ATAL BIHARI VAJPAYEE VISHWAVIDYALAYA, BILASPUR (C.G)

(Established by Chhattisgarh Legislative Assembly Act No. 07 of 2012)

Scheme and Syllabus

of

Bachelor of Science

Year- First

W.E.F. Session:- 2023-24

Syllabus Approved by the Central Board of Studies

B.Sc. Ist Year

1. Foundation Course -   i. Hindi   ii. English
2. Physics
3. Chemistry
4. Botany
5. Zoology
6. Mathematics
7. Microbiology
8. Geology
9. Anthropology
10. Biochemistry
11. Biotechnology
12. Computer Science
13. Information Technology
14. Electronics
15. Forestry

बी.ए./ बी.एस-सी./ बी.कॉम./ बी.एच.एस.सी. भाग -एक

(आधार पाठ्यक्रम)

प्रथम प्रश्नपत्र

हिंदी भाषा

कोड....   पूर्णांक 75
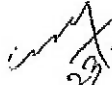
                                                                क्रेडिट 05

पाठ्यक्रमका उद्देश्य:-

1.हिंदी भाषाके प्रयोजनात्मक स्वरूप का सामान्य ज्ञान प्रदान करना।

2.कंप्यूटर में हिंदी भाषा के प्रयोग की आवश्यकता के अनुरूप कंप्यूटर की कार्य प्रणाली की आरंभिक जानकारी से अवगत होने के लिए प्रेरित करना।

3.हिंदी व्याकरण की बुनियादी ज्ञान संप्रेषण कौशल तथा भाषायी दक्षता से अवगत कराना।
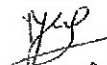
4.साहित्य और समाज को समझने की दिशा में रुझान उत्पन्न करना।

पाठ्य विषय:-

इकाई 1. (क) पल्लवन, पत्राचार, अनुवाद (ख) एक टोकरी भर मिट्टी : माधवराव सप्रे बड़े भाई साहब : प्रेमचंद	अंक 15 18 कालखंड
इकाई 2. (क) संक्षेपण, हिंदी में संक्षिप्तिकरण, हिंदी-अपठित गद्यांश, पारिभाषिक शब्दावली, हिंदी में पदनाम, मुहावरे एवंलोकोक्तियाँ (ख) जागो फिर एक बार: सूर्यकांत त्रिपाठी 'निराला' जन्मदिन ('मिट्टी से कहूँगाधन्यवाद' संग्रह से):एकांत श्रीवास्तव	अंक 15 18 कालखंड
इकाई 3. (क) शब्द-शुद्धि, वाक्य-शुद्धि, शब्द-ज्ञान- पर्यायवाची शब्द, विलोम शब्द, अनेकार्थी-शब्द, समश्रुत शब्द, अनेक शब्दों के लिए एक शब्द (ख) भोलाराम का जीव : हरिशंकर परसाई जीप पर सवार इल्लियां: शरद जोशी	अंक 15 18 कालखंड
इकाई 4.(क) मानक भाषा का अर्थ, मानक हिंदी भाषाका अर्थ, स्वरूप,	अंक 15

बी.ए./ बी.एस-सी./ बी.कॉम./ बी.एच.एस.सी. भाग -एक

(आधार पाठ्यक्रम)

प्रथम प्रश्नपत्र

हिंदी भाषा

कोड....   पूर्णांक 75
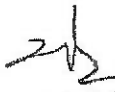
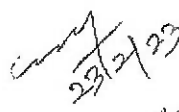   क्रेडिट 05

पाठ्यक्रमका उद्देश्य:-

1.हिंदी भाषाके प्रयोजनात्मक स्वरूप का सामान्य ज्ञान प्रदान करना।

2.कंप्यूटर में हिंदी भाषा के प्रयोग की आवश्यकता के अनुरूप कंप्यूटर की कार्य प्रणाली की आरंभिक जानकारी से अवगत होने के लिए प्रेरित करना।

3.हिंदी व्याकरण की बुनियादी ज्ञान संप्रेषण कौशल तथा भाषायी दक्षता से अवगत कराना।

4.साहित्य और समाज को समझने की दिशा में रुझान उत्पन्न करना।

पाठ्य विषय:-

इकाई 1. (क) पल्लवन, पत्राचार, अनुवाद (ख) एक टोकरी भर मिट्टी : माधवराव सप्रे बड़े भाई साहब : प्रेमचंद	अंक 15 18 कालखंड
इकाई 2. (क) संक्षेपण, हिंदी में संक्षिप्तिकरण, हिंदी-अपठित गद्यांश, पारिभाषिक शब्दावली, हिंदी में पदनाम, मुहावरे एवंलोकोक्तियाँ (ख) जागो फिर एक बार: सूर्यकांत त्रिपाठी 'निराला' जन्मदिन ('मिट्टी से कहूँगाधन्यवाद' संग्रह से):एकांत श्रीवास्तव	अंक 15 18 कालखंड
इकाई 3. (क) शब्द-शुद्धि, वाक्य-शुद्धि, शब्द-ज्ञान- पर्यायवाची शब्द, विलोम शब्द, अनेकार्थी-शब्द, समश्रुत शब्द, अनेक शब्दों के लिए एक शब्द (ख) भोलाराम का जीव : हरिशंकर परसाई जीप पर सवार इल्लियां: शरद जोशी	अंक 15 18 कालखंड
इकाई 4.(क) मानक भाषा का अर्थ, मानक हिंदी भाषाका अर्थ, स्वरूप,	अंक 15

