

# CURRICULUM

For

---

UNDERGRADUATE DEGREE COURSE IN

**BASIC SCIENCES**

**B.Sc. (PCM)**

(First Year)

---

**[Proposed from 2018-19]**



IIMT UNIVERSITY  
MEERUT

**IIMT University, Meerut**

**B.Sc. (PCM)**  
**FIRST YEAR, SEMESTER-I**

**STUDY & EVALUATION SCHEME**

S. No.	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BSM-101	Calculus	4	1	-	4	30	70	100
2	BSP-101	Optics	4	1	-	4	30	70	100
3	BSC-101	Inorganic chemistry - I	4	1	-	4	30	70	100
4	SEC-101	Fundamentals of computers	3	-	-	3	25	50	75
5	FC-111	Functional & Communicative English-I	3	-	-	3	30	70	100
6	BSP-111P	Basic Physics Lab	-	-	2	2	25	50	75
7	BSC-111P	Chemistry Lab -I	-	-	2	2	25	50	75
8	SEC-111P	Computer Lab-I	-	-	2	2	25	50	75
9	ECC-111/112/113/114	Skill Enhancement Course			2	4	-	100	100
		<b>Total</b>	<b>18</b>	<b>3</b>	<b>6</b>	<b>28</b>	<b>220</b>	<b>580</b>	<b>800</b>

**FIRST YEAR, SEMESTER-II**  
**STUDY & EVALUATION SCHEME**

S. No.	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BSM-201	Differential Equations and Integral Transform	4	1	-	4	30	70	100
2	BSP-201	Quantum Mechanics and Laser	4	1	-	4	30	70	100
3	BSC-201	Organic chemistry - I	4	1	-	4	30	70	100
4	SEC-201	Fundamentals of computers-II	3	-	-	3	25	50	75
5	AEC-202	Environmental Science	3	-	-	3	25	50	75
6	FC-211	Functional & Communicative English-II	3	1	-	3	30	70	100
7	BSP-222	Physics Lab- II	-	-	2	2	25	50	75
8	BSC-222	Chemistry Lab -II	-	-	2	2	25	50	75
9	SEC-222	Computer Lab-II	-	-	2	2	25	50	75
10	ECC-211/212/213/214	Skill Enhancement Course			2	4	100		100
		<b>Total</b>	<b>21</b>	<b>4</b>	<b>8</b>	<b>28</b>	<b>345</b>	<b>530</b>	<b>875</b>



## SEMESTER-I

[L= Lecture, T = Tutorials, P = Practicals & C = Credits]

<b>BSM-101</b>	<b>CALCULUS</b>	<b>4L:1T:0P</b>	<b>4 Credits</b>
----------------	-----------------	-----------------	------------------

### UNIT I (L-8)

$\epsilon - \delta$  definition of the limit of a function, Continuous functions and classification of discontinuities, Differentiability, Chain rule of differentiability, Rolle's theorem, First and second mean value theorems, Taylor's theorems with Lagrange's and Cauchy's forms of remainder,

### UNIT II (L-8)

Successive differentiation and Leibnitz's theorem, Partial differentiation, Euler's theorem, Change of variables. Jacobians, Approximation of errors.

### UNIT III (L-8)

Expansion of functions (in Taylor's and Maclaurin's series), indeterminate forms, Maxima and Minima (for functions of two variables), Tangents and Normals (polar form only),

### UNIT IV (L-8)

Curvature, Envelopes and evolutes, Asymptotes, Tests for concavity and convexity, Points of inflexion, multiple points, Tracing of curves in Cartesian and polar co-ordinates

### UNIT V (L-8)

Reduction formulae, Rectification, Volumes and surfaces of solids of revolution, theorem, Double and triple integrals, Change of order of integration, Beta and Gamma functions, Dirichlet's and Liouville's integral formulae.

#### Course Outcome:

After completing the course, students should be able to understand:

1. Basics of limit and continuity of a function.
2. Basics of differentiability and its properties.
3. Applications of Differential in different Aspects.
4. Double and triple integrations and related functions.

#### Books Recommended

1. *H. Anton, I. Bivens and S. Davis, Calculus, John Wiley and Sons, Inc., 2011.*
2. *G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007.*

---

<b>BSP-101</b>	<b>Optics</b>	<b>4L:1T:0P</b>	<b>4 Credits</b>
----------------	---------------	-----------------	------------------

**UNIT I (L-8)**

Geometrical Optics: Cardinal Points of a Coaxial Optical System, general relationship, thick lens, combination of two thin lenses, nodal slide and Newton's formula, Huygen's and Ramsden's eyepieces. Aberration in images: Chromatic aberration, achromatic combination of lenses in contact and separated lenses, Monochromatic aberration and their reduction.

**UNIT II (L-8)**

Wave Optics: Theories of Light, Electromagnetic Nature of Light Definition of a Wave Front, Propagation of a Wave Front, Huygens Principle of Secondary Wavelets.

