Innovations. Classes for I$^{st}$ semester will commence after completion of **Induction Program**.
2. Minimum passing marks for any subject (Paper) shall be 40% in the external examination and 40% in the aggregate of internal and external examination of the subject.
3. The students may use scientific calculator in the examination.

## Chemistry- I

**BSC-102** **Total Credits: 4**
**L T P** **Internal Marks: 20**
**3 1 0** **External Marks: 80**
**Total Marks: 100**

**Course Objective:**

- To impart technological aspects of applied chemistry
- To lay foundation of practical application of chemistry in engineering aspects
- To apply basic chemistry concepts to chemical process industries
- Student will able to understand the new developments, research and breakthrough efficiency in engineering chemistry
- To understand and explain scientifically the various chemistry related problems in industry and engineering field.

**Pre-requisites (if any):** Basics of Periodic properties, thermodynamics, concept of bonding theories, different types of general organic reactions.

**Course Outcomes:**

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- List major chemical reactions that are used in the synthesis of molecules.
- Understanding the Schrödinger equation for 1-D box as well as hydrogen atom & its application
- Understanding the bonding in tetrahedral and octahedral complexes and their energy diagram
- Detailed discussion of electrochemistry and cell corrosion
- Understanding the stereochemistry of organic molecules

**Content**

| **UNIT- I** | **12 Hours** |
|---|---|
| **Atomic and molecular structure**: Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition | |

| | |
|---|---|
| metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures | |
| **UNIT- II** | **8 Hours** |
| **Spectroscopic techniques and applications:** Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.<br>**Intermolecular forces and potential energy surfaces:** Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces | |
| **UNIT- III** | **10 Hours** |
| **Use of free energy in chemical equilibria:** Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.<br>**Periodic properties:** Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries | |
| **UNIT- IV** | **16 Hours** |
| **Stereochemistry:** Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds<br>**Organic reactions and synthesis of a drug molecule:** Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule. | |
| **Suggested Text Books** | |
| 1. | University chemistry, by B. H. Mahan, Pearson Publication |
| 2. | Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane, McGraw-Hill |
| 3. | Fundamentals of Molecular Spectroscopy, by C. N. Banwell, McGraw-Hill |
| 4. | Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan, |
| 5. | Physical Chemistry by P. W. Atkins, W. H. Freeman and Company |

**Note:** Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

## Mathematics- I: (Calculus and Linear Algebra)

**BSC -103** **Total Credits: 4**
**L T P** **Internal Marks: 20**
**3 1 0** **External Marks: 80**
**Total Marks: 100**

**Course Objective:** The objective of this course is:

- To give adequate exposure of basics of Engineering Mathematics so as to enable them to visualize engineering problems by using Mathematical tools and to support their subsequent engineering studies.
- To familiarize the students with techniques in basic calculus and linear algebra.
- To equip the students with standard concepts and tools at an intermediate to advanced level.
- To know the advanced level of mathematics and applications that they would find useful in their disciplines.
- Students will demonstrate the ability to apply the techniques of multivariable Calculus to problems in mathematics, the physical sciences, and engineering.

**Pre-requisites (if any):** Integration, differentiation, Matrices, Algebraic structure

**Course Outcomes:** The students will learn:

- To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from various applications, they will have a basic understanding of Beta and Gamma functions.
- The essential tools of matrices and linear algebra including linear transformations, eigenvalues, diagonalization and orthogonalization.

