



Sunbeam College for Women



Autonomous Post Graduate College
Accredited 'A' Grade by NAAC
BHAGWANPUR, VARANASI-221005 (U.P.)

B.Sc. I Sem. ACADEMIC PLANNER 2025-26

Physics Lecture Plan
B.Sc. 1st Semester
Session- 2025-26

Physics Syllabus by NEP

Programme/Class: Certificate	Year: First	Semester: First
Subject: Physics		
Course Code: BS2410101T	Course Title: Mathematical Physics & Newtonian Mechanics	
Course Outcomes (COs)		
<ol style="list-style-type: none"> 1. Recognize the difference between scalars, vectors, pseudo-scalars and pseudo-vectors. 2. Understand the physical interpretation of gradient, divergence and curl. 3. Comprehend the difference and connection between Cartesian, spherical and cylindrical coordinate systems. 		
Credits: 4	Core Compulsory / Elective	
Max. Marks: 25+75	Min. Passing Marks: 10+25	
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 4-0-0		
Unit		No. of Lectures
PART A		
Basic Mathematical Physics		
Vector Algebra		
I	Geometrical and physical interpretation of addition, subtraction, dot product, cross product and triple product of vectors. Position, separation and displacement vectors. Coordinate rotation, reflection and inversion as the basis for defining scalars, vectors, pseudoscalars and pseudo-vectors (include physical examples).	7
Vector Calculus		
II	Geometrical and physical interpretation of vector differentiation, Gradient, Divergence and Curl and their significance. Vector integration, Line, Surface (flux) and Volume integrals of vector fields. Gradient theorem, Gauss-divergence theorem, Stoke-curl theorem, Greens theorem and Helmholtz theorem (statement only).	8
Coordinate Systems-I		
III	2D & 3D Cartesian, Spherical and Cylindrical coordinate systems, basis vectors, transformation equations. Expressions for displacement vector, arc length, area element, volume element.	8
Coordinate Systems-II		
IV	Gradient, divergence and curl in different coordinate systems. Components of velocity and acceleration in different coordinate systems. Examples of non-inertial coordinate system and pseudo-acceleration. Introduction to Dirac delta function.	7

Sunbeam College for Women, Bhagwanpur

Lesson Plan

B.Sc. - I Semester (2025-26)

Physics- Part-A (Mathematical Physics)

Subject Teacher: Dr. Amit Kumar Jaiswal

Reference Books:

1. "Schaum's Outline Series: Vector Analysis" by Murray Spiegel, Seymour Lipschutz, Dennis Spellman. Publication: McGraw Hill.
2. "Mathematical Physics" by H. K. Das, Publication: S. Chand & Sons.
3. "Matrices and Tensors in Physics" by A.W. Joshi. Publication: New Age International Private Limited, 1995.

S.N.	Unit	Month	Week	No. of Lectures	Topics
2.	Bridge Course + I Unit	August (11 Days)	1 st	--	*****
			2 nd	2	Bridge Course: Brief idea of scalar and vectors. Examples of scalar and vector quantities in physics. Need of coordinate systems in physics.
			3 rd	1+2	Brief idea of Cartesian and polar coordinate systems and their inter conversion in 2D. Vector Algebra: Geometrical and physical interpretation of addition, subtraction.
			4 th	3	Geometrical and physical interpretation of dot product, cross product and triple product of vectors.
			5 th	3	Position, separation and displacement vectors. Coordinate rotation, reflection and inversion as the basis for defining scalars, vectors, pseudoscalars and pseudo-vectors (include physical examples).
3.	II Unit	September (11 Days)	1 st	3	Vector Calculus: Geometrical and physical interpretation of vector differentiation, gradient and divergence with their significance.
			2 nd	3	Geometrical and physical interpretation of Curl and its significance, vector integration.
			3 rd	2	Line, Surface (flux) and volume integrals of vector fields.
			4 th	3	Gradient theorem. Gauss-divergence theorem. Stoke-curl theorem. Greens theorem and Helmholtz theorem (statement only).

			5 th	---	*****
4.	III Unit	October (09 Days)	1 st	---	*****
			2 nd	3	Coordinate Systems-I: 2D & 3D Cartesian and Spherical coordinate systems.
			3 rd	3	2D & 3D Cylindrical coordinate system. Basis vectors. Transformation equations.
			4 th	---	*****
			5 th	3	Expressions for displacement vector, arc length, area element. Expressions for volume element.
5.	IV Unit	November (11 Days)	1 st	---	*****
			2 nd	2	Coordinate Systems-II: Gradient in different coordinate systems.
			3 rd	3	Divergence and curl in different coordinate systems.
			4 th	3	Components of velocity and acceleration in different coordinate systems.
			5 th	3	Examples of non-inertial coordinate system and pseudo-acceleration. Introduction to Dirac delta function.
Total Class			42	*****	

PART B

Newtonian Mechanics & Wave Motion

Unit -V

Dynamics of a System of Particles

Dynamics of a system of particles, centre of mass motion, and conservation laws & their deductions. Rotating frames of reference, general derivation of origin of pseudo forces (Euler, Coriolis & centrifugal) in rotating frame, and effects of Coriolis force.

No. of Lecture: 8

Unit -VI

Dynamics of a Rigid Body

Angular momentum, Torque, Rotational energy. Rotational inertia for simple bodies (ring, disk, rod, solid and hollow sphere). The combined translational and rotational motion of a rigid body on horizontal and inclined planes. Elasticity, relations between elastic constants, bending of beam and torsion of cylinder.

No. of Lecture: 8

Unit -VII

Motion of Planets & Satellites

Newton's law of gravitation, gravitational field and gravitational potential. Kepler's laws of planetary motion and their deductions. Motions of geo-synchronous & geo-stationary satellites and basic idea of Global Positioning System (GPS).

No. of Lecture: 7

Unit -VIII

Wave Motion

Differential equation of simple harmonic motion and its solution, use of complex notation, damped and forced oscillations, Quality factor. Composition of simple harmonic motion, Lissajous figures. Differential equation of wave motion. Principle of superposition of waves, stationary waves, phase and group velocity.

No. of Lecture: 7

Suggested Readings

PART A

1. Murray Spiegel, Seymour Lipschutz, Dennis Spellman, "Schaum's Outline Series: Vector Analysis", McGraw Hill, 2017, 2e
2. A.W. Joshi, "Matrices and Tensors in Physics", New Age International Private Limited, 1995, 3e

PART B

1. Charles Kittel, Walter D. Knight, Malvin A. Ruderman, Carl A. Helmholz, Burton J. Moyer, "Mechanics (In SI Units): Berkeley Physics Course Vol 1", McGraw Hill, 2017, 2e

2. Richard P. Feynman, Robert B. Leighton, Matthew Sands, “The Feynman Lectures on Physics - Vol. 1”,
Pearson Education Limited, 2012
3. Hugh D. Young and Roger A. Freedman, “Sears & Zemansky's University Physics with Modern Physics”,
Pearson Education Limited, 2017, 14e
4. D.S. Mathur, P.S. Hemne, “Mechanics”, S. Chand Publishing, 1981, 3e

Course Prerequisites

Physics in 12th / Mathematics in 12th

This course can be opted as an Elective by the students of following subjects

Open to all

Continuous Internal Evaluation (CIE) Methods (Maximum Marks:25) Proposed Bifurcation of Marks (25) under CIE as follows

Assessment Type	Max. Marks
Class Test	10
Quiz /Seminar/project/Presentation/Research Orientation/ Assignment /Assignment(Char/Flora/Rural services/ Technology/ Dissemination/ Excursions/Lab. Visit/Industrial training).	15

Note: The award for 25 marks will be in integer (for example 12.5=13)

Note: In End semester examination equal weightage should be given to Part A and Part B while framing the question

Programme/Class: **Certificate** Year: **First** Semester: **First**

Subject: **Physics**

Course Code: **BS2410102P** Course Title: **Mechanical Properties of Matter**

Course Outcomes (COs)

Experimental physics has the most striking impact on the industry wherever the instruments are used to study and determine the mechanical properties. Measurement precision and perfection is achieved through Lab Experiments. Online Virtual Lab Experiments give an insight in simulation techniques and provide a basis for modeling.

Credit: 2
Max.Marks: 25+75

Core compulsory/Elective
Min. Passing Marks:10+25.

Lab Experiment List

1. Moment of inertia of a flywheel
2. Moment of inertia of an irregular body by inertia table
3. Modulus of rigidity by statistical method (Barton's apparatus)
4. Modulus of rigidity by dynamical method (sphere / disc / Maxwell's needle)
5. Young's modulus by bending of beam
6. Young's modulus and Poisson's ratio by Searle's method
7. Poisson's ratio of rubber by rubber tubing
8. Acceleration due to gravity by bar pendulum
9. Height of a building by Sextant

10. Spring Constant of a spiral spring

Online Virtual Lab Experiment List / Link

Virtual Labs at Amrita Vishwa Vidyapeetham

<https://vlab.amrita.edu/?sub=1&brch=74>

1. Torque and angular acceleration of a fly wheel
2. Torsional oscillations in different liquids
4. Newton's second law of motion
5. Ballistic pendulum
6. Collision balls
7. Projectile motion
8. Elastic and inelastic collision

Continuous Internal Evaluation (CIE) Methods (Maximum Marks:25) Proposed Bifurcation of Marks (25) under CIE as follows

Assessment Type	Max. Marks
Class Test	10
Quiz /Seminar/project/Presentation/Research Orientation/ Assignment /Assignment(Char/Flora/Rural services/ Technology/ Dissemination/ Excursions/Lab. Visit/Industrial training).	15

Note: The award for 25 marks will be in integer (for example 12.5=13)

LECTURE PLAN

Academic session 2025-2026

Class/Section – B.Sc. 1st year-1st Sem [PMC]

Teacher Name: Dr. Devendra Mohan Upadhyay

Course Name: Part-B Newtonian Mechanics

Course Code: B010101T

Reference Book:

PART B

1. Charles Kittel, Walter D. Knight, Malvin A. Ruderman, Carl A. Helmholz, Burton J. Moyer, "Mechanics (In SI Units): Berkeley Physics Course Vol 1", McGraw Hill, 2017, 2e

2. Richard P. Feynman, Robert B. Leighton, Matthew Sands, "The Feynman Lectures on Physics - Vol. 1", Pearson Education Limited, 2012

3. Hugh D. Young and Roger A. Freedman, "Sears & Zemansky's University Physics with Modern Physics", Pearson Education Limited, 2017, 14e

4. D.S. Mathur, P.S. Hemne, "Mechanics", S. Chand Publishing, 1981, 3e

5. J. C. Upadhyay, "Mechanics", S. Chand Publishing, 1981,

Lecture Plan

Month	Unit	Week	No. of Planned Lecture	Topic
August	V	1 st	2	Bridge course: Basic terms of Mechanics and their brief description,
		2 nd	2	Law of Motion, Elasticity and some related terms
		3 rd	2	Unit V: Dynamics of a System of Particles
		4 th	3	Dynamics of a system of particles, centre of mass motion, and conservation laws & their deductions. Rotating frames of reference,
		5 th	3	general derivation of origin of pseudo forces (Euler, Coriolis & centrifugal) in rotating frame, and effects of Coriolis force.
September	VI	1 st	2	Unit -VI: Dynamics of a Rigid Body
		2 nd	3	Angular momentum, Torque, Rotational energy.
		3 rd	3	Rotational inertia for simple bodies (ring, disk, rod, solid and hollow sphere). The combined translational and rotational motion of a rigid body on horizontal and inclined planes.
		4 th	3	Elasticity, relations between elastic constants, bending of beam and torsion of cylinder.
		5 th	-----	
October	VII VIII	1 st	-----	
		2 nd	3	Kepler's laws of planetary motion and their deductions. Motions of geo-synchronous satellites
		3 rd	2	geo-stationary satellites and basic idea of Global Positioning System (GPS).
		4 th	2	Unit -VIII: Wave Motion
		5 th	2	Differential equation of simple harmonic motion and its solution, use of complex notation,
November	VIII	1 st	1	damped and forced oscillations,
		2 nd	3	Quality factor. Composition of simple harmonic motion, Lissajous figures.
		3 rd	3	Differential equation of wave motion..
		4 th	3	Principle of superposition of waves, stationary waves,
		5 th	3	phase and group velocity
	Total		45	

LECTURE PLAN

Academic session 2025-2026

Programme/Class: **Certificate**

Year: **First**

Semester: **First**

Subject: **Physics**

Course Code: **BS2410102P** Course Title: **Mechanical Properties of Matter**

Course Outcomes (COs)

Experimental physics has the most striking impact on the industry wherever the instruments are used to study and determine the mechanical properties. Measurement precision and perfection is achieved through Lab Experiments. Online Virtual Lab Experiments give an insight in simulation techniques and provide a basis for modeling.