Interference: Division of Amplitude and Division of Wave front, Young's Double Slit Experiment, Lloyd's Mirror and Fresnel's Biprism, Phase Change on Reflection: Stoke's treatment, Interference in Thin Films: Parallel and Wedge-shaped Films, Newton's Rings: Measurement of Wavelength and Refractive Index.

**UNIT III (L-8)**

Michelson's Interferometer: (1) Idea of form of fringes (No Theory required), (2) Determination of Wavelength, (3) Wavelength Difference, (4) Refractive Index of thin transparent film, (5) Standardization of Meter and (6) Visibility of Fringes, Intensity distribution in multiple beam interference Fabry – Perot.

**UNIT IV (L-8)**

Fresnel diffraction: Fresnel diffraction, intensity due to cylindrical wavefront by Fresnel half period zones method, Zone plate, straight edge, rectilinear propagation.

Fraunhofer diffraction: Diffraction at a slit, the intensity distribution, Rayleigh criterion, resolving power of telescope and microscopic systems.

**UNIT V (L-8)**

Diffraction gratings: Diffraction at N parallel slits intensity distribution, plane diffraction grating, reflection grating, blazed gratings, Concave grating and different mountings, Resolving power of a grating and comparison with resolving powers of prism.

### **Books Recommended**

1. *Fundamentals of Optics* by Francis Arthur Jenkins & Harvey Elliott White (McGraw-Hill, 76).
2. *Optics* by Ajoy Ghatak (Tata McGraw Hill, 2008).
3. *Optics* by Eugene Hecht and A R Ganesan (Pearson Education, 2002).
4. *Light and Optics: Principles and Practices* by Abdul Al-Azzawi (CRC Press, 2007).
5. *Contemporary Optics* by A. K. Ghatak & K. Thyagarajan.(Plenum Press,1978).
6. *Introduction to Optics* by Khanna and Gulati.

<b>BSC-101</b>	<b>INORGANIC CHEMISTRY – I</b>	<b>4L:1T:0P</b>	<b>4 Credits</b>
----------------	--------------------------------	-----------------	------------------

**UNIT I (L-8)****Atomic Structure**

Dual nature of matter and idea of de Broglie matter waves, de Broglie equation; Wave mechanical model, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of  $\psi$  and  $\psi^2$ , quantum numbers, shapes of s, p, d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements.

**UNIT II (L-8)****Periodic Properties**

Atomic and ionic radii, ionization energy, electron affinity and electronegativity - definition, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behaviour.

**UNIT III (L-13)****Chemical Bonding**

Covalent Bond - Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence Shell Electron Pair Repulsion (VSEPR) Theory to  $\text{NH}_3$ ,  $\text{H}_3\text{O}^+$ ,  $\text{SF}_4$ ,  $\text{ClF}_3$ ,  $\text{ICl}_2^-$  and  $\text{H}_2\text{O}$ . MO theory. homonuclear and heteronuclear (CO and NO) diatomic molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

Ionic Solids - Ionic structures, radius ratio effect and co-ordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions. Fajan's rule. Inert pair effect, singlet bond, odd electron bonds and hydrogen bond.

Weak Interactions - Hydrogen bonding, vander Waals forces.

**UNIT IV (L-6)****s-Block Elements**

Comparative study, diagonal relationship, abnormal behaviour of Li and Be. Preparation, properties and uses of lithium aluminium hydride, sodamide and basic beryllium acetate.

**UNIT V (L-13)****p-Block Elements**



Comparative study of groups 13-17 elements, compounds like hydrides, oxides oxyacids and halides of groups 13-16, hydrides of boron-diborane and higher boranes, borax, carbides, peroxy acids of sulphur, sodium thiosulphate, interhalogens, freon and Teflon

### **Chemistry of Noble Gases**

Isolation of noble gases, chemistry of xenon, structure and bonding in xenon compounds.

### **Books Recommended**

1. Basic Inorganic Chemistry, F.A. Cotton, G. Wilkinson and P.L. Gaus, Wiley.
2. Concise Inorganic Chemistry, J.D. Lee, ELBS.
3. Concepts of Models of Inorganic Chemistry, B. Douglas, D. McDaniel and J. Alexander, John Wiley.
4. Inorganic Chemistry, D.E. Shriver, P.W. Atkins and C.H. Langford, Oxford.
5. Inorganic Chemistry, W.W. Porterfield, Addison-Wesley.
6. Inorganic Chemistry, A.G. Sharpe, ELBS.

<b>SEC-101</b>	<b>Fundamental of Computers-I</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
----------------	-----------------------------------	-----------------	------------------

**UNIT I****(L-8)**

Knowing computer: What is Computer, Basic Applications of Computer; Components of Computer System, Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other input/output Devices, Computer Memory, Concepts of Hardware and Software; Concept of Computing, Data and Information; Applications of IECT; Connecting keyboard, mouse, monitor and printer to CPU and checking power supply. Operating Computer using GUI Based

**UNIT II****(L-8)**

Operating System: What is an Operating System; Basics of Popular Operating Systems; The User Interface, Using Mouse; Using right Button of the Mouse and Moving Icons on the screen, Use of Common Icons, Status Bar, Using Menu and Menu-selection, Running an Application, Viewing of File, Folders and Directories, Creating and Renaming of files and folders, Opening and closing of different Windows; Using help; Creating Short cuts, Basics of O.S Setup; Common utilities.