**Contents**

| **UNIT- I** | **12 Hours** |
|---|---|
| **Calculus:** Evolutes and involutes, Evaluation of definite and improper integrals, Beta and Gamma functions and their properties, Applications of definite integrals to evaluate surface areas and volumes of revolutions.<br>**Calculus:** Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule, Maxima and minima. | |
| **UNIT-II** | **10 Hours** |
| **Matrices:** Matrices, vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination. | |
| **UNIT- III** | **10 Hours** |
| **Vector spaces:** Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank nullity theorem, composition of linear maps, Matrix associated with a linear map. | |
| **UNIT- IV** | **10 Hours** |
| **Vector spaces:** Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigenbases. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization. | |
| **Suggested Text/Reference Books** | |
| 1. | G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002. |
| 2. | Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, |

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|---|---|
| | 2006. |
| 3. | D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005. |
| 4. | Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008. |
| 5. | Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010. |
| 6. | N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010. |
| 7. | B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000. |
| 8. | V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005. |


**Note:** Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

# Programming for Problem Solving

**ESC-103** **Total Credits: 3**
**L T P** **Internal Marks: 20**
**3 0 0** **External Marks: 80**
**Total Marks: 100**

**Course Objective:** The objective of this course is:

- To provide basic understanding of computer including history, various operating systems, number system, various languages developed etc.
- To impart adequate knowledge on the need and concept of algorithms and programming.
- Develop, execute and document computerized solution for various problems using the features of C language.
- To enable effective usage of arrays, structures, functions, pointers and to implement the concepts of file organization.

**Pre-requisite:** Basics of computers, algorithms and flowcharts.

**Course Outcome:** After studying this course students will be able to:

- Explain the basic architecture of computers and various programming language to solve various engineering problem.
- Apply problem solving skills in programming.
- Developing logical thinking using C programming.
- Develop and run computer programs in C language.

**Contents**

| **UNIT-I** | **12 Hours** |
|---|---|
| **Basic of Computer architecture and programming**: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.). Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code- Arithmetic expressions and precedence. | |
| **UNIT-II** | **10 Hours** |
| **Basic of C Programming**: Concept of variables, program statements and function calls from the library (printf for example), C data types: int, char, float etc., C expressions, arithmetic operation, relational and logic operators, C assignment statements, extension of assignment of the operations. C primitive input output using get char and put char, exposure to scanf and printf functions, C Statements, conditional executing using if, else , switch case, goto and break statements. | |
| **UNIT-III** | **12 Hours** |
| **Conditional Branching and Loops**: Concept of loops in C using for, while and do-while, Writing and evaluation of conditionals and consequent branching Iteration and loops Arrays Arrays (1-D, 2-D), Character arrays and Strings, example of iterative programs using arrays and use in matrix computations. Functions, parameters and return values, standard library functions, Basic Algorithms Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection). | |

| UNIT-IV | 12 Hours |
|---|---|
| **Pointers, Strings and Structure**: Pointers, relationship between arrays and pointers, Call by reference. Array of pointers, passing arrays as arguments. Character strings: processing strings using loops, and string library functions, Structures, Defining structures and Array of Structures. | |
| **Text/ Reference Books** | |
| 1. | Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India |
| 2. | Let Us C, 13th Edition, Yashavant Kanetkar, BPB Publications, ISBN:978-8183331630, 2013. |
| 3. | Fundamentals of Computers, 6th Edition, V Rajaraman, PHI Learning, 2014 |
| 4. | Programming in ANSI C, 6th Edition, McGraw Hill Education (India) Private Limited E Balagurusamy, ISBN: 978-1259004612, 2012**.** |
| 5. | Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill |

**Note:** Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

## English

**HSMC -101** **Total Credits: 2**
**L T P** **Internal Marks: 10**
**2 0 0** **External Marks: 40**
**Total Marks: 50**

**Course Objective:** The aim of this course is:

- To equip students with English Language skills needed in academic and professional world
- To make students technically proficient in handling language skills required for competitive exams.
- To inculcate human/ethical values in the students to ensure their holistic development
- To develop ability to critically read the literary texts