Credit: 2

Max.Marks: 25+75

Core compulsory/Elective

Min. Passing Marks:10+25.

Lab Experiment List

No. of Lecture: Sixty (60)

1. Moment of inertia of a flywheel
2. Moment of inertia of an irregular body by inertia table
3. Modulus of rigidity by statistical method (Barton's apparatus)
4. Modulus of rigidity by dynamical method (sphere / disc / Maxwell's needle)
5. Young's modulus by bending of beam
6. Young's modulus and Poisson's ratio by Searle's method
7. Poisson's ratio of rubber by rubber tubing
8. Acceleration due to gravity by bar pendulum
9. Height of a building by Sextant
10. Spring Constant of a spiral spring

Course Name: Mechanical Properties of Matter

Course Code: BS2410102P

Lecture Plan

Month	Unit	Week	No. of Planned Lecture	Topic
August	I	1st	----	-----
		2nd	-----	
		3rd	2	Physics practical: List of Practical 1. Moment of inertia of a fly wheel 2. Acceleration due to gravity by bar pendulum 3. Young's modulus and Poisson's ratio by Searle's method 4. Spring constant of a spring in form of a coil 5. Young's modulus by bending of beam 6. Young's modulus and Poisson's ratio by Searle's method 7. Poisson's ratio of rubber by rubber tubing 8. Acceleration due to gravity by bar pendulum 9. Height of a building by Sextant 10. Spring Constant of a spiral spring
		4th	2	Above mentioned practical has been carried out in each practical class
		5th	2	Above mentioned practical has been carried out in each practical class
September	I	1st	2	Above mentioned practical has been carried out in each practical class

		2nd	2	Above mentioned practical has been carried out in each practical class
		3rd	2	Above mentioned practical has been carried out in each practical class
		4th	2	Above mentioned practical has been carried out in each practical class
		5th	----	
October	II	1st	-----	
		2nd	2	Above mentioned practical has been carried out in each practical class
		3rd	2	Above mentioned practical has been carried out in each practical class
		4th	----	Above mentioned practical has been carried out in each practical class
		5th	2	Above mentioned practical has been carried out in each practical class
November		1st	----	
		2nd	2	Above mentioned practical has been carried out in each practical class
		3rd	2	Above mentioned practical has been carried out in each practical class
		4th	2	Above mentioned practical has been carried out in each practical class
		5th	2	Above mentioned practical has been carried out in each practical class
	Total Class		28	

Online Virtual Lab Experiment List / Link

Virtual Labs at Amrita Vishwa Vidyapeetham

<https://vlab.amrita.edu/?sub=1&brch=74>

1. Torque and angular acceleration of a fly wheel
2. Torsional oscillations in different liquids
4. Newton's second law of motion
5. Ballistic pendulum
6. Collision balls
7. Projectile motion
8. Elastic and inelastic collision

Chemistry Lecture Plan
B.Sc. 1st Semester
Session- 2025-26

Semester-1,
Paper-1 (Theory)
Course Title: Fundamentals of Chemistry

Programme: Certificate in Bioorganic and Medicinal Chemistry	Year: First	Semester: First
Paper-1 Theory	Subject: Chemistry	
Course Code:BS2420101T	Course Title: Fundamentals of Chemistry	
<p>Course outcomes: There is nothing more fundamental to chemistry than the chemical bond. Chemical bonding is the language of logic for chemists. Chemical bonding enables scientists to take the 100-plus elements of the periodic table and combine them in myriad ways to form chemical compounds and materials. Periodic trends, arising from the arrangement of the periodic table, provide chemists with an invaluable tool to quickly predict an element's properties. These trends exist because of the similar atomic structure of the elements within their respective group families or periods, and because of the periodic nature of the elements. Reaction mechanism gives the fundamental knowledge of carrying out an organic reaction in a step-by-step manner. This course will provide a broad foundation in chemistry that stresses scientific reasoning and analytical problem solving with a molecular perspective. Students will gain an understanding of</p> <ul style="list-style-type: none"> • Molecular geometries , physical and chemical properties of the molecules. • Current bonding models for simple inorganic and organic molecules in order to predict structures and important bonding parameters. • The chapter Recapitulation of basics of organic chemistry gives the most primary and utmost important knowledge and concepts of organic Chemistry. • This course gives a broader theoretical picture in multiple stages in an overall chemical reaction. It describes reactive intermediates , transition states and states of all the bonds broken and formed .It enables to understand the reactants, catalyst , stereochemistry and major and minor products of any organic reaction. • It describes the types of reactions and the Kinetic and thermodynamic aspects one should know for carrying out any reaction and the ways how the reaction mechanism can be determined. • The chapters Stereochemistry gives the clear picture of two-dimensional and three-dimensional structure of the molecules, and their role in reaction mechanism. 		
Credits: 4	Compulsory	
Max. Marks: 25+75		
Total No. of Lectures = 60		
Unit	Topics	No. of Lectures
I	<i>Introduction to Indian ancient Chemistry and contribution of Indian Chemists, in context to the holistic development of modern science and technology, should be included under Continues Evaluation (CIE)</i>	10

	<p>Molecular polarity and Weak Chemical Forces : Resonance and resonance energy, formal charge, Van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interaction, dipole moment and molecular Structure (Diatomic and polyatomic molecules), Percentage ionic character from dipole moment, polarizing power and polarizability. Fajan's rules and consequences of polarization. Hydrogen bonding, van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interaction. Effects of weak chemical forces, melting and boiling points, solubility, energetics of dissolution process. Lattice energy and Born-Haber cycle, solvation energy, and solubility of ionic solids.</p>	
II	<p>Simple Bonding theories of Molecules Atomic orbitals, Aufbau principle, multiple bonding (σ and π bond approach) and bond lengths, the valence bond theory (VBT), Concept of hybridization, hybrid orbitals and molecular geometry, Bent's rule, Valence shell electron pair repulsion theory (VSEPR), shapes of the following simple molecules and ions containing lone pairs and bond pairs of electrons: H_2O, NH_3, PCl_5, SF_6, SF_4, ClF_3, I_3^-, ClF_2^- and SO_4^{2-} and H_3O^+. Molecular orbital theory (MOT). Molecular orbital diagrams bond orders of homonuclear and heteronuclear diatomic molecules and ions (N_2, O_2, C_2, B_2, F_2, CO, NO, and their ions)</p>	10
III	<p>Periodic properties of Atoms (with reference to s & p-block): Brief discussion, factors affecting and variation trends of following properties in groups and periods. Effective nuclear charge, shielding or screening effect, Slater rules, Atomic and ionic radii, Electronegativity, Pauling's/ Allred Rochow's scales, Ionization enthalpy, Electron gain enthalpy.</p>	05
IV	<p>Recapitulation of basics of Organic Chemistry: Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bonding, Van der Waals interactions, inclusion compounds, Clathrates, Charge transfer complexes, hyperconjugation, Dipole moment; Electronic Displacements: Inductive, electromeric, resonance mesomeric effects and their applications</p>	05
V	<p>Mechanism of Organic Reactions: Curved arrow notation, drawing electron movements with allows, half-headed and double-headed arrows, homolytic and heterolytic bond fission, Types of reagents – electrophiles and nucleophiles, Types of organic reactions, Energy considerations. Reactive intermediates – Carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples). Assigning formal charges on intermediates and other ionic species. Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).</p>	10
VI	<p>Stereochemistry-Concept of isomerism, Types of isomerism; Optical isomerism – elements of symmetry, molecular chirality, enantiomers, stereogenic center, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centers, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomer, inversion, retention and 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. Keto-enol tautomerism of ethyl acetoacetate. Conformational isomerism – conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives, Newman projection and Sawhorse formulae, Fischer and flying wedge formulae, Difference between configuration and conformation.</p>	10
VII	<p>Basic Computer system (in brief)-Hardware and Software; Input devices, Storage devices, Output devices, Central Processing Unit (Control Unit and Arithmetic Logic Unit); Number system (Binary, Octal and Hexadecimal Operating System); Computer Codes (BCD and ASCII); Numeric/String constants and variables. Operating Systems (DOS, WINDOWS, and Linux)</p>	05
VIII	<p>Mathematical Concepts for Chemistry Logarithmic relations, curve sketching, linear graphs and calculation of slopes, differentiation of functions like Kx, e^x, X^n, $\sin x$, $\log x$; maxima and minima, partial differentiation and reciprocity relations</p>	05

Suggested Readings:

1. Lee, J.D. Concise Inorganic Chemistry, Pearson Education 2010
2. Huheey, J.E., Keiter, E.A., Keiter, R. L., Medhi, O.K. Inorganic Chemistry, Principles of Structure and Reactivity, Pearson Education 2006.
3. Douglas, B.E. and Mc Daniel, D.H., Concepts & Models of Inorganic Chemistry, Oxford, 1970
4. Shriver, D.D. & P. Atkins, *Inorganic Chemistry 2nd Ed.*, Oxford University Press, 1994.
5. Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications 1962.
6. Singh J., Yadav L.D.S., Advanced Organic Chemistry, Pragati Edition
7. Morrison, R. N. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
8. Carey, F. A., Giuliano, R. M. *Organic Chemistry*, Eighth edition, McGraw Hill Education, 2012.
9. Loudon, G. M. *Organic Chemistry*, Fourth edition, Oxford University Press, 2008.
10. Clayden, J., Greeves, N. & Warren, S. *Organic Chemistry*, 2nd edition, Oxford University Press, 2012.
11. Graham Solomons, T.W., Fryhle, C. B. *Organic Chemistry*, John Wiley & Sons, Inc.
12. Sykes, P. *A guidebook to Mechanism in Organic Chemistry*, Pearson Education, 2003
13. Francis, P. G. Mathematics for Chemists, Springer, 1984

Note: For the promotion of Hindi language, course books published in Hindi may be prescribed by the University

Suggested online links:

<http://heecontent.upsdc.gov.in/Home.aspx>

<https://nptel.ac.in/courses/104/106/104106096/>

<http://heecontent.upsdc.gov.in/Home.aspx>

<https://nptel.ac.in/courses/104/106/104106096/>

<https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm>

<https://nptel.ac.in/courses/104/103/104103071/#>

Suggested Continuous Evaluation Methods: Max. Marks: 25

SN	Assessment Type	Max. Marks
1	Class Tests	10
2	Quiz/Seminar/Project/Presentation/Research Orientation Assignment/ Assignments (Charts/Flora/Rural Service/Technology Dissemination/Excursions/Lab Visits/Industrial training)	15