**UNIT III****(L-13)**

Understanding Word Processing: Word Processing Basics; Opening and Closing of documents; Text creation and Manipulation; Formatting of text; Table handling; Spell check, language setting and thesaurus; Printing of word document. Using Spread Sheet: Basics of Spreadsheet; Manipulation of cells; Formulas and Functions; Editing of Spread Sheet, printing of Spread Sheet. Introduction to Internet, WWW and Web Browsers: Basic of Computer networks; LAN, WAN; Concept of Internet; Applications of Internet; connecting to internet; What is ISP; Knowing the Internet; Basics of internet connectivity related troubleshooting, World Wide Web; Web Browsing software's, Search Engines; Understanding URL; Domain name; IP Address; Using e-governance website

**UNIT IV****(L-6)**

Communications and collaboration: Basics of electronic mail; Getting an email account; Sending and receiving emails; Accessing sent emails; Using Emails; Document collaboration; Instant Messaging; Netiquettes.

**UNIT V****(L-13)**

Making Small Presentation: Basics of presentation software; Creating Presentation; Preparation and Presentation of Slides; Slide Show; Taking printouts of presentation / handouts.

**Books Recommended**

1. *Introduction to computer Science, ITL Education solution Limited, R&D Wing, PEARSON Education, and Edition 2004*
2. *Rajaraman V. – Fundamental of Computers, Prentice Hall of India Pvt. Ltd., New Delhi – 2nd edition, 1996.*

FC-111	Functional & Communicative English-I	4L:1T:0P	4 credits
--------	--------------------------------------	----------	-----------

**Unit-I- Functional Grammar****(L-8)**

- **Parts of speech**
- Nouns –Kinds, Number, Gender, Noun and Case
- Adjectives—Kind, Comparative degrees, Formation of adjectives
- Pronouns---Types
- Verbs: Irregular verbs, Three forms of verbs, Auxiliary verbs, Modal auxiliaries
- Adverbs-Types
- Prepositions
- Conjunctions
- Interjections
- Articles
- Time, Tense and Aspect

*Resources--- \*Explanation and Grammar Worksheets***UNIT–II Vocabulary****(L-8)**

- One word substitute Compound Words
- Use of Suffix/Prefix
- Synonymous

*Resources---\*Paraphrase, \*Editing \*Understanding of context, \*Worksheets***UNIT-III Spoken English****(L-8)**

- **Extempore:** What is an extempore speech? How to prepare for an extempore speech. Nuances to Extempore speech.
- **Debates:** Types of Debate, Importance of Debate, Debate rules, Debate format, Nuances of Debate with rebuttal strategy.

*Resources---\* a Conversational situation to be provided to develop, \*Topics to be given to speak on recent issues based on contemporary situation.***UNIT-IV Soft skills****(L-8)**

- **Kinesics :** Introduction, What is Body Language ,
- Major components of Body Language,
- Features of Body Languages,
- Importance of Body Language,
- Proxemics: Distances (Intimate Distance, Personal Distance, Social Distance, Public Distance),

**UNIT-V Written English**

**(L-8)**

- Do's/dont's of writing
- Application: Application to dean, application for leave, application to bank Manager to sanction loan for education.

**Books prescribed :**

1. Oxford Guide to writing and speaking , John Seely, O.U.P
2. Effective Technical Communication, M. Asraf Rizvi, Tata McGraw Hill
3. English Grammar & composition, Wren & Martin

---

<b>BSP 111</b>	<b>Basic Physics Lab</b>	<b>0L:0T:2P</b>	<b>2 Credits</b>
----------------	--------------------------	-----------------	------------------

**Note: Select any ten experiments from the following list**

1. To determine the wavelength of Sodium light by Newton's rings.
2. To determine the wavelength of Sodium light by Fresnel's biprism.
3. To determine the specific rotation of the cane sugar solution with the help of biquartz Polarimeter.
4. To determine Refractive index and dispersive power of a prism material by spectrometer.
5. To determine the resolving power of grating.
6. To determine the Resolving power of a telescope.
7. To study the angular divergence of He-Ne laser beam.
8. To determine the Coefficient of Thermal Conductivity of Copper by Searle's Method.
9. To determine the Coefficient of Thermal Conductivity of Copper by Angstrom's Method.
10. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method.
11. To verify Stefan's law.