**Pre-requisites (if any):** None

**Course Outcomes:**

- The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

**Contents**

| **UNIT-I** | **10 Hours** |
|---|---|
| **Vocabulary Building:** The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations.<br>**Basic Writing Skills:** Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely | |
| **UNIT-II** | **10 Hours** |
| **Identifying Common Errors in Writing:** Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés | |
| **UNIT-III** | **10 Hours** |
| **Nature and Style of sensible Writing:** Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion | |
| **UNIT- IV** | **10 Hours** |
| **Writing Practices:** Comprehension, Précis Writing, Essay Writing<br>**Oral Communication:** (This unit involves interactive practice sessions in Language Lab)<br>• Listening Comprehension<br>• Pronunciation, Intonation, Stress and Rhythm<br>• Common Everyday Situations: Conversations and Dialogues<br>• Communication at Workplace<br>• Interviews<br>• Formal Presentations | |

**Suggested Text/Reference Books:**


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|---|---|
| 1. | Practical English Usage. Michael Swan. OUP. 1995, oxford |
| 2. | Remedial English Grammar. F.T. Wood. Macmillan.2007, TRINITY publication |
| 3. | On Writing Well. William Zinsser. Harper Resource Book. 2001, HarperCollins |
| 4. | Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006, |

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|---|---|
| 5. | Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011. |
| 6. | Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press Practical English Usage. Michael Swan. OUP. 1995. |

**Note:** Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

## English Language Lab

**HSMC -101-P** **Total Credits: 1**
**L T P** **Internal Marks: 10**
**0 0 2** **External Marks: 40**
**Total Marks: 50**

**Course Objective:** The objective of this course is:

- To develop English language skills especially speaking and listening of the students.
- To make the students excel in their professional lives through proficiency in communication.
- To enhance the students linguistic and communicative competence.
- To enable them to face the challenges of professional and social life.

**Pre-requisites (if any):** None

**Course Outcomes:** The students will be able to:

- Acquire basic proficiency in Spoken English.
- Enhance their listening skills with listening comprehension exercises.
- Polish their speaking skills in English both at social and professional platforms.
- Present themselves confidently and meaningfully in professional and social circles.

**Content**

**Oral Communication**

Interactive practice sessions in Language Lab

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations

## Workshop / Manufacturing Practices

**ESC -104-P** **Total Credits: 3**
**L T P** **Internal Marks: 20**
**1 0 4** **External Marks: 80**
**Total Marks: 100**

**Course Objective:** The aim of this course is:

- To prepare the students to gain knowledge of the different manufacturing process which are commonly employed in the industry, to fabricate components using different materials.

**Pre-requisites (if any):** None

**Course Outcomes:** Upon completion of this course, the students will enable:

- To decide about the appropriate methods and tool for manufacturing a given product/job which gives the desired dimensional accuracies and dimensional tolerances.
- Fabricate components with their own hands safely while working with different machine tools and hand tools.
- By assembling different components, they will be able to produce small devices of their interest.

**Content**

| **Lectures** | **10 Hours** |
|---|---|
| • Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing Methods<br>• CNC machining, Additive manufacturing<br>• Fitting operations & power tools<br>• Electrical &Electronics<br>• Carpentry<br>• Plastic moulding, glass cutting<br>• Metal casting<br>• Welding (arc welding & gas welding), brazing | |
| **Workshop Practice** | **48 Hours** |
| • Machine shop (10 hours)<br>• Fitting shop (8 hours)<br>• Carpentry (6 hours)<br>• Electrical & Electronics (8 hours)<br>• Welding shop (8 hours (Arc welding 4 hrs + gas welding 4 hrs)<br>• Casting (8 hours)<br>• Smithy (6 hours)<br>• Plastic moulding& Glass Cutting (6 hours) | |
| **Suggested Text/Reference Books:** | |
| 1. | Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai. |
| 2. | Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002. |
| 3. | Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson |

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|---|---|
| | Education, 2008. |
| 4. | Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998. |
| 5. | Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017. |

## Programming for Problem Solving Lab

**ESC-103-P** **Total Credits: 2**
**L T P** **Internal Marks: 10**
**0 0 4** **External Marks: 40**
**Total Marks: 50**

**Course Objective:**

- To impart adequate knowledge on the need and concept of algorithms and programming.
- To make the student learn a programming language.
- To learn problem solving techniques.
- To teach the student to write programs in C and to solve the problems.
- Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.