LECTURE PLAN
Academic session 2025-2026

Class- B.Sc. - 1stSemester

Teacher Name: Dr. Chhaya Pandey

Course Name: Fundamentals of Chemistry Course Code: B020101T

Lecture Plan				
Month	Unit	Week	No. of Planned Lecture	Topic
August	I	3rd	3	Resonance ,Definition and rules to draw resonating structures
		4th	3	Calculation of Formal charge and assigning formal charge to various canonical structure ,Resonance energy.
		5th	3	Van der Waal, forces ,Dipole Moments and structure of molecules Polarizing Power and Polarizability
September	I	1st	3	Hydrogen bond ,Definition and classification, Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bonding.
		2nd	3	Van der Waals interactions, inclusion compounds, Clathrates , Charge transfer complexes.
		3rd	3	Hyperconjugation, Dipole moment; Electronic Displacements: Inductive, electrometric ,resonance mesmeric effects and their applications Curved arrow notation, drawing electron movements , half-headed and double-headed arrow.
		4th	3	Homolytic and heterolytic bond fission, Types of reagents–electrophiles and nucleophiles,
		5th	Zero	
October	V	1st	Zero	
		2nd	3	Types of organic reactions, Energy considerations. Reactive intermediates–Carbocations.
		3rd	3	Free radicals, carbenes, arynes and nitrenes(with examples).Assigning formal charges on intermediates and other ionic species
		4th	Zero	
		5th	3	Component of a computer, Hardware and software Number system(Binary, Octal and Hexadecimal Operating System)
November	III	2nd	3	Computer Codes (BCD and ASCII); Numeric/String constants and variables. Operating Systems (DOS, WINDOWS, and Linux);
		3rd	3	Logarithmic relations, curve sketching, linear graphs and calculation of slopes, differentiation of functions like Kx , e^x , X^n , $\sin x$, $\log x$.
		4th	3	Maxima and minima, partial differentiation and reciprocity relations, Integration of some useful/relevant functions; permutations and combinations, Factorials,Probability.
		5th	3	Revision and Problem solving

LECTURE PLAN
Academic session 2025-2026
(Chemistry)

Class/Section – B.Sc. [PMC& BZC] – 1st Semester

Teacher Name: Dr. Arun Kumar Upadhyay

Course Name: Fundamentals of Chemistry

Course Code: BS2420101T

Lecture Plan				
Month	Unit	Week	No. of Planned Lecture	Topic
August		3rd	2	Atomic orbitals, Aufbau principle, multiple bonding (σ and π bond approach) bond lengths & valence bond theory (VBT),
	II	4th	3	Concept of hybridization, Hybrid orbitals and molecular geometry Bent's rule, Valence shell electron pair repulsion theory (VSEPR),
		5th	3	Shapes of the following simple molecules and ions containing lone pairs and bond pairs of electrons: H_2O , NH_3 , PCl_5 , SF_6 , SF_4 , ClF_3 , I_3 , ClF_2 and SO_4^{2-} and H_3O^+
September	II	1st	2	Molecular orbital theory (MOT) Molecular orbital diagrams bond orders of homonuclear and heteronuclear diatomic molecules and ions (N_2 , O_2 , C_2)
		2nd	3	Molecular orbital diagrams bond orders of homonuclear and heteronuclear diatomic molecules and ions (B_2 , F_2 and their ions) and heteronuclear diatomic molecules CO , NO their ion
		3rd	2	Brief discussion, factors affecting and variation trends of following properties in groups and periods
		4th	3	Effective nuclear charge, Shielding effect, Slater rule and calculation of ENC
		5th	0	-
October	II	1st	0	-
		2nd	3	Atomic and ionic radii, Electronegativity, Pauling/Allred Rochow's scale
		3rd	2	Ionization enthalpy/Ionization energy
		4th	2	Electron gain enthalpy
		5th	2	Concept of isomerism, Types of isomerism; Optical isomerism – elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centers
November		1st	1	Diastereomers, threo and erythro diastereomers, meso compounds,
		2nd	2	Resolution of enantiomer, inversion, retention and 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.
		3rd	3	Conformational isomerism – conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives
		4th	3	Newman projection and Sawhorse formulae, Fischer and flying wedge formulae, Difference between configuration and conformation.
		5th	3	Hardware and Software; Input devices, Storage devices, Output devices, Central Processing Unit (Control Unit and Arithmetic Logic Unit); Number system (Binary, Octal and Hexadecimal Operating System); Computer Codes (BCD and ASCII); Numeric/String constants and variables. Operating Systems (DOS, WINDOWS, and Linux

Semester-I, Paper-2 (Practical)
Course Title: Quantitative Analysis

Programme: Certificate in Bioorganic and Medicinal Chemistry	Year: First	Semester: I
Practical paper-2		Subject: Chemistry
Course Code: BS2420102P	Course Title: Quantitative Analysis	
<p>Course outcomes:</p> <p>Upon completion of this course the students will have the knowledge and skills to: understand the laboratory methods and tests related to estimation of metals ions and estimation of acids and alkali contents in commercial products.</p> <ul style="list-style-type: none"> • Potability tests of water samples. • Estimation of metal ions in samples • Estimation of alkali and acid contents in samples • Estimation of inorganic salts and hydrated water in samples 		
Credits: 2	Elective	
Max. Marks: 25+75 = 100		
Practical		60 h
Unit	Topics	No of Lectures
I	Water Quality analysis 1. Estimation of hardness of water by EDTA. 2. Determination of chemical oxygen demand (COD).	16
II	Estimation of Metals ions 1. Estimation of ferrous and ferric by dichromate method. 2. Estimation of copper using thiosulphate.	14
II	Estimation of acids and alkali contents 1. Determination of acetic acid in commercial vinegar using NaOH. 2. Determination of alkali content – antacid tablet using HCl. 3. Estimation of oxalic acid by titrating it with KMnO ₄ .	14
IV	Estimation of inorganic salts and hydrated water 1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. 2. Estimation of calcium content in chalk as calcium oxalate by permanganometry. 3. Estimation of water of crystallization in Mohr’s salt by titrating with KMnO ₄ .	16

Suggested Readings:

1. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.
2. Harris, D. C. Quantitative Chemical Analysis. 6th Ed., Freeman (2007) Chapters 3-5.
3. Harris, D.C. *Exploring Chemical Analysis*, 9th Ed. New York, W.H. Freeman, 2016.
4. Khopkar, S.M. *Basic Concepts of Analytical Chemistry*. New Age International Publisher, 2009.
5. Skoog, D.A. Holler F.J. and Nieman, T.A. *Principles of Instrumental Analysis*, Cengage Learning India Edition

Note: For the promotion of Hindi language, course books published in Hindi may be prescribed by the University

Suggestive digital platforms web links

6. <https://www.labster.com/chemistry-virtual-labs/>
7. <https://www.vlab.co.in/broad-area-chemical-sciences>
8. <http://chemcollective.org/vlabs>

Suggested Continuous Evaluation Methods: Max. Marks: 25

SN	Assessment Type	Max. Marks
1	Class Tests	10
2	Quiz/Seminar/Project/Presentation/Research Orientation Assignment/ Assignments (Charts/Flora/Rural Service/Technology Dissemination/Excursions/Lab Visits/Industrial training)	15

LECTURE PLAN**Academic session 2025-2026****Class- B.Sc. – 1stSemester**

Teacher Name: Dr. Chhaya Pandey

Course Name: Quantitative Analysis**Course Code:** B020102P

CHEMISTRY PRACTICAL				
Month	Unit	Week	No. of Planned Lecture	Topic
August		2nd	2	Estimation of Hardness of water by EDTA
		3rd	2	Estimation of ferrous by dichromate method.
		4th	2	Estimation of ferric by dichromate method.
		5th	2	Estimation of Oxalic acid by titrating it with $KMnO_4$
September		1st	2	Estimation of copper using thiosulphate
		2nd	2	Determination of Chemical oxygen demand
		3rd	Zero	
		4th	2	Record submission and viva
		5th	Zero	
October		1st	Zero	
		2nd	2	Determination of acetic acid in commercial vinegar using NaOH.
		3rd	2	Determination of alkali content-anta acid tablet using HCl.
		4th	Zero	
		5th	2	Estimation of sodium carbonate & bicarbonate present in mixture.
November		2nd	Zero	
		3rd	2	Estimation of sodium carbonate & bicarbonate present in mixture.
		4th	2	REVISION
		5th	2	Record submission and viva

Mathematics Lecture Plan
B.Sc. 1st Semester
Session- 2025-26

B.Sc. I (SEMESTER-I) PAPER-I Differential Calculus & Integral Calculus

Programme: Certificate	Year: First	Semester: First
Class: B.Sc.	Subject: Mathematics	
Course Code: BS2430101T	Course Title: Differential Calculus & Integral Calculus	
Course outcomes:		
<p>CO1: The programme outcomes is to give foundation knowledge for the students to understand basics of mathematics including applied aspect for developing enhanced quantitative skills and pursuing higher mathematics and research as well.</p> <p>CO2: By the time students complete the course they will have wide ranging application of the subject and have the knowledge of real valued functions such as sequence and series. They will also be able to know about convergence of sequence and series. Also, they have knowledge about curvature, envelope and evolutes and trace curve in polar, Cartesian as well as parametric curves.</p> <p>CO3: The main objective of the course is to equip the student with necessary analytic and technical skills. By applying the principles of integral he learns to solve a variety of practical problems in science and engineering.</p> <p>CO4: The student is equipped with standard concepts and tools at an intermediate to advance level that will serve him well towards taking more advance level course in mathematics.</p>		
Credits: 4		Core Compulsory / Elective
Max. Marks: 25+75		
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 4-0-0		
Part- A Differential Calculus		
Unit	Topics	No. of Lectures
I	Introduction to Indian ancient Mathematics and Mathematicians should be included under Continuous Internal Evaluation (CIE). Definition of a sequence, theorems on limits of sequences, bounded and monotonic sequences, Cauchy's convergence criterion, Cauchy sequence, limit superior and limit inferior of a sequence, subsequence, Series of non-negative terms, convergence and divergence, Comparison tests, Cauchy's integral test, Ratio tests, Root test, Raabe's logarithmic test, de Morgan and Bertrand's tests, alternating series, Leibnitz's theorem, absolute and conditional convergence.	9
II	Limit, continuity and differentiability of function of single variable, Cauchy's definition, Intermediate value theorem, Extreme value theorem, Darboux's intermediate value theorem for derivatives, Chain rule, indeterminate forms.	7
III	Rolle's theorem, Lagrange and Cauchy Mean value theorems, mean value theorems of higher order, Taylor's theorem with various forms of remainders, Successive differentiation, Leibnitz theorem, Maclaurin's and Taylor's series, Partial differentiation, Euler's theorem on homogeneous function.	7
IV	Tangent and normal, Asymptotes, Curvature, Envelops and evolutes, Tests for concavity and convexity, Points of inflexion, Multiple points, Parametric representation of curves and tracing of parametric curves, Tracing of curves in Cartesian and Polar forms.	7

Suggested Readings (Part- A Differential Calculus):

1. R. G. Bartle & D. R. Sherbert, Introduction to Real Analysis, John Wiley & Sons
2. T. M. Apostol, Calculus Vol. I, John Wiley & Sons Inc.
3. S. Balachandra Rao & C. K. Shantha, Differential Calculus, New Age Publication.
4. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.
5. G. B. Thomas and R. L. Finney, Calculus, Pearson Education, 2007.
6. H. S. Dhama, Differential Calculus, New Age Publisher
7. Suggestive digital platforms web links: NPTEL/SWAYAM/MOOCs
8. Krishna Publications.