<b>BSC-111</b>	<b>CHEMISTRY LAB - I</b>	<b>0L:0T:2P</b>	<b>2 Credits</b>
----------------	--------------------------	-----------------	------------------

**Note: Do all experiments from the following list**

- Laboratory techniques.
- To analyse given inorganic mixture for two acid and basic radicals from following radicals
  - Basic Radicals:  
 $\text{NH}_4^+$ ,  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Bi}^{3+}$ ,  $\text{Cd}^{2+}$ ,  $\text{As}^{3+}$ ,  $\text{Sb}^{3+}$ ,  $\text{Sn}^{2+}$ ,  $\text{Al}^{3+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Cr}^{3+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$
  - Acidic Radicals:  
 $\text{CO}_3^{2-}$ ,  $\text{S}^{2-}$ ,  $\text{SO}_3^{2-}$ ,  $\text{CH}_3\text{COO}^-$ ,  $\text{NO}_2^-$ ,  $\text{NO}_3^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{SO}_4^{2-}$
- Calibration of fractional weights, pipette and burette.
- Preparation of standard solutions, dilutions, 0.1M to 0.001M solution.
- Titrimetric Analysis:
  - To determine the percentage of available chlorine in the supplied sample of bleaching powder.
  - To determine the total hardness of water sample in terms of  $\text{CaCO}_3$  by EDTA titration method using EBT indicator.
  - To determine the strength of given HCl solution by titration against NaOH solution using phenolphthalein as indicator.
  - To determine the chloride content in supplied water sample by using Mohr's method.
  - Determination of temporary hardness of water sample by O-Hehner's method.

---

<b>SEC-111</b>	<b>Computer Lab-I</b>	<b>0L:0T:2P</b>	<b>2 Credits</b>
----------------	-----------------------	-----------------	------------------

### Windows

1. Create a new folder and do the following:
  1. Make a word document in it.
  2. Make an Excel document in it.
  3. Make a new folder in it
  4. Rename the initial folder
  5. Move, Copy & Delete the initial folder
2. Implement the various well known features of Windows operating system such as Notepad, WordPad, Paint, System tools, Entertainment etc. enclosed in Start→Programs→Accessories.
3. Implement various display properties by right clicking on the Windows Desktop.
4. Explore the taskbar of Windows.
5. Set the wall paper and screen saver.
6. Set the data/time.

### **MS-Word**

1. Create a document and
  - a. Put Bullets and Numbers
  - b. Apply various Font parameters.
  - c. Apply Left, Right, and Centre alignments.
  - d. Apply hyperlinks
  - e. Insert pictures
  - f. Insert ClipArt
  - g. Show the use of WordArt
2. Create any document and show the use of File→versions.
3. Create any document and show the difference between paste and paste special.
4. Create a document to show the use of Washout/Watermark.
5. Implement the concept of mail merge.
6. Implement the concept of macros.
7. Implement the concept of importing a file/document.
8. Implement the concept of merging the documents.
9. Create a student table and do the following:
  - a. Insert new row and fill data
  - b. Delete any existing row
  - c. Resize rows and columns
  - d. Apply border and shading
  - e. Apply merging/splitting of cells
  - f. Apply sort
  - g. Apply various arithmetic and logical formulas.
10. Create your resume using General Templates.





## **Skill Enhancement Course**

Once upon a time, people thought it was possible to qualify for a job and then just do that job forever without having to learn more. This was probably never really true...but it is DEFINITELY NOT true now! The technical skills and knowledge needed for work are changing all the time now and everyone need to be learning throughout their careers to stay relevant and competitive.

Learning is skills enhancement – and skills enhancement will help you to get employed and stay employed. Skills Enhancement is all about getting the skills you need to succeed in the work you want to do. Some jobs require specific technical skills and specific education, accreditation or licensing – you will need to know what is required for kind of work you want.

At IIMTU the student will go through the following Skill Enhancement course structure,

S. No.	Course Name	Course Code	Max. marks
1.	Industrial Visits/ Seminars or Presentation on The Reports of The Visits.	ECC-111	25
2.	University Social Responsibility(USR)	ECC-112	25
3.	Spoken Tutorial Certification	ECC-113	25
4.	MOOCS(Swayam)	ECC-114	25

### **1. Industrial Visits/ Seminars or Presentation on the reports of the visits;**

In this section the presentation skills on the basis of observation and learning will be developed and evaluated. Student will be expected to give presentation in the department interpreting the report of his/her industrial visit organized by his department during semester. Participation in the seminars organized in the department will also be considered and evaluated in this section.

### **2. University Social Responsibility(USR);**

Social responsibility describes the way we are making a difference to the social and economic well-being of our communities through our teaching, research, and public events and activities.

We strive to make a positive difference to the life and future of our region by taking socially responsible decisions that have real, beneficial, measurable impacts on the people and the world around us.

The aim of USR should be;

- Increasing the university's impact within society and contributing to tackling societal challenges increasing public understanding of the university's research
- Increasing cooperation with industry or public bodies
- Increasing the impact of university research on the social and cultural life of the local
- Community promoting university participation in policy-making
- Potential helping to align the university with trends in policy and funding

To meet the mentioned challenges a variety of activities can be carried out. Some of the points are listed below.