विशेषताएँ, मानक, उपमानक, अमानक-भाषा	18 कालखंड
(ख) शिकागो से स्वामी विवेकानंद का पत्र सत्य और अहिंसा : महात्मा गांधी	
इकाई 5. (क) देवनागरी लिपि- नामकरण, स्वरूप, विशेषताएँ, कंप्यूटर का सामान्य परिचय, कंप्यूटर में हिंदी का अनुप्रयोग। (ख) कछुआ-धरम : चन्द्रधर शर्मा 'गुलेरी' छत्तीसगढ़ का वैभव: हीरालाल शुक्ल	अंक 15 18 कालखंड

मूल्यांकन योजना:-

प्रत्येक इकाई से एक-एक प्रश्न पूछे जाएंगे। एक प्रश्न के 15 अंक होंगे। प्रत्येक प्रश्न में आंतरिक विकल्प होगा। प्रत्येक प्रश्न के दो भाग 'क' और 'ख' होंगे एवं अंक क्रमश:08 एवं 07 होंगे। प्रश्नपत्र का पूर्णांक 75 निर्धारित है।

प्रश्नपत्रकेपूर्णांककादसप्रतिशतअंकआंतरिकमूल्यांकनकेलिएनिर्धारितहैं।
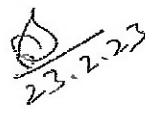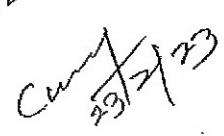
पाठ्यक्रम अधिगम परिणाम:-

इस पाठ्यक्रम को पूर्ण करने के पश्चात विद्यार्थी:-
1. हिंदी प्रयोजनात्मक तथा कार्यशील भाषा के प्रति सजग होंगे।
2. भाषा संबंधी संभावित अशुद्धियों एवं उनके परिष्कारसे परिचित होंगे तथा मानक भाषा का व्यवहार करने में सक्षम होंगे।
3. विद्यार्थियों के शब्द भंडार में वृद्धि होगी।
4. हिंदी साहित्य के पठन-पाठन के प्रति रुचि जागृत होगी एवं सामाजिक महत्व के विविध आयामों को समझने की दृष्टि विकसित होगी।
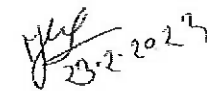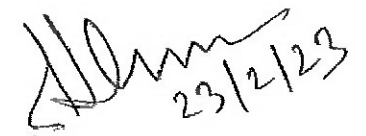
पाठ्यक्रम निर्माण का औचित्य:-
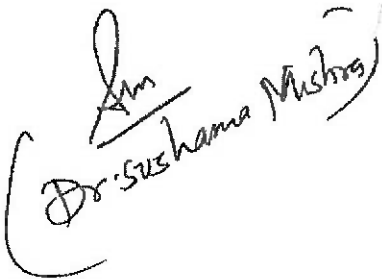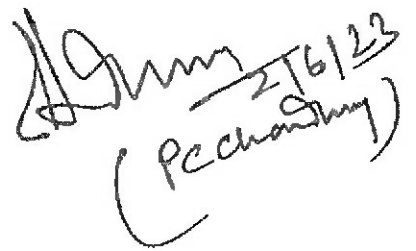
Central Board of Studies Foundation Course Paper-II
English Language for Under Graduate Students

Programme Outcomes for English Language B.A/B.Sc/B.Com I, II, III

The programme enables a student to get acquainted

- With the rich cultural heritage and develops patriotic feelings through the works of Indian authors & poets.
- To get exposure of the usage of grammar according to contemporary times.
- To have an exposure about the literary genre with the help of the authors & poets across the globe.
- To develop an appreciation for English Language & Communication Skills.

27/6/23

(PC Choudhry)

(Dr. Sushama Mishra)

Learning Outcomes (English Language) B.A/B.Sc/B.Com - I, II,III

The learning outcomes are as follows:

1. To strengthen the linguistic skills - Listening, Speaking, Reading and Writing.

2. To refine the way of thinking and speaking which would lead them to have mighty ideas in day to day life.

3. To improve students speaking ability in English both in terms of fluency and comprehensibility.

4. To enhance practical use of English in day-to-day life.

5. To enrich the vocabulary of the students.

Programme Specific Outcomes FC_ Paper-II
(English Language) B.A/B.Sc/B.Com - I, II,III

The Programme Specific outcomes are as follows:

1. To develop abilities of the students as a critical reader and writer.

2. To develop the ability of public interaction and speaking.

3. To develop self awareness about English language.

4. To develop critical thinking .

To give a practice in writing, drafting of English assignments.

(Dr. Sushama Mishra)

2/6/23

(P C Choudhary)

BA/B.Sc./B.Com/B.Sc. Home.Sc. (Part-I)
Foundation Course Paper-II English Language

Max. Marks:75
Total credits: 05

Qualifying Marks:26

Paper-II	Mark's	Period's	Credit
Unit-I Flamingo : A Textbook for college students Publication : Macmillan Publishers	3x5=15	18	01
Unit -II • Writing Skill • Describing a place or a person. • Writing a Biographical Sketch • Narrating an event or experience	1x10=10	18	01
Unit -III Reading Comprehension • (a) Unseen Passage (Normal) • (b) Vocabulary (Text-based)	1x5=05 1x10=10	18	01
Unit -III Reading Comprehension (a) Unseen Passage (Normal) (b) Vocabulary (Text-based)	1x5=5 1x5=5	09	0.5
Unit-V Grammar • Articles • Gerunds /Participles • Subject Verb Agreement • Use of Conjunctions • Tenses • Relatives • Possessives