Sunbeam College for Women, Bhagwanpur

B.Sc. - First Semester (2025)

Math- Part A (Paper: Differential Calculus)

Subject Teacher: Dharmendra Dubey

S.N.	Unit	Month	Week	No. of Lectures	Topics
1.	I	August	1st	-	
			2nd		Successive differentiation,
			3rd	2	Leibnitz's Theorem.
			4th	5	Maclaurin's and Taylor's series
			5th	5	Partial differentiation
2.		September	1st	4	theorem on homogeneous function
			2nd	5	Euler's theorem on homogeneous function
			3rd	5	theorem on homogeneous function
			4th	5	Tangent and normal, Asymptotes, Curvature, Envelops and evolutes
			5th	-	Definition of a sequence, theorems on limits of sequences
3.	II & III	October	1st	-	
			2nd	5	Definition of a sequence, theorems on limits of sequences. bounded and monotonic
			3rd	4	subsequence. Cauchy's convergence criterion
			4th	2	Cauchy sequence, limit superior and limit inferior of a sequence
			5th	4	Series of non-negative terms, convergence and divergence, Comparison tests, Cauchy's integral test
4.	IV & VII	November	1st	1	Ratio tests, Root test, Raabe's
			2nd	5	logarithmic test, de Morgan and Bertrand's tests, alternating series, Leibnitz's theorem, absolute and conditional convergence Limit, continuity and differentiability of function of single variable.
			3rd	5	definition of Cauchy's and Intermediate value theorem Darboux's intermediate value theorem for derivatives, Chain rule, indeterminate forms
			4th	5	Tests for concavity and convexity, Points of inflexion, Multiple Points Parametric representation of curves and tracing of parametric curves,
			5th	5	Tracing of curves in Cartesian and Polar forms Rectification, Volumes and Surfaces of Solid of revolution, Pappu's theorem, Multiple integrals, change of order of double integration

Total Number of Lecture-67

Part-B		
Integral Calculus		
Unit	Topics	No. of Lectures
V	Definite integrals as limit of the sum, Riemann integral, Integrability of continuous and monotonic functions, Fundamental theorem of integral calculus, Mean value theorems of integral calculus, Differentiation under the sign of Integration.	13
VI	Improper integrals, their classification and convergence, Comparison test, μ -test, Abel's test, Dirichlet's test, quotient test, Beta and Gamma functions.	9
VII	Rectification, Volumes and Surfaces of Solid of revolution, Pappu's theorem, Multiple integrals, change of order of double integration.	8

Suggested Readings (Part-B Integral Calculus):

1. T. M. Apostol, Calculus Vol. II, John Wiley Publication
2. Shanti Narayan & Dr. P.K. Mittal, Integral Calculus, S. Chand
3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
4. H. S. Dhama, Integral Calculus, New Age Publisher
5. Suggestive digital platforms web links: NPTEL/SWAYAM/MOOCs
6. Krishna Publications.

Suggested Continuous Evaluation Methods: Max. Marks: 25

SN	Assessment Type	Max. Marks
1	Class Tests	10
2	Quiz/Seminar/Project/Presentation/Research Orientation Assignment/ Assignments (Charts/Flora/Rural Service/Technology Dissemination/Excursions/Lab Visits/Industrial training)	15

Sunbeam College for Women, Bhagwanpur

B.Sc. - First Semester (2025)

Math- Part B (Paper: Integral Calculus)

Subject Teacher: Dr. Manish Srivastava

S.N.	Unit	Month	Week	No. of Lectures	Topics
1.	V	August	1st	-	-
			2nd	-	-
			3rd	2	Definite integral, Definite integrals as limit of the sum.
			4th	2	Riemann integral Darboux Theorem
			5th	2	Condition for R-integrability and Integrability of continuous and monotonic functions
2.		September	1st	2	Mean value theorem, Fundamental theorem of integral calculus
			2nd	2	Problems on R-integration
			3rd	1	Differentiation under the sign of Integration
			4th	2	Problems on differentiation under the sign of Integration
			5th	-	-
3.	VI	October	1st	-	-
			2nd	2	Improper integrals, their classification and convergence
			3rd	2	Comparison test, μ -test, Abel's test, Dirichlet's test, quotient test
			4th	-	-
			5th	2	Beta and Gamma functions.
4.		November	1st	-	-
			2nd	1	Problems on Beta, Gamma functions
			3rd	2	Problems on Beta, Gamma functions, Duplication Formula

Total Number of Lecture-22

B.Sc. I (SEMESTER-I) Paper-II Practical

Programme: Certificate	Year: First	Semester: First
Class: B.Sc.		
Subject: Mathematics		
Course Code: BS2430102P	Course Title: Practical	
<p>Course outcomes:</p> <p>CO1: The main objective of the course is to equip the student to plot the different graph and solve the different types of equations by plotting the graph using different computer software such as Mathematica /MATLAB /Maple /Scilab/Maxima etc.</p> <p>CO2. After completion of this course student would be able to know the convergence of sequences through plotting, verify Bolzano-Weierstrass theorem through plotting the sequence, Cauchy's root test by plotting n^{th} roots and Ratio test by plotting the ratio of n^{th} and $(n + 1)^{\text{th}}$ term.</p> <p>CO3. Student would be able to plot Complex numbers and their representations, Operations like addition, subtraction, Multiplication, Division, Modulus and Graphical representation of polar form.</p> <p>CO4: Student would be able to perform following task of matrix as Addition, Multiplication, Inverse, Transpose, Determinant, Rank, Eigenvectors, Eigenvalues, Characteristic equation and verification of the Cayley-Hamilton theorem, Solving the systems of linear equations.</p>		
Credits: 2	Core Compulsory / Elective	
Max. Marks: 25+75	Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 0-0-4		
Unit	Topics	No. of Lectures
	<p>Practical / Lab work to be performed in Computer Lab. List of the practicals to be done using R/Python/Mathematica /MATLAB /Maple /Scilab/Maxima etc.</p> <p>1. Plotting the graphs of the following functions:</p> <p>(i) ax</p> <p>(ii) $[x]$ (greatest integer function)</p> <p>(iii) x^{2n}; $n \in \mathbb{N}$</p> <p>(iv) x^{2n-1}; $n \in \mathbb{N}$</p> <p>(v) $\frac{1}{x^{2n-1}}$; $n \in \mathbb{N}$</p> <p>(vi) $\frac{1}{x^{2n}}$; $n \in \mathbb{N}$</p> <p>(vii) $\sqrt{ax + b}$, $ax + b$, $c \pm ax + b$</p> <p>(ix) $\frac{ x }{x}$, $\sin\left(\frac{1}{x}\right)$, $x \sin\left(\frac{1}{x}\right)$, e^x, e^{-x} for $x \neq 0$.</p> <p>(x) e^{ax+b}, $\log(ax + b)$, $\frac{1}{ax+b}$, $\sin(ax + b)$, $\cos(ax + b)$, $\sin(ax + b)$, $\cos(ax + b)$.</p> <p>Observe and discuss the effect of changes in the real constants a and b on the graphs.</p> <p>(2) By plotting the graph find the solution of the equation $x = e^x$, $x^2 + 1 = e^x$, $1 - x^2 = e^x$, $x = \log_{10}(x)$, $\cos(x) = x$, $\sin(x) = x$, $\cos(y) = \cos(x)$, $\sin(y) = \sin(x)$ etc</p> <p>(3) Plotting the graphs of polynomial of degree 2, 3, 4 and 5, and their first and second derivatives.</p>	

- (4) Sketching parametric curves, e.g., Trochoid, Cycloid, Epicycloid and Hypocycloid etc.
- (5) Tracing of conic in Cartesian coordinates.
- (6) Graph of circular and hyperbolic functions.
- (7) Obtaining surface of revolution of curves.
- (8) Complex numbers and their representations, Operations like addition, Multiplication, Division, Modulus. Graphical representation of polar form.
- (9) Find numbers between two real numbers and plotting of finite and infinite subset of \mathbb{R} .
- (10) Study the convergence of sequences through plotting.
- (11) Verify Bolzano-Weierstrass theorem through plotting of sequences and hence identify convergent subsequences from the plot.
- (12) Study the convergence/divergence of infinite series by plotting their sequences of partial sum.
- (13) Cauchy's root test by plotting n -th roots.
- (14) Ratio test by plotting the ratio of n -th and $(n + 1)$ -th term.

Suggested Continuous Evaluation Methods: Max. Marks: 25

SN	Assessment Type	Max. Marks
1	Class Tests	10
2	Quiz/Seminar/Project/Presentation/Research Orientation Assignment/ Assignments (Charts/Flora/Rural Service/Technology Dissemination/Excursions/Lab Visits/Industrial training)	15

Botany Lecture Plan
B.Sc. 1st Semester
Session- 2025-26

CERTIFICATE COURSE IN MICROBIAL TECHNOLOGY & CLASSICAL BOTANY / B.Sc-I		
Programme: <i>Certificate Course in Microbial Technology & Classical Botany</i>		Year: I Semester: I Paper-I
Subject: Botany		
Course Code: BS2440101T	Course Title: Microbiology & Plant Pathology	
Course outcomes: After the completion of the course the students will be able to:		
<ol style="list-style-type: none"> 1. Develop understanding about the classification and diversity of different microbes including viruses, Algae, Fungi & Lichens & their economic importance. 2. Develop conceptual skill about identifying microbes, pathogens, biofertilizers & lichens. 3. Gain knowledge about developing commercial enterprise of microbial products. 4. Learn host –pathogen relationship and disease management. 5. Learn Presentation skills (oral & writing) in life sciences by usage of computer of computer &multimedia 6. Gain Knowledge about uses of microbes in various fields. 7. Understand the structure and reproduction of certain selected bacteria algae, fungi and lichens 8. Gain Knowledge about the economic values of this lower group of plant community. 		
Credits: 4	Core Compulsory	
Max. Marks: 25+75	Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0		
Unit	Topic	No. of Lectures (60 hrs.)
I	<p>Introduction to Indian ancient, Vedic and heritage Botany and contribution of Indian Botanists, in context with the holistic development of modern science and technology, has to be practiced and assessed via class interaction/ assignments / self-study mentioned under Continuous Internal Evaluation (CIE).</p> <p>Microbial Techniques & Instrumentation Microscopy – Light, Phase Contrast and Electron (scanning and transmission) microscopy. Staining techniques for light microscopy. Common equipment of microbiology lab and principle of their working – Autoclave, Oven, Laminar air flow, Centrifuge. Colorimetry, Spectrophotometry and pH meter</p>	8
II	<p>Microbial world General classification of bacteria, Structure of bacterial cell, Gram-positive and Gram-negative bacteria (characteristic feature). Types of bacterial nutrition. Bacterial Growth curve, factors affecting growth of microbes; Batch culture techniques; Bacterial Chemotaxis and Quorum sensing; Sporulation, reproduction and recombination in bacteria; Plasmids and their economic importance. Viruses- general characteristics, Structure of viruses -Tobacco Mosaic Viruses (TMV). Bacteriophages- Structure of T4 & λ-phage; Multiplication of phages by Lytic and Lysogenic cycles. General characters of - Viroids, Prions, Mycoplasmas, Phytoplasmas and Actinomycetes</p>	8
III	<p>Phycology Range of thallus organization in Algae. Pigments, Reserve food materials and methods of reproduction in Algae. Classification of Algae by F E Fritsch (up to orders). Thallus Structure, Reproduction and Life cycles of – <i>Nostoc</i>, <i>Chlorella</i>, <i>Volvox</i>, <i>Chara</i>, <i>Vaucheria</i>, <i>Ectocarpus</i> and <i>Polysiphonia</i>. Economic importance of algae - Role of algae in soil fertility- as biofertilizer (biological Nitrogen fixation). Commercial products of algae –Biofuel and Agar.</p>	7
IV	<p>Mycology Fungi and its general characteristics, Mode of nutrition and economic importance of Fungi. Classification up to class (Alexopoulos and Mims). Detail study of Zygomycotina -<i>Rhizopus</i>, Ascomycotina <i>Saccharomyces</i> and <i>Peziza</i>, Basidiomycota-, <i>Puccinia</i>, <i>Agaricus</i>, Deuteromycotina –<i>Alternaria</i>. Heterothallism, Heterokaryosis & Parasexuality</p>	7
V	<p>Mushroom Cultivation, Lichenology & Mycorrhiza Tools and techniques of Mushroom cultivation General account of lichens, reproduction and economic importance. Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance.</p>	7
VI	<p>Plant Pathology Disease concept, Symptoms, Etiology & Causal complex, Primary and secondary inoculum. Infection, Pathogenicity and Pathogenesis. Koch's Postulates. Mechanism of infection (Brief idea about Pre-penetration, Penetration and Post-penetration). Defense mechanism with special reference to Phytoalexin. Resistance- Systemic acquired and Induced systemic. Fungicides-Bordeaux mixture, Lime Sulphur, Tobacco decoction, Neem cake & oil.</p>	7