- Collaboration with companies, public services or NGOs in social projects to help the disadvantaged
- Sensitizing, educational campaigns on social responsibility in areas of influence which are close to the university
- Collaboration with public services and NGOs in sustainable initiatives
- Sensitizing educational campaigns on environmental protection in areas of influence which are close to the university
- Organization and sponsoring of performances committed to both local and regional socioeconomic development
- Organization of volunteering programs for students, professors and staff
- Scientific research on social problems and the knowledge generation
- Application of scientific knowledge to the development of new environment-friendly products, technologies and processes
- Integrating values such as respecting individual and social
- Education in environmental values
- University awareness of environmental problems and Vocational training to solve environmental problems

In this section the performance of the student will be evaluated on the basis of his/her participation and work carried out towards USR.

### **3. Spoken Tutorial Certification;**

Salient features of the Spoken Tutorial project are

- Spoken Tutorial is a 10 minute audio-video tutorial on IT topics.
- The objective of the Spoken Tutorial project is to improve the employment potential of our students by teaching them IT skills

- The Spoken Tutorial project is funded by the National Mission on Education through ICT, MHRD.
- There are about 630 original spoken tutorials, created in English
- Spoken Tutorials cover many useful IT topics, such as Basic IT Literacy, Tux Typing, KTurtle, C, C++, Java, PHP, Linux, Scilab, Python, OpenFOAM, PERL, Ruby, LibreOffice, Blender, GeoGebra, Jmol, GChemPaint and Inkscape.
- These videos are dubbed into all 22 Indian languages. In each of the following languages, we have more than 100 tutorials: Assamese, Bengali, Gujarati, Hindi, Kannada, Malayalam, Marathi, Nepali, Punjabi, Sanskrit, Tamil, Telugu and urdu. Including the dubbed tutorials, there is a total of 4200 videos.
- Spoken Tutorials are created for self learning - achieved through novice check of the script.
- The usage of language dubbed Spoken Tutorials is increasing, with the large scale acceptance of this method by ITIs, who entered our fold about six months ago. We have already trained more than 4,00,000 ITI students through this methodology. The local language use is expected to increase further when the Government Schools start using this methodology.

#### 4. MOOCS (Massive Open Online courses);

A massive open online course (MOOC) is an online course aimed at unlimited participation and open access via the web. In addition to traditional course materials such as filmed lectures, readings, and problem sets, many MOOCs provide interactive courses with user forums to support community interactions among students, professors, and teaching assistants (TAs) as well as immediate feedback to quick quizzes and assignments.

The certification courses recommended are tabulated below;

PHP, My SQL / Perl	Engg. (Degree & Diploma) (CS & IT), BCA, MCA, B.Sc. (CS)
C/C++, Java, Netbeans & Python	CS / IT - Engg., BCA, MCA, B.Sc. (CS)
Linux	Diploma - CS / IT, BCA, B.Sc (CS)
Science Lab. & OSCAD (Free EDA)	B.Tech. & Poly. (EC, EE, CE, ME)
Latex & Firefox	B.Ed & BTC B.Sc. Nursing B.Sc. Home Science B.Sc. (All Streams) B.Com.
GIMP, Q - CAD	B.Arch. / BFT ( <b>Proposed (2018-2019)</b> )
Cell Designer	B.Sc. Biotech. B.Sc. Microbiology

---

G. Chem. Paint & J Mol app	B.Sc. Chem. B. Pharma M. Pharma M.Sc. Chem.
Inks cape & Blender	BJMC
Java Business app.	Librarians
Math	B.Sc. (Maths)

s

## SEMESTER-II

[L= Lecture, T = Tutorials, P = Practicals &amp; C = Credits]

BSM-201	Differential Equations and Integral Transforms	4L:1T:0P	4 Credits
---------	--	----------	-----------

**Unit 1****(09 Lectures)**

Formation of a differential equation (D.E.), Degree, order and solution of a D.E., Equations of first order and first degree : Separation of variables method, Solution of homogeneous equations, linear equations and exact equations, Differential equations of the first order but not of the first degree, Clairaut's equations and singular solutions, Orthogonal trajectories.

**Unit 2****(09 Lectures)**

Linear differential equations of nth order with constant coefficients, Homogeneous linear differential equations, Simultaneous linear differential equations with constant coefficients, Linear differential equations of the second order (including the method of variation of parameters),

**Unit 3****(09 Lectures)**

Series solutions of second order differential equations, Legendre and Bessel functions ( $P_n$  and  $J_n$  only) and their properties Order, degree and formation of partial differential equations,

**Unit 4****(09 Lectures)**

Partial differential equations of the first order, Lagrange's equations, Charpit's general method, Linear partial differential equations with constant coefficients, Partial differential equations of the second order, Monge's method.

**Unit 5****(09 Lectures)**

The concept of transform, Integral transforms and kernel, Linearity property of transforms, Laplace transform, Inverse Laplace transform, Convolution theorem, Applications of Laplace transform to solve ordinary differential equations.

**Books Recommended**

1. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.
2. I. Sneddon, Elements of Partial Differential Equations, McGraw-Hill, International Edition, 1967.