**Pre-requisite:** Basics of computers, algorithms and flowcharts.

**Course Outcome:** After studying this course students will be able to:

- Read, understand and trace the execution of programs written in C language.
- Write the C code for a given algorithm.
- Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
- Write programs that perform operations using derived data types

**List of Experiments**

| | |
|---|---|
| 1. | Write and implement basic arithmetic operations using C– sum, average, product, difference, quotient and remainder of given numbers etc. |
| 2. | Develop a C Program to find the roots of quadratic equation for non-zero coefficient using if-else ladder construct |
| 3. | Write a Program to convert temperature. (Fahrenheit –Centigrade and vice-versa). |
| 4. | Write a program to check whether given number is palindrome or not |
| 5. | Write a program to print the following formats.<br>1 *<br>1 2 * *<br>1 2 3 * * *<br>1 2 3 4 * * * * |
| 6. | Write a program to search the given element by using linear search. |
| 7. | Write a program to sort the given elements using bubble sort technique. |
| 8. | Write a program to verify the given string is palindrome or not (without built-in functions, with using built-in functions) |
| 9. | Write a program to find total marks of individual student and average marks for 10 students using structures |

**Note:** At least 10 experiments are to be performed by students in the semester. Out of which at least seven experiments should be performed from the above list, remaining three experiments may either be performed from the above list or designed and set by the concerned faculty as per the scope of the syllabus.

## Chemistry Lab

**BSC -102 –P** **Total Credits: 1**
**L T P** **Internal Marks: 10**
**0 0 2** **External Marks: 40**
**Total Marks: 50**

**Course Objective:**

- To acquire practical knowledge in conductometry
- To develop the skill in water analysis
- Understand the different types of Chromatography
- To understand the principle and its various applications of adsorption, surface tension & viscosity
- Carry out synthesis of organic compounds

**Pre-requisites (if any):** Basics of chemistry.

**Course Outcomes:** The students will learn to:

- Estimate rate constants of reactions from concentration of reactants/products as a function of time.
- Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.
- Synthesize a small drug molecule and analyse a salt sample.

**List of Experiments**

| | |
|---|---|
| 1. | Determination of surface tension and viscosity |
| 2. | Thin layer chromatography |
| 3. | Ion exchange column for removal of hardness of water |
| 4. | Determination of chloride content of water |
| 5. | Colligative properties using freezing point depression |
| 6. | Determination of the rate constant of a reaction |
| 7. | Determination of cell constant and conductance of solutions |
| 8. | Potentiometry– determination of redox potentials and emfs |
| 9. | Synthesis of a polymer/drug |
| 10. | Saponification/acid value of an oil |
| 11. | Chemical analysis of a salt |
| 12. | Lattice structures and packing of spheres |
| 13. | Models of potential energy surfaces |
| 14. | Chemical oscillations- Iodine clock reaction |
| 15. | Determination of the partition coefficient of a substance between two immiscible liquids |
| 16. | Adsorption of acetic acid by charcoal |
| 17. | Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg . |
| **Suggested Text/ Reference Books** | |
| 1. | A Text book on Experiments and Calculation –Engineering Chemistry by S.S.Dara, S.Chand & Company Ltd. |
| 2. | Essential of Experimental Engineering chemistry, Shashi Chawla, Dhanpat Rai |

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|---|---|
| | Publishing Co. |
| 3. | Theory & Practice Applied Chemistry – O.P.Virmani, A.K. Narula, New Age International Private Limited |

**Note:** At least 10 experiments are to be performed by students in the semester. Out of which at least seven experiments should be performed from the above list, remaining three experiments may either be performed from the above list or designed and set by the concerned faculty as per the scope of the syllabus.