VII	Diseases and Control Symptoms, Causal organism, Disease cycle and Control measures of – Early & Late blight of Potato, Black rust of wheat, red rot of Sugarcane, Mosaic diseases on tobacco, Citrus canker, Little leaf of brinjal. Disease management: - Quarantine, Chemical, Biological and Integrated pest disease management.	8
VIII	Applied Microbiology Food fermentations and food produced by microbes, Production of antibiotics, enzymes and alcoholic beverages. Microbes in genetic recombinant vaccines production. Plant growth promoting rhizobacteria. Biopesticides— <i>Trichoderma</i> sp. and <i>Pseudomonas</i> . Single cell proteins (SCP). Role of microbes in biopolymers, bioindicators and bioremediation. Production of biofuels, biodegradation of pollutants and biodeterioration (cultural property).	8

Suggested Readings:

Unit-I A:

- i. <https://indianculture.gov.in/rarebooks/economic-botany-india>
https://www.infinityfoundation.com/mandala/t_es/t_es_tiwari_botany_frameset.htm
- ii. https://www.researchgate.net/publication/335715457_Ancient_Indian_rishi's_Sages_knowledge_of_botany_and_medicinal_plants_since_Vedic_period_was_much_older_than_the_period_of_Theophrastus_A_case_study-who_was_the_actual_father_of_botany
- iii. <https://www.scribd.com/presentation/81269920/Botany-of-Ancient-India>
- iv. https://insa.nic.in/writereaddata/UpLoadedFiles/LJHS/Vol17_2_17_PKBhattacharyya.pdf
- v. http://wgbis.ces.iisc.ernet.in/biodiversity/sahyadri/wgbis_info/botany_history.pdf

Suggested Reading

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A.
3. Agarwal, S. K. 2009. Foundation Course in Biology, A one books Pvt. Ltd., New Delhi.
4. Aneja, K. R. 1993. Experiments in Microbiology, Pathology and Tissue Culture, Vishwa Prakashan, New Delhi.
5. Chopra. G. L. 1984. A text book of Algae, Rastogi publications, Meerut, India.
6. Desikachari, T. V. 1959. Cyanophyta, ICAR, New Delhi.
7. Dubey, R. C. and Maheshwari. D.K. 2012. Practical Microbiology, S. Chand & Company, Pvt. Ltd., New Delhi.
8. [Dorothy Wood](#), [Joanne Willey](#), [Kathleen Sandman](#). 2022. Prescott's Microbiology 12ED. McGraw-Hill Education
9. Fritsch, F. E. 1956. Structure and Reproduction of Algae, Cambridge University Press, London.
10. Agrios, G.N. (1997). Plant Pathology, 4th edition. Cambridge, U.K.: Academic Press.
11. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, 4th edition. Singapore, Singapore: John Wiley & Sons.
12. [Roger Y Stanier](#), [John L Ingraham](#), [Mark L Wheelis](#) Pager Stanier. (1999). General Microbiology 5e MacMillan.
13. Robert Edward Lee (2008). Phycology. Cambridge University Press.
14. Morris Ian (1968). An Introduction to Algae. London, Hutchinson
15. Sharma, P.D. (2011). Plant Pathology. Meerut, U.P.: Rastogi Publication.
16. Webster, J., Weber, R. (2007). Introduction to Fungi, 3rd edition. Cambridge, U.K.: Cambridge University Press.
17. Pandey B.P. 2001. College Botany Volume 1, S Chand & Company Pvt.Ltd, New Delhi.
18. Pandey. B.P. 2014 Modern Practical Botany, (Vol-I) S. Chand and Company Pvt. Ltd., New Delhi.
19. Pelzar, 1963. Microbiology, Tata Mc Graw Hill, New Delhi
20. Sambamurty. A.V.S.S. 2006, A Text book of Algae, I. K. International Publishing House, Pvt. Ltd., New Delhi.
21. Sharma, P. D. 2012, Microbiology and Plant Pathology, Rastogi Publication Pvt Ltd., Meerut, India.
22. Singh, R. P. 2007. Microbial Taxonomy and Culture Techniques, Kalyani Publication, New Delhi.
23. Harjinder Singh *et al.*, Text book of Microbiology and Plant Pathology, Krishna Publication Meerut.
24. Singh, Jain and Pandey A text book of Botany Rastogi Publication, Meerut.
25. Prescott's Microbiology 12 Ed (2023) Dorothy Wood.

This course can be opted as an elective by the students of following subjects: Open to all but special for B.Sc. Biotech, B.Sc. Microbiology, B.Sc. Agriculture, B.A. (Curators), B.A. Archaeology, B.A. Geology, BAMS.

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Test	10
Quiz/ Seminar/ Presentation/ Assignment (Charts/ Flora/ Rural Service/ Technology Dissemination/Research Orientation assignment/Lab Visits/Excursion/Industrial Training)	15
	25

Course prerequisites:

Qualification: To study this course, a student must have qualified 10+2 with Biology/ NSQF level 3 from Sector Skill Councils / Diploma holder from ITI in (Biology/ Agriculture/ Biotech/ Forestry/ Microbiology/Gardening /biomedical Science.

Facilities: Smart and Interactive Class

Other Requisites: Video collection, Books, CDs, Access to On-line resources, Display Charts

Suggested equivalent online courses:

<https://indianculture.gov.in/rarebooks/economic-botany-india>

<https://community.plantae.org/tags/mooc>

<futurelearn.com/courses/teaching-biology-inspiring-students-with-plants-in-science>

<https://www.coursera.org/courses?query=plants> <http://egyankosh.ac.in/handle/123456789/53530>

<https://www.classcentral.com/tag/microbiology> <https://www.edx.org/learn/microbiology>

<https://www.mooc-list.com/tags/microbiology>

<https://www.udemy.com/topic/microbiology/>

<https://ucmp.berkeley.edu/bacteria/bacteria.html> <https://www.livescience.com/53272-what-is-a-virus.html> <https://gclambathach.in/lms/Economic%20importance%20of%20Algae.pdf>

<https://www.slideshare.net/sardar1109/algae-notes-1>

<https://www.onlinebiologynotes.com/algae-general-characteristics-classification/>

<https://www.sciencedirect.com/topics/immunology-and-microbiology/fungus>

<https://ucmp.berkeley.edu/fungi/fungi.html>

<https://agrimoon.com/wp-content/uploads/Mashroom-culture.pdf>

<http://ecoursesonline.iasri.res.in/mod/page/view.php?id=11293>

<http://www.hillagric.ac.in/edu/coa/pplpath/lect/plpath111/Lect.%201%20%20Introduction-PI%20Path%20111.pdf> http://www.jnkvv.org/PDF/11042020102651plant_pathology.pdf

<https://www.apsnet.org/edcenter/disimpactmngmnt/topc/EpidemiologyTemporal/Pages/ManagementStrategies.aspx>

<https://learn.saylor.org/course/view.php?id=23§ionid=6821>

<https://www.sciencedirect.com/topics/earth-and-planetary-sciences/microscopy>

http://physics.fe.uni-lj.si/students/predavanja/Microscopy_Kulkarni.pdf

<https://lipidnanostructuresgroup.weebly.com/>

<https://zoology4civilservices.wordpress.com/2016/06/18/65/>

<https://microbenotes.com/laminar-flow-hood/>

Sunbeam College For Women, Bhagwanpur Varanasi

B.Sc Botany I Semester 2025-26 (Dr. Ekta Shukla)

Course Code: BS2440101T Course Title: Microbiology and Plant Pathology

S.No.	Unit	Month	Week	No. of Lectures	Topics
1	I and IV	AUGUST (24 Days)	1	2	Bridge Course
					Bridge Course
			2nd	2	Bridge Course
					Bridge Course
			3rd	3	Microscopy
					Light microscopy
					Light microscopy , Dark Field Microscopy
			4th	4	Phase contrast microscopy , Fluorescent microscopy
					Electron microscopy- TEM
					Electron microscopy-SEM
					Common equipments of microbiology lab and principle of their working- autoclave, oven, laminar air flow, centrifuge
			5th	4	Common equipments of microbiology lab and principle of their working- Colorimetry and spectrophotometry, pH meter
					MYCOLOGY - General characteristics, mode of nutrition, life cycle, Economic importance of Fungi, Classification upto class (Ainsworth/Alexopoulos and Mims).
					Distinguishing characters of Myxomycotina
General characters. <i>Zygomycotina Rhizopus</i>					
3	IV and II	SEPTEMBER (22 Days)	1st	3	General characters. <i>Zygomycotina Rhizopus</i>
					General Characters Ascomycotina
					Ascomycotina <i>Saccharomyces</i>
			2nd	4	Ascomycotina -Peziza
					General Characters - Basidiomycotina
					Basidiomycotina- <i>Puccinia</i>
			3rd	4	Basidiomycotina- <i>Agaricus</i>
					Deuteromycotina - <i>Alternaria</i>
					Heterothallism, Heterokaryosis & Parasexuality
					Bacteria - General Introduction classification of bacteria, Structure of bacterial cell, Gram-positive and Gram-negative bacteria
			4th	4	Types of bacterial nutrition. Bacterial Growth curve, factors affecting growth of microbes
					Bacteria- Sporulation, reproduction and recombination in bacteria
					Plasmids and their economic importance
					Viruses-General characteristics, Structure of viruses
5th	0	Viruses-General characteristics, Structure of viruses			
4	II, V and VIII	OCTOBER (18 Days)	1st	0	
			2nd	4	Tobacco Mosaic Viruses (TMV)- Structure

					Tobacco Mosaic Viruses (TMV)- Multiplication and Diseases
					Bacteriophages- Structure of T4 & λ-phage
					Bacteriophages- Multiplication of phages by Lytic cycles.
			3rd	3	Bacteriophages- Multiplication of phages by Lysogenic cycles.
					General characters of - Viroids, Prions,
					General characters of -Mycoplasmas,
			4th	2	General characters of - Phytoplasmas and Actinomycetes
					Tools and techniques of Mushroom cultivation
			5th	3	Tools and techniques of Mushroom cultivation
					General account of lichens
					General account of lichens- Internal structure
5	VIII	November (24 Days)	1st	1	Lichens- reproduction and economic importance.
			2nd	4	Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance
					Applied Microbiology- Food fermentations and food produced by microbes
					Applied Microbiology- Food fermentations and food produced by microbes
					Production of antibiotics,
			3rd	4	Production enzymes and alcoholic beverages
					Microbes in genetic recombinant vaccines production
					Plant growth promoting rhizobacteria.
					Biopesticides--Trichoderma sp. and Pseudomonas.
			4th	4	Single cell proteins (SCP)
					Role of microbes in biopolymers, bioindicators and bioremediation
					Production of biofuels,
					biodegradation of pollutants and biodeterioration (cultural property).
			5th	4	LEFT OVER TOPICS
					LEFT OVER TOPICS
					LEFT OVER TOPICS
LEFT OVER TOPICS					

Reference Books:

1. Microbiology by Prescott
2. Microbiology and Plant Pathology -krishna Publication
3. B.Sc I Botany for First Semester – Singh, Pandey, Jain (Rastogi)
4. Fungi – Sharma(Tata McGraw Hill), B. R. Vashistha, A. K. Sinha (S.Chand&Company)
5. A Text Book of Botany Vol. I- Singh, Pandey, Trivedi (Vikas)
6. A Text Book of Microbiology- Dubey and Maheshwari (S. Chand)
7. Fungi- H.C. Dube
8. College Botany – B. P. Pandey (S. Chand)
9. Fundamentals of Botany Semmester I - R.K. Singh (Wisdom Publication)

Sunbeam College For Women, Bhagwanpur Varanasi

B.Sc Botany I Semester 2025-26 (Dr. Yashveer Singh)