<b>BSP-201</b>	<b>Quantum Mechanics and Laser</b>	<b>4L:1T:0P</b>	<b>4 Credits</b>
----------------	------------------------------------	-----------------	------------------

**UNIT – I****(09Lectures)**

Basic concept of Classical Mechanics: Mechanics of particle, Mechanics of System of Particles, constraints, Holonomic and Non Holonomic constraints, Virtual work, Alembert's Principle, Lagrange's equations, Simple Application of Lagrange's formulation- Linear Harmonic Oscillator, simple Pendulum.

**UNIT – II****(09Lectures)**

Quantum Theory: Origin of Quantum theory, Black body Radiations, Distribution of energy in the Spectrum of black body Radiation, Photoelectric effect, Laws of photoelectric emission, Ritz combination principle, Planck's radiation.

**UNIT – III****(09Lectures)**

De Broglie's Wave and Uncertainty Principle: Inadequacy of classical mechanics, Two slit experiment, Superposition Principle, Wave particle dualism for light and matter, De Broglie's Wave, De Broglie's model of the atom, Davisson-Germer experiment, Wave Velocity and group velocity, Heisenberg uncertainty Principle, Application of uncertainty Principle.

**UNIT – IV****(09Lectures)**

Schrodinger Equation and its Application: Concept of Wave function " $\Psi$ ", Schrodinger Equations- Time dependent form, Expectation Value, Operators, Time Independent Schrodinger equation ( Steady State form), Particle in one dimensional box, energy Quantization, Wave function.

**UNIT – V****(09Lectures)**

Lasers: Spontaneous and Stimulated emissions, Metastable states, Einstein's A and B coefficients, Optical Pumping and Population Inversion, Three-Level and Four-Level Lasers, Ruby Laser and He- Ne Laser.

**Text and Reference Books**

1. Classical Mechanics – Herbert Goldstein.
2. Classical Mechanics – J.C. Upadhayaya.
3. Classical Mechanics – Gupta – Kumar ( Pragati publication).
4. Perspective of Modern Physics – Bezier.
5. Quantum Mechanics – Robert Eisberg.
6. Modern Physics – J. B. Rajam.
7. Quantum Mechanics – B. S. Rajput.
8. Elements of Quantum Mechanics – Kamal Singh-S.P. Singh.

<b>BSC-201</b>	<b>ORGANIC CHEMISTRY - I</b>	<b>4L:1T:0P</b>	<b>4 Credits</b>
----------------	------------------------------	-----------------	------------------

**UNIT - I****(09Lectures)****Structure, Bonding and Mechanism of Organic Reactions**

Hybridization, bond lengths and bond angles, bond energy, vander Waals interactions, resonance, hyperconjugation, aromaticity, inductive and field electromeric, hydrogen bonding. homolytic and heterolytic bond breaking. Types of reagents: electrophiles and nucleophiles. Types of organic reactions. Reactive intermediates: carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples).

**UNIT - II****(09Lectures)****Stereochemistry of Organic Compounds**

Concept of isomerism. Type of isomerism. Optical isomerism - elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, meso compounds, resolution of enantiomers, racemization.

Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.

Geometric isomerism - determination of configuration of geometric isomers. E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

Conformational isomerism - conformational analysis of ethane and n-butane conformation of cyclohexane, axial and equatorial bonds, Newman projection.

**UNIT - III****(09Lectures)****Alkanes and Cycloalkanes**

IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation, physical properties and chemical reactions of alkanes.

Mechanism of free radical halogenation of alkanes; orientation, reactivity and selectivity. Cycloalkanes - nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring, banana bonds.

**UNIT - IV****(09Lectures)****Alkenes, Cycloalkenes, Dienes and Alkynes**

Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohol and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes.

Chemical reaction of alkenes - mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration, oxidation, oxymercuration- reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with  $\text{KMnO}_4$ .

Polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes, Industrial applications of ethylene and propene.

Methods of formation, conformation and chemical reactions of cycloalkenes.

Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structure of butadiene, methods of formation, polymerization. Chemical reactions - 1,2 and 1,4 additions, Diel's-Alder reaction.

Nomenclature, structure and bonding in alkynes. Methods of formation, chemical reactions, acidity of alkynes, Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation, metal-ammonia reductions. oxidation and polymerization.

**UNIT - V****(09 Lectures)****Arenes and Aromaticity**

Nomenclature of benzene derivatives. The aryl group. Aromatic nucleus and side chain. Structure of benzene; molecular formula and Kekule structure, Stability and carbon- carbon bond length of benzene. resonance structure. MO picture.

Aromaticity : the Huckel rule, aromatic ions.

Aromatic electrophilic substitution - mechanism of nitration, halogenation. Sulphonation and Friedel- Crafts reaction. Activating and deactivating substituents, orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Methods of formation and chemical reactions of alkyl benzenes, alknylbenzenes,

**Alkyl and Aryl halides**

Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides,  $S_N2$  and  $S_N1$  reactions. Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides via allyl, vinyl and aryl halides. Synthesis and uses of DDT and BHC.