Course Code: : BS2440101T Course Title: Microbiology and Plant Pathology

S.No.	Unit	Month	Week	No. of Lectures	Topics
1	III	AUGUST (24 Days)	2nd	2	Bridge Course
					Phycology - General Characters of Algae and their habitat.
			3rd	2	Range of thallus organization in Algae
					Pigments and Reserve food materials in Algae
			4th	2	Methods of reproduction in Algae
Classification of Algae by F E Fritsch (upto orders).					
5th	2	Classification of Algae by F E Fritsch (upto orders).			
		General characters and Life cycles of – <i>Nostoc</i>			
3	III	SEPTEMBER (22 Days)	1st	2	General characters and Life cycles of- <i>Chlorella</i>
					General characters and Life cycles of- <i>Volvox</i>
			2nd	2	General characters and Life cycles of- <i>Chara</i>
					General characters and Life cycles of- <i>Vaucheria</i>
			3rd	2	General characters and Life cycles of- <i>Ectocarpus</i>
General characters and Life cycles of- <i>Polysiphonia</i>					
4th	2	Economic importance of algae - Role of algae in soil fertility- as biofertilizer (biological Nitrogen fixation).			
		Economic importance of algae -Commercial products of algae –Biofuel and Agar.			
4	VI and VII	OCTOBER (18 Days)	2nd	2	Plant Pathology - Disease concept, Symptoms, Etiology & Causal complex
					Primary and secondary inoculum. Infection, Pathogenicity and Pathogenesis
			3rd	2	Koch's Postulates. Mechanism of infection (Brief idea about Pre-penetration, Penetration and Post-penetration).
					Defense mechanism with special reference to Phytoalexin
			4th	2	Resistance- Systemic acquired and induced systemic
Fungicides- Bordeaux mixture, Lime Sulphur					
5th	2	Fungicides- Tobacco decoction, Neem cake & oil. , Lime Sulphur, Tobacco decoction, Neem cake & oil.			
5	VII	NOVEMBER (24 Days)	2nd	1	Disease cycle and Control measures of – Early blight of Potato,
					3rd
			Disease cycle and Control measures of – Black rust of wheat		
			4th	2	Disease cycle and Control measures of –Red rot of Sugarcane
					Disease cycle and Control measures of –Mosaic diseases on tobacco
5th	2	Disease cycle and Control measures of –Citrus canker			
		Disease cycle and Control measures of –Little leaf of brinjal			
		Disease management: - Quarantine and Chemical			
					Disease management: - Biological
					Integrated pest disease management

Reference Books:

1. Microbiology by Prescott
2. Microbiology and Plant Pathology -krishna Publication
3. B.Sc I Botany for First Semester – Singh, Pandey, Jain (Rastogi Publication)
4. Fungi – Sharma(Tata McGraw Hill), B. R. Vashistha, A. K. Sinha (S.Chand&Company)
5. A Text Book of Botany Vol. I- Singh, Pandey, Trivedi (Vikas)
6. A Text Book of Microbiology- Dubey and Maheshwari (S. Chand)
7. Fungi-H.C. Dube
8. College Botany – B. P. Pandey (S. Chand)
9. Fundamentals of Botany Semmester I - R.K. Singh (Wisdom Publication)

Programme: Certificate Course in Microbial Technology & Classical Botany		Year: I	Semester: I/Paper-II
Subject: Botany			
Course Code: BS2440102P		Course Title: Techniques in Microbiology & Plant Pathology	
<p>Course outcomes: After the completion of the course the students will be able:</p> <p>Understand the instruments, techniques, lab etiquettes and good lab practices for working in a microbiology laboratory.</p> <p>Develop skills for identifying microbes and using them for Industrial, Agriculture and Environment purposes.</p> <p>Practical skills in the field and laboratory experiments in Microbiology & Pathology.</p> <p>Learn to identify Algae, Lichens and plant pathogens along with their Symbiotic and Parasitic associations.</p> <p>Can initiate her own Plant & Seed Diagnostic Clinic</p> <p>Can start own enterprise on microbial products</p>			
Credits: 2		Core Compulsory	
Max. Marks: 25+75		Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-2			
Unit	Topic	No. of Lectures (60 hrs.)	
1.	INSTRUMENTS & TECHNIQUES 1. Laboratory safety and good laboratory practices 2. Principles and application of Laboratory instruments-microscope, incubator, autoclave, centrifuge, filtration unit, pH meter. 3. Cleaning and Sterilization methods of glassware and media 4. Preparation of media- Nutrient Agar and Broth	7	
II	BACTERIAL IDENTIFICATION 1. Techniques for the Identification of bacteria. 2. Staining techniques: Gram's, Staining. 3. Pure culture techniques (Types of streaking, Serial dilution) (Demonstration)	8	
III	MYCOLOGICAL STUDY: 1. Identification of fungi by lactophenol cotton blue method- <i>Rhizopus</i> , <i>Peziza</i> , <i>Puccinia</i> and <i>Alternaria</i> . 2. Permanent slides of uredial, telial, pycnial & aecial stages of <i>Puccinia</i> . 3. <i>Agaricus</i> : Specimens of button stage and full-grown mushroom; Sectioning of gills of <i>Agaricus</i> through permanent slide. 4. Lichens: crustose, foliose and fruticose (specimens).	8	
IV	PHYCOLOGY: 1. To study the thallus structure of the following Algal taxa of different classes with temporary mounting and staining – <i>Spirulina</i> , <i>Nostoc</i> , <i>Volvox</i> , <i>Chara</i> , <i>Vaucheria</i> , <i>Ectocarpus</i> and <i>Polysiphonia</i>	8	
V	EXPERIMENTAL PLANT PATHOLOGY 1. Preparation of fungal media (PDA). 2. Identification of diseases with the help of pathological specimens- White Rust of Crucifers, Black rust of Wheat, red rot of Sugarcane, Late blight of potato, Citrus Canker and Curling leaf of Papaya.	8	
VI	PRACTICALS IN APPLIED MICROBIOLOGY-1 1. To study the isolation techniques of nitrogen fixing bacteria from root nodules of legumes (Demo) 2. To study the isolation techniques of Rhizosphere and Phyllosphere microflora. (Demo)	7	
VII	PRACTICALS IN APPLIED MICROBIOLOGY-2 1. Wine production. (Demonstration) 2. Isolation of lactic acid bacteria from curd.	8	
VIII	1. Visit to NBAIM, Mau, to view Microbial Culture Repository. 2. Visit to Mushroom cultivation unit (Mau/IIVR Aarazi Line Varanasi).	6	

Suggested Readings:**Course Books published.**

1. Practical Botany (Part I) ISBN #:81-301-0008-8 Sunil D Purohit, Gotam K Kukda & Anamika Singhvi Edition:2013 Apex Publishing House Durga Nursery Road, Udaipur, Rajasthan (bilingual)
2. Modern Mushroom Cultivation and Recipes (hindi) (hb)ISBN: 9788177545180Edition: 01Year: 2017Author: Singh Riti, Singh UC Publisher: Agrobios (India)
3. Biofertilizer Production Manual (hindi) (hb) ISBN: 9788177541274Edition: 01Year: 2014Author: Gehlot D Publisher: Agrobios (India)Language: Hindi
4. Botany Practical Part 1 Ashok Bendre & Ashok Kumar Rastogi Publication, Meerut
5. Dubey, R. C. and Maheshwari. D.K. 2012. Practical Microbiology, S. Chand & Company, Pvt. Ltd., New Delhi.
6. Pandey. B.P. 2014 Modern Practical Botany, (Vol-I) S. Chand and Company Pvt. Ltd., New Delhi.
7. Singh, R. P. 2007. Microbial Taxonomy and Culture Techniques, Kalyani Publication, New Delhi.
8. <https://agrimoon.com/wp-content/uploads/Mashroom-culture.pdf>
9. <http://nhb.gov.in/pdf/Cultivation.pdf>
10. https://www.k-state.edu/fungi/Greeting/Publications_files/2006%20Handbook.pdf

This course can be opted as an elective by the students of following subjects: Open to all but special for B.Sc. Biotech, B.Sc. Microbiology, B.Sc. Agriculture, B.A. (Curators), B.A. Archaeology, B.A. Geology, BAMS

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall be as follows:

Internal Assessment	Marks
Test	10
Presentation/ Assignment (Charts/ Herbarium/ Projects/Rural Service/ Technology Dissemination/Research Orientation assignment/Lab Visits/Excursion/Industrial Training)	15
	25
Suggested equivalent online courses: https://community.plantae.org/tags/mooc futurelearn.com/courses/teaching-biology-inspiring-students-with-plants-in-science https://microbiologysociety.org/publication/education-outreach-resources/basic-practical-microbiology-a-manual.html https://microbiologyonline.org/file/7926d7789d8a2f7b2075109f68c3175e.pdf http://allaboutalgae.com/benefits/ https://repository.cimmyt.org/xmlui/bitstream/handle/10883/3219/64331.pdf https://www.mooc-list.com/tags/microbiology http://www.agrifs.ir/sites/default/files/A%20text%20book%20of%20practical%20botany%201%20%7BAshok%20Bendre%20%20%5B8171339239%5D%20%281984%29.pdf https://www.coursera.org/courses?query=plants http://egyankosh.ac.in/handle/123456789/53530 https://www.classcentral.com/tag/microbiology https://www.edx.org/learn/microbiology https://www.mooc-list.com/tags/microbiology https://www.udemy.com/topic/microbiology/	

Course prerequisites:

Qualification: To study this course, a student must have qualified 10+2 with Biology/ NSQF level 3 from Sector Skill Councils / Diploma holder from ITI in (Biology/ Agriculture/ Biotech/ Microbiology/biomedical Science).

Facilities: Smart and Interactive Class

Other Requisites: Video collection, Books, CDs, Access to On-line resources, Display Charts Lab Requisites: Microscopes, Stains, Dissection box, Hemocytometer, Specimens, Permanent slides, Autoclave, incubator, Oven, laminar flow cabinet, balances, Fermenter, Anaerobic jar and Spectrophotometer

Sunbeam College For Women, Bhagwanpur Varanasi

B.Sc Botany I Semester 2025-26 (Dr. Ekta Shukla)

Course Code: : BS2440102P Course Title: Techniques in Microbiology & Plant Pathology (Practical)

S.No.	Unit	Month	Week	No. of Lectures	Topics			
1	I	August (24 Days)	2nd	2	Bridge Course			
					Bridge Course			
			3rd	2	Laboratory safety and good laboratory practices 2. Principles and application of Laboratory instruments-microscope, incubator, autoclave			
					Laboratory safety and good laboratory practices 2. Principles and application of Laboratory instruments-centrifuge, filtration unit, pH meter			
			4th	2	Cleaning and Sterilization methods of glassware and media			
					Preparation and Sterilization of media- Nutrient Agar and Broth.			
			5th	2	Identification of fungi by lactophenol cotton blue method- <i>Rhizopus</i> ,			
					Identification of fungi by lactophenol cotton blue method- <i>Peziza</i>			
			3	III and IV	SEPTEMBER (22 Days)	1st	2	Identification of fungi by lactophenol cotton blue method- <i>Puccinia</i>
								Identification of fungi by lactophenol cotton blue method- <i>Alternaria</i>
2nd	2	Permanent slides of uredial, telial, pycnial & aecial stages of <i>Puccinia</i>						
		<i>Agaricus</i> : Specimens of button stage and full-grown mushroom; Sectioning of gills of <i>Agaricus</i> through permanent slide.						
3rd	2	Lichens: crustose, foliose and fruticose specimens						
		To study the thallus structure of the following Algal taxa of different classes with temporary mounting and staining – <i>Spirulina, Nostoc</i>						
4th	2	To study the thallus structure of the following Algal taxa of different classes with temporary mounting and staining – Chlorophyceae - <i>Chlorella, Volvox</i>						
		To study the thallus structure of the following Algal taxa of different classes with temporary mounting and staining- <i>Chara, Vaucheria</i>						

4	V	OCTOBER (18 days)	2nd	2	To study the thallus structure of the following Algal taxa of different classes with temporary mounting and staining- <i>Ectocarpus and Polysiphonia</i>
					EXPERIMENTAL PLANT PATHOLOGY - Preparation of fungal media (PDA).
			3rd	2	Identification of diseases with the help of pathological specimens- White Rust of Crucifers
					Identification of diseases with the help of pathological specimens- Black rust of Wheat, red rot of Sugarcane,
			5th	2	Identification: of diseases with the help of pathological specimens-Red rot of Sugarcane, Late blight of potato,
					Identification: of diseases with the help of pathological specimens- Citrus Canker and Curling leaf of Papaya
5	II, VI, VII and VIII	NOVEMBR (23 Days)	2nd	2	Staining techniques: Gram's, Staining, Endospore
					Pure culture techniques (Types of streaking, Serial dilution) (Demonstration)
			3rd	2	To study the isolation techniques of nitrogen fixing bacteria from root nodules of legumes (DEMO)
					To study the isolation techniques of Rhizosphere and Phyllosphere microflora.(DEMO)
			4th	2	Wine production. (Demonstration)
					Isolation of lactic acid bacteria from curd.
			5th	2	LEFT OVER PRACTICAL
					LEFT OVER PRACTICAL

Zoology Lecture Plan
B.Sc. 1st Semester
Session- 2025-26

B.Sc. First Year

DETAILED SYLLABUS FOR

Certificate Course in Medical Diagnostics & Public Health

Programme/Class: Certificate	Year: First	Semester: First
Subject: ZOOLOGY		
Course Code: BS2450101T	Course Title: Cytology, Genetics and Infectious Diseases	
Course outcomes: The student at the completion of the course will be able to: <ul style="list-style-type: none">• Understand the structure and function of all the cell organelles.• Know about the chromatin structure and its location.• To be familiar with the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms.• How one cell communicates with its neighbouring cells?• Understand the basic principles of genetics and how genes (earlier called factors) are inherited from one generation to another.• Understand the Mendel's laws and the deviations from conventional patterns of inheritance.• Comprehend how environment plays an important role by interacting with genetic factors.• How to detect chromosomal aberrations in humans and study the pattern of inheritance by pedigree analysis in families.		
Credits: 4	Core: Compulsory	
Max. Marks: 25+75	Min. Passing Marks: as per rules	
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P:4-0-0		
Unit	Topics	Total No. of Lectures (60)
I	Structure and Function of Cell Organelles I <ul style="list-style-type: none">• Plasma membrane: chemical structure—lipids and proteins• Cell-cell interaction: cell adhesion molecules, cellular junctions• Endomembrane system: protein targeting and sorting, endocytosis, exocytosis Introduction to all national and international Biologists (Zoologists) who have contributed/contributing to Zoological and Life Sciences as a mark of tribute to ancient and modern biology will be included as part of the Continuous Internal Evaluation (CIE)	6
II	Structure and Function of Cell Organelles II Cytoskeleton: microtubules, microfilaments, intermediate filaments <ul style="list-style-type: none">• Mitochondria: Structure and function; Oxidative phosphorylation• Peroxisome and ribosome: structure and function	6
III	Nucleus and Chromatin Structure <ul style="list-style-type: none">• Structure and function of nucleus in eukaryotes• Chemical structure and base composition of DNA and RNA• DNA supercoiling, chromatin organization, structure of chromosomes• Types of DNA and RNA	8
IV	<ul style="list-style-type: none">• Cell cycle, Cell Division and Cell Signalling• DNA replication in prokaryotes and eukaryotes	8

	<ul style="list-style-type: none"> • Cell division: mitosis and meiosis • Cell cycle and its regulation, apoptosis • Cancer • Signal transduction: intracellular signaling and cell surface receptors, via G-protein linked receptors, JAK-STAT pathway 	
V	Mendelism and Sex Determination <ul style="list-style-type: none"> • Basic principles of heredity: Mendel's laws, monohybrid and dihybrid crosses • Complete and Incomplete Dominance • Penetrance and expressivity • Genic Sex-Determining Systems, Environmental Sex Determination, Sex Determination in Drosophila, Sex Determination in Humans • Sex-linked characteristics and Dosage compensation 	8
VI	Extensions of Mendelism, Genes and Environment <ul style="list-style-type: none"> • Extensions of Mendelism: Multiple Alleles, Gene Interaction • The Interaction Between Sex and Heredity: Sex-Influenced and Sex Limited Characteristics • Linkage and crossing over • Cytoplasmic Inheritance, Genetic Maternal Effects • Genomic Imprinting, Anticipation • Interaction Between Genes and Environment: Environmental Effects on Gene Expression, Inheritance of Continuous Characteristics 	8
VII	Human Chromosomes and Patterns of Inheritance <ul style="list-style-type: none"> • Human karyotype • Chromosomal anomalies: Structural and numerical aberrations with examples; Gene mutation • Pedigree analysis • Patterns of inheritance: autosomal dominant, autosomal recessive, X-linked recessive, X-linked dominant 	8
VIII	Infectious Diseases <ul style="list-style-type: none"> • Introduction to pathogenic organisms: viruses, bacteria, fungi, protozoa, and worms. • Structure, life cycle, pathogenicity, including diseases, causes, symptoms and control of common parasites: Trypanosoma, Giardia and Wuchereria 	8

Suggested Readings:

1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
2. Alberts et al: Molecular Biology of the Cell: Garland (2002).
3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
5. Lewin B. Genes VIII. Pearson (2004).
6. Watson et al. Molecular Biology of the Gene. Pearson (2004).
7. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis Kuby Immunology. W H Freeman (2007).
8. Delves Peter J., Martin Seamus J., Burton Dennis R., Roitt Ivan M. Roitt's Essential Immunology, 13th Edition. Wiley Blackwell (2017).
9. Shetty Nandini Immunology Introductory Textbook. New Age International. (2005)

Suggested Continuous Evaluation Methods:

Total Marks: 25

Class Test: 10 Marks

Written Assignment/Presentation/Project / Research orientation/Seminar:/ Quiz: 15 marks

Sunbeam College for Women, Bhagwanpur, Varanasi

B.Sc. I Semester (Session 2025-26)

Course Code: BS2450101T

Course Title:- Cytology ,Genetics and infectious disease

Teacher- Dr. Priti Srivastava

Recommended Books:-

1. Lodish et al: Molecular Cell Biology: 1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
2. Alberts et al: Molecular Biology of the Cell: Garland (2002).
3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
5. Lewin B. Genes VIII. Pearson (2004).
6. Watson et al. Molecular Biology of the Gene. Pearson (2004).
7. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis KubyKuby Immunology. W H Freeman (2007).
8. Delves Peter J., Martin Seamus J., Burton Dennis R., Roitt Ivan M. Roitt's Essential Immunology, 13th Edition. Wiley Blackwell (2017).
9. Shetty Nandini Immunology Introductory Textbook. New Age International. (2005)

S. No.	Unit	Month	Week	No. of lectures	Topics
1	IV	August	1st	1	Bridge course (Brief account of famous discovery and inventions in field of Cyto- genetics)
			2nd	2	Bridge course (Different types of cell and Tissue)
			3rd	1	Bridge course (Histological studies of tissues)
			4th	3	DNA and RNA; • DNA replication in prokaryotes and eukaryotes
			5th	3	Cell cycle and its regulation
2	IV & V	September	1st	2	Cell division mitosis, meiosis
			2nd	3	Apoptosis and cancer
			3rd	1	Signal transduction: intracellular signaling and cell surface receptors, via G-protein linked receptors, JAK-STAT pathway,
			4th	3	Basic principles of heredity: Mendel's laws, monohybrid and dihybrid crosses: Complete and Incomplete Dominance
			5th		
3	VI	October	1st		
			2nd	3	Penetrance and expressivity; Epistasis
			3rd	2	Extensions of Mendelism: Multiple Alleles, Gene Interaction
			4th	2	Genic Sex-Determining Systems; Environmental Sex Determination, Sex Determination in Drosophila, Sex Determination in Humans
			5th	2	Sex-linked characteristics and Dosage compensation
4	VII & IV	November	1st	1	The Interaction Between Sex and Heredity: Sex-Influenced and Sex- Limited Characteristics
			2nd	3	Interaction Between Genes and Environment: Environmental Effects on Gene Expression, Inheritance of Continuous Characteristics; Human karyotype
			3rd	3	Genomic Imprinting, Anticipation; cytoplasmic inheritance, Genetic maternal effect
			4th	3	Chromosomal anomalies: Structural and numerical aberrations with examples; gene mutation
			5th	3	Pedigree analysis; Patterns of inheritance: autosomal dominant, autosomal recessive; X-linked recessive, X-linked dominant,

B.Sc. Ist year (BZC) Semester: First 2025-26

Course Code: BS2450101T Course Title: - Cytology, Genetics and Infectious Diseases

Reference Books:

- 1. Cell Biology by P.S. Verma & V. K. Agarwal**
- 2. ZOOLOGY for BSc students Cytology, Genetics and Infectious Diseases by VK Agarwal S. Chand Publications**
- 3. Cell and Molecular Biology by De Robertis**

Teacher: Dr. Madhumita Srivastava

Sl. No.	Unit	Month	Week	No. of Lectures (43)	Topics
1	I & II	August	1st	0	
			2nd	3	Unit I: Structure and Function of Cell Organelles I Plasma membrane: Chemical Structure- Lipids and Proteins Cell- cell interaction: Cell adhesion molecules, Cellular junctions
			3rd	3	Endomembrane system Protein targeting and sorting, Endocytosis, Exocytosis
			4th	3	Unit II: Structure and Function of Cell Organelles II Cytoskeleton: Microtubules
			5th	3	Microfilaments Intermediate filaments
2	II	September	1st	3	Unit II: Structure and Function of Cell Organelles II contd. Mitochondria: Structure & Function
			2nd	3	Kreb's cycle, Electron Transport Chain Oxidative Phosphorylation
			3rd	2	Peroxisome
			4th	3	Ribosome: Structure and Function
			5th	0	
3	III	October	1st	0	
			2nd	3	Unit III: Nucleus and Chromatin Structure Structure and function of Nucleus in Eukaryotes Chemical Structure and base composition of DNA and RNA
			3rd	3	DNA supercoiling, chromatin organization
			4th	0	
			5th	3	Structure of Chromosomes Types of DNA and RNA
4	VIII		1st	0	
			2nd	2	Unit- VIII: Infectious Diseases Introduction to pathogenic organisms: Viruses Bacteria
		November	3rd	3	Fungi Protozoa Parasitic Worms
			4th	3	Structure, Life cycle, Pathogenicity including diseases, causes, symptoms and control of common parasites: <i>Trypanosoma</i>
			5th	3	<i>Giardia</i> <i>Wuchereria</i>

Programme/Class: Certificate	Year: First	Semester: First
Subject: ZOOLOGY		
Course Code: BS2450102P	Course Title: Cell Biology & Cytogenetics Lab	
Course outcomes: At the completion of the course students will learn Hands-on: 1. To use simple and compound microscopes. 2. To prepare slides and stain them to see the cell organelles. 3. To be familiar with the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms. 4. The chromosomal aberrations by preparing karyotypes. 5. How chromosomal aberrations are inherited in humans by pedigree analysis in families. 6. The antigen-antibody reaction		
Credits: 2	Core: Compulsory	
Max. Marks: 25+75	Min. Passing Marks: as per rules	
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P:0-0-4		
Unit	Topics	Total No. of Lectures (60)
I	1. To study different cell types such as buccal epithelial cells, neurons, striated muscle cells using Methylene blue. 2. To study the different stages of Mitosis in root tip of onion. 3. To study the different stages of Meiosis in grasshopper testis. 4. To prepare molecular models of nucleotides, amino acids, dipeptides using bead and stick method. 5. To check the permeability of cells using salt solution of different concentrations.	15
II	1. Study of parasites (eg. Protozoans, helminths etc.) from permanent slides. 2. To learn the procedures for preparation of temporary and permanent stained/unstained slides	15
III	1. Study of mutant phenotypes of Drosophila. 2. Preparation of polytene chromosomes. 3. Study of sex chromatin (Barr bodies) in buccal smear and hair bud cells (Human). 4. Preparation of human karyotype and study the chromosomal aberrations with respect to number, translocation, deletion etc. from the pictures provided. 5. To prepare family pedigrees. 6. Genetical exercises	15
IV	Virtual Labs (Suggestive sites) https://www.vlab.co.in https://zoologysan.blogspot.com www.vlab.iitb.ac.in/vlab www.onlinelabs.in www.powershow.com https://vlab.amrita.edu https://sites.dartmouth.edu	15

Suggested Readings:

1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
2. Alberts et al: Molecular Biology of the Cell: Garland (2002).
3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
5. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis Kuby Kuby Immunology. W H Freeman (2007).
6. Kesar, Saroj and Vashishta N. (2007). Experimental Physiology: Comprehensive Manual. Heritage Publishers, New Delhi Course Books published in Hindi may be prescribed by the Universities and Colleges

Course prerequisites: To study this course, a student must have had the subject biology in class/12th
The eligibility for this paper is 10+2 from Arts/ Commerce/ Science

Suggested Continuous Evaluation Methods:

Total Marks: 25

Class Test: 10 Marks

Written Assignment/Presentation/Project / Term Papers/Seminar: 15 Marks

At the End of the whole syllabus any remarks/suggestions: University must ensure incorporation of all 04 units including virtual labs in practical evaluation.