**Text and Reference Books**

1. Organic Chemistry, Morrison and Boyd, Prentice Hall.
2. Organic Chemistry, L.G. Wade jr., Prentice Hall.
3. Fundamentals of Organic Chemistry, Solomons, John-Wiley.
4. Organic Chemistry Vol. I, II & III, S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd., (New Age International).
5. Organic Chemistry, F.A. Carey, McGraw Hill, Inc.



<b>SEC-201</b>	<b>Fundamentals of computers-II</b>	<b>4L:1T:0P</b>	<b>4 Credits</b>
----------------	-------------------------------------	-----------------	------------------

**UNIT 1.**

Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker. Number system : Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic, , Operators and expression using numeric and relational operators, operator precedence and associativity

**UNIT 2.**

Approaches to Problem Solving, Concept of algorithm and flow charts. Fundamental data types, Storage classes- automatic, register, static and external. History and Importance of C ,Basic Structure and execution of C programmes, Constants, Variables, and Data Types and various type of declarations

**UNIT 3.**

Conditional Statements: if statement and nesting if and if-else statement, Switch statement. Program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and **continue statements.**

**UNIT 4.**

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Defining Structure, Declaring Structure Variable and Accessing Structure Members, Initialization of Structure, union, enumerated data types, Definition of Functions, Function calls and arguments and corresponding return values, recursive functions

**UNIT 5**

**Use of Computer in E-Commerce** Data Processing, Files and Records, File Organization (Sequential,Direct/Random, Index ) Computer Applications in Business – Need and Scope Computer Applications in various fields of Commerce, Cryptography, Firewall, Internet Security, Privacy Ethical Issues & Cyber Law.

**Text Book:** 1. Introduction to computer Science, ITL Education solution Limited, R&D Wing, PEARSON Education, Edition 2004.

2. Let Us C Of Yashwant Kanetkar 11th Edition, 2016.

**Reference Book:** 1. Rajaraman V. – Fundamental of Computers, Prentice Hall of India Pvt. Ltd., New Delhi – 2nd edition, 1996.

2. Programing in Ansi c by E Balagurusamy.

3. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill

4. Bernard Menezes, " Network Security and Cryptography", Cengage Learning.

AEC-202	Environmental Science	4L:1T:0P	4 Credits
---------	-----------------------	----------	-----------

**UNIT I [08 Hrs]**

**Environment and Natural Resources** : Definition, scope, importance and need for public awareness, Natural Resources - Forest, water, mineral, energy, food, land resources and their conservation, Material cycle - Nitrogen, carbon, sulphur cycle, human activities and environment, Sustainable development.

**UNIT II [08 Hrs]**

**Ecology and Ecosystem:** Concept of ecology, classification and application, Concept of ecosystem, structure, functioning and energy flow, important ecosystem such as forest, desert, pond grassland and marine etc., Food web, food chain, ecological pyramids, ecological succession.

**UNIT III [08 Hrs]**

**Bio-diversity:** Concept, classification, value of biodiversity, biodiversity at global and national level. Hot spot of biodiversity, Threat to biodiversity, India as a mega biodiversity centre, Endangered and endemic species of India, Conservation of biodiversity (ex-situ and in-situ).

**UNIT IV [10 Hrs]**

**Environment Pollution:** Environment pollution - Water, air, soil, noise, thermal, marine, solid waste, nuclear pollution etc. Global environmental problem - Green house effect, global warming, Ozone hole, Deforestation, acid rain, water an air borne diseases etc. Natural disaster - Earthquake, Tsunami, Floods, Cyclone, Landslides, Volcanic eruptions etc, Case study - Bhopal Gas Tragedy, Chernobyl nuclear disaster, London and photochemical smog etc.

**UNIT V [10 Hrs]**

**Environment Protection:** Role of government in environmental protection, Ministry of environment and forestry, water act 1974, Air act 1981, wildlife act 1972, forest act 1988, Environment protection act 1986 etc. EIA, Role of environmental education in environmental protection, Role of NGO in environmental protection. Man and Biosphere Program (MAB), Environmental organizations and agencies in India such as CPCB, CSE, CEE, NEERI etc., Global efforts for environmental protection - International conventions and protocols, Stockholm conference 1972; Montreal protocol 1987, Earth Summit 1992, Kyoto protocol 1997 etc., Case study - Chipko movement, Silent valley project, Narmada Bachao Andolan, Bishnoi community etc.

**Text Books:**

1. Ecology and environment by Dr. P.D. Sharma
2. Essential of environment and ecology by Dr.S.V.S Rana
3. Environmental chemistry by Dr.A.K. de
4. Environmental geography by Dr.Savindra Singh .

**Reference Books:**

- Principles of Environmental Science and Engineering - P. Venugopala Rao, Prentice Hall of India.  
Environmental Science and Engineering - Meenakshi, Prentice Hall India.