B.Sc. Ist year (BZC)		Semester: First		2025-26	
Course Code: BS2450102		Course Title - Cell Biology and Cytogenetics Lab			
Practical Book: Modern Practical Zoology Vol. I by Yadav & Varshney					
Teacher: Dr. Madhumita Srivastava					
Sl. No.	Unit	Month	Week	No. of Lectures (30)	Topics
1	I	August	1st	0	
			2nd	2	To study different cell types such as buccal epithelial cells neurons, striated muscle cells using Methylene blue.
			3rd	2	To study the different stages of Mitosis in root tip of onion.
			4th	2	To study the different stages of Meiosis in grasshopper testis.
			5th	2	To prepare molecular models of nucleotides, amino acids, dipeptides using bead and stick method.
2	I & II	September	1st	2	To check the permeability of cells using salt solution of different concentrations.
			2nd	2	Study of Protozoan parasites from permanent slides.
			3rd	2	Study of Helminths parasites from permanent slides.
			4th	2	To learn the procedures for preparation of temporary and permanent stained/unstained slides
			5th	0	
3	III	October	1st	0	
			2nd	2	Study of mutant phenotypes of Drosophila.
			3rd	2	Preparation of polytene chromosomes.
			4th	0	
			5th	2	Study of sex chromatin (Barr bodies) in buccal smear and hair bud cells (Human).
4	III contd.	November	Ist	0	
			2nd	2	Preparation of human karyotype and study the chromosomal aberrations with respect to number, translocation, deletion etc. from the pictures provided.
			3rd	2	Preparation of human karyotype and study the chromosomal aberrations with respect to number, translocation, deletion etc. from the pictures provided contd.
			4th	2	To prepare family pedigrees.
			5th	2	Presentation (Chart- making)

Programme: B.Sc.		Year: First	Semester: First
Subject: Science			
Course Code: 240107C		Course Title: Food, Nutrition and Hygiene	
Course outcomes: <ul style="list-style-type: none"> To learn the basic concept of the Food and Nutrition To study the nutritive requirement during special conditions like pregnancy and lactation To learn meal planning To learn 100 days Nutrition Concept To study common health issues in the society To learn the special requirement of food during common illness 			
Credits: 2		Co-Curricular Course	
Max. Marks: 25+75			
Total No. of Lectures: 30			
Unit	Topics		No. of Lectures
I	Concept of Food and Nutrition (a) Definition of Food, Nutrients, Nutrition, Health, balanced Diet (b) Types of Nutrition- Optimum Nutrition, under Nutrition, Over Nutrition (c) Meal planning- Concept and factors affecting Meal Planning (d) Food groups and functions of food		8
II	Nutrients: Macro and Micro RDA, Sources, Functions, Deficiency and excess of: Carbohydrate, Fats, Protein, Minerals: Major: Calcium, Phosphorus, Sodium, Potassium Trace: Iron, Iodine, Fluorine, Zinc Vitamins: Water soluble vitamins: Vitamin B, C; Fat soluble vitamins: Vitamin A, D, E, K Water, Dietary Fibre		7
III	1000 days Nutrition (a) Concept, Requirement, Factors affecting growth of child (b) Prenatal Nutrition (0 - 280 days): Additional Nutrients' Requirement and risk factors during pregnancy (c) Breast / Formula Feeding (Birth – 6 months of age) (d) Complementary and Early Diet (6 months – 2 years of age)		8
IV	Community Health Concept (a) Causes of common diseases prevalent in the society and Nutrition requirement in the following: Diabetes, Hypertension (High Blood Pressure), Obesity, Constipation, Diarrhea, Typhoid (b) National and International Program and Policies for improving Dietary Nutrition (c) Immunity Boosting Food		10
Suggested Readings:			
1. Singh, Anita, "Food and Nutrition", Star Publication, Agra, India, 2018. 2. 1000Days-Nutrition_Brief_Brain-Think_Babies_FINAL.pdf 3. https://pediatrics.aappublications.org/content/141/2/e20173716 4. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5750909/ 5. Sheel Sharma, Nutrition and Diet Therapy, Peepee Publishers Delhi, 2014, First Edition.			
Latest edition of the text books should be used.			
This course can be opted as Co-Curricular Course by the students of following subjects: Open for all			
Suggested Continuous Evaluation Methods: Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall be as follows:			
Class Test		(10 marks)	
Quiz/ Seminar/ Project/ Presentation/ Research Orientation Assignment/ Assignments (Charts/ Flora/ Rural Service/ Technology Dissemination/ Excursions/ Lab Visits/ Industrial Training)		(15 marks)	

B.Sc. I yr (BZC) Semester I 2025-26

Paper- Food, Nutrition and Hygiene (Co- Curricular Course)

Sl. No.	Unit	Month	Week	No. of Lectures (30)	Topics
1	I	August	1st	0	
			2nd	2	Concept of Food and Nutrition (a) Definition of Food, Nutrients, Nutrition, Health, balanced Diet (b) Types of Nutrition
			3rd	2	Optimum Nutrition, under Nutrition, Over Nutrition
			4th	2	(c) Meal planning- Concept and factors affecting Meal Planning
			5th	2	d) Food groups and functions of food
2	II	September	1st	1	Nutrients: Macro and Micro RDA, Sources, Functions, Deficiency and excess of (a) Carbohydrate (b) Fats
			2nd	2	(c) Protein (d) Minerals Major: Calcium, Phosphorus, Sodium, Potassium Trace: Iron, Iodine, Fluorine, Zinc
			3rd	2	(e) Vitamins Water soluble vitamins: Vitamin B, C Fat soluble vitamins: Vitamin A, D, E, K
			4th	2	(f) Water (g) Dietary Fibre
			5th	0	
3	III	October	1st	0	
			2nd	2	1000 days Nutrition (a) Concept of 1000 days Nutrition Requirement of 1000 days Nutrition Factors affecting growth of child
			3rd	2	(b) Prenatal Nutrition (0 - 280 days) Additional Nutrients' Requirement and risk factors during pregnancy
			4th	1	(c) Breast / Formula Feeding (Birth – 6 months of age) Formula Feeding
			5th	2	Complementary and Early Diet (6 months – 2 years of age)
4	IV	November	1st	0	
			2nd	2	Community Health Concept (a) Causes of common diseases prevalent in the society and Nutrition requirement in the following: Diabetes Hypertension (High Blood Pressure) Obesity
			3rd	2	Constipation Diarrhea Typhoid
			4th	2	(b) National and International Program and Policies for improving Dietary Nutrition
			5th	2	(c) Immunity Boosting Food

Programme/Class: **Certificate**

Year: **First**

Semester: **First**

Subject: **Vocational**

Course Code: **240109V**

Course Title: **Basics of Computers and Electronics**

Course Outcomes (COs)

1. Understand the basics of computer hardware and software.
3. Comprehend the difference between conductors and semiconductors.
4. Understand the basics of fundamental electronics.
5. Basic idea of digital electronics.

Credit: 3

Max.Marks: 25+75

Core compulsory/Elective

Min. Passing Marks:10+25.

PART A

Introduction to Computers

Unit -I

Definition, history, and evolution of computers, Types of computers (analog, digital, hybrid), Basic components (input, processing, output, storage devices)

No. of Lecture: 7

Unit -II

Computer Hardware

CPU (architecture, functions), Memory (types, hierarchy), Input/output devices (keyboard, mouse, monitor, speakers), Storage devices (types, characteristics).

No. of Lecture: 7

Unit -III

Computer Software

Types of software (system, application, utility), Operating Systems (functions, types), Application software (word processing, spreadsheet, presentation).

No. of Lecture: 7

PART B

Introduction to Electronics

Unit -IV

Basic concepts; Behaviour of electric charge, Emission of electrons, energy level of atoms, various bands in conductors and semiconductors.

No. of Lecture: 8

Unit -V

Digital Electronics

Number systems; binary, decimal, hexadecimal and their interconversion, Logic gates (AND, OR, NOT) and their combinations. Construction of logic gates.

No. of Lecture: 8

Unit -VI

Electronics Fundamentals

Electric circuits (series, parallel), Electronic devices (resistors, capacitors, inductors), Basic electronic materials, semiconductor and current conduction through them.

No. of Lecture: 8

LECTURE PLAN

Academic session 2025-2026

Class/Section – B.Sc. 1st year-1st Sem [PMC]

Teacher Name: Dr. Devendra Mohan Upadhyay and Dr. Amit Kumar

Subject: Vocational

Course Code: 240109V

Course Title: Basics of Computers and Electronics

Reference Book:

PART B

1. Charles Kittel, Walter D. Knight, Malvin A. Ruderman, Carl A. Helmholz, Burton J. Moyer, "Mechanics (In SI Units): Berkeley Physics Course Vol 1", McGraw Hill, 2017, 2e
2. Richard P. Feynman, Robert B. Leighton, Matthew Sands, "The Feynman Lectures on Physics - Vol. 1", Pearson Education Limited, 2012
3. Hugh D. Young and Roger A. Freedman, "Sears & Zemansky's University Physics with Modern Physics", Pearson Education Limited, 2017, 14e
4. D.S. Mathur, P.S. Hemne, "Mechanics", S. Chand Publishing, 1981, 3e
5. J. C. Upadhyay, "Mechanics", S. Chand Publishing, 1981,

Lecture Plan

Month	Unit	Week	No. of Planned Lecture	Topic
August	I and II	1 st	2	PART A: Introduction to Computers Unit -I: Definition, history, and evolution of computers,
		2 nd	1	Types of computers (analog, digital, hybrid),
		3 rd	1	Basic components (input, processing, output, storage devices)
		4 th	2	Unit -II: Computer Hardware CPU (architecture, functions), Memory (types, hierarchy),
		5 th	2	Input/output devices (keyboard, mouse, monitor, speakers), Storage devices (types, characteristics).
September	III and IV	1 st	1	Unit -III: Computer Software: Types of software (system, application, utility),
		2 nd	2	Operating Systems (functions, types),
		3 rd	2	Application software (word processing, spreadsheet, presentation).
		4 th	2	PART B: Introduction to Electronics: Unit -IV Basic concepts; Behaviour of electric charge,
		5 th	-----	
October	III	1 st	-----	
		2 nd	2	Emission of electrons, energy level of atoms, various bands in conductors and semiconductors.
		3 rd	1	Unit -V: Digital Electronics: Number systems;
		4 th	2	Number systems; binary, decimal, hexadecimal and their interconversion,
		5 th	1	Logic gates (AND, OR, NOT) and their combinations. Construction of logic gates.
November	VIII	1 st	1	Logic gates (AND, OR, NOT) and their combinations. Construction of logic gates.
		2 nd	2	Unit -VI: Electronics Fundamentals: Electric circuits (series, parallel),
		3 rd	2	Electronic devices (resistors, capacitors, inductors),
		4 th	2	Basic electronic materials, semiconductor and current conduction through them.
		5 th	2	Revision
Total			30	