FC-211	Functional & Communicative English-II	4L:1T:0P	4 Credits
--------	---------------------------------------	----------	-----------

### Unit-1--Functional Grammar

- Structures-Sentence, Types,
- Structural Classification of sentences ,
- Phrases, Types,
- Active/Passive Speech
- Direct/Indirect narration,
- Subject -verb Agreement{ Error Correction }

*Resources---* \*Explanation and Grammar Worksheets

### Unit-2 Vocabulary

- Word formation/transformation
- Homonyms
- Frequent use of Phrases/idioms
- Foreign words and Phrases
- Correction of spelling

*Resources---*\*Paraphrase, \*Editing \*Understanding of context ,\*Worksheets

### Unit 3-Communication skills

- Meaning of communication,
- Process of communication,
- language of tool of communication,
- Difference between General and Professional communication,
- Types of Communication: Formal and informal communication, Oral and written communication, Verbal and Non-Verbal communication,
- Significance of Communication,
- Barrier to communication

### Unit 4- Spoken English

- **Elaborate quotations** :Quote interpretation , Answering a telephone call, Making enquiries, General tips- Pronunciation, Tone, Pitch, Pace, Volume, relevance, brief, simple Reading Newspaper, sentence starter for explaining quotes, quote analysis worksheet.
- **Speak on proverbs:** Usage and Speech on famous proverbs,

*Resources---* \* a Conversational situation to be provided to develop, \*Topics to be given to speak on recent issues based on contemporary situation.

## **Unit 5-Written English**

- Formal/informal styles of writing
- Letters: Formal and Informal letter
- Resume Writing

---

<b>BSP-222</b>	<b>Physics Lab-II</b>	<b>0L:0T:2P</b>	<b>2 Credits</b>
----------------	-----------------------	-----------------	------------------

**Note: Select any ten experiments from the following list:**

1. To determine Ionisation potential of a gas (Soft valve).
2. Determine the viscosity coefficient of water.
3. To determine the Ionization Potential of mercury.
4. V-I characteristic of the diode and zener diode by Characteristics apparatus.
5. To determine Moment of inertia of a Flywheel.
6. To determine Young's Modulus in case of Uniform bending using Scale, telescope and optic lever.
7. To determine Young's Modulus in case of Cantilever using Pin and Microscope.
8. To determine Modulus of Rigidity by using Torsion pendulum.
9. To determine Viscosity by the Capillary flow (Radius using Mercury pellet).
10. To determine Surface tension by using Capillary rise (Radius using Vernier microscope).
11. To verify Bernoulli's theorem.

BSC-222	Chemistry Lab - II	0L:0T:2P	2 Credits
---------	--------------------	----------	-----------

**Note: Do all experiments from the following list:**

1. Laboratory techniques.
2. Checking the calibration of the thermometer  
80 - 82°C (Naphthalene), 113.5 - 114°C (Acetanilide), 132.5 - 133°C (Urea), 100°C (Distilled Water)
3. Determination of melting Point  
Naphthalene 80 - 82°C, Benzoic acid 121.5 - 122°C, Urea 132.5 - 133°C, Succinic acid 184.5 - 185°C, Cinnamic acid 132.5 - 133°C, salicylic acid 157.5 - 158°C, Acetanilide 113.5 - 114°C, m-dinitro benzene 90°C, p-Dichlorobenzene 52°C, Aspirin 135°C.
4. Determination of boiling points  
Ethanol 78°C, Cyclohexane 81.4°C, Toluene 110.6°C, Benzene 80°C.
5. Purification of organic compounds by crystallization using the following solvents:
  - a. Water
  - b. Alcohol
  - c. Alcohol-water
6. Determination of the melting points of unknown organic compounds (Kjeldahl method and electrically heated melting point apparatus)
7. Effect of impurities on the melting point – mixed melting point of two unknown organic compounds.  
Urea – Cinnamic acid mixture of various compositions (1:4, 1:1, 4:1)
8. Crystallization  
Concept of induction of crystallization,  
Phthalic acid from hot water (using fluted filter paper and stemless funnel)  
Acetanilide from boiling water  
Naphthalene from ethanol  
Benzoic acid from water

---

SEC-222	Computer Lab-II	0L:0T:2P	2 Credits
---------	-----------------	----------	-----------

**Note: Do all Programs from the following list:**

1. WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate of Interest and Time are entered through the keyboard
2. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula  $C/5=(F-32)/9$ .
3. WAP to find the greatest of three numbers.
4. WAP that swaps values of two variables using a third variable
5. WAP that finds whether a given number is even or odd.
6. WAP that tells whether a given year is a leap year or not.
7. WAP to find the factorial of a given number.
8. WAP to print sum of even and odd numbers from 1 to N numbers.
9. WAP to print the Fibonacci series.
10. WAP to check whether the entered number is prime or not.
11. WAP to find the sum of digits of the entered number.
12. WAP to find the reverse of a number.
13. WAP to add and multiply two matrices of order nxn.
14. WAP that finds the sum of diagonal elements of a mxn matrix.
15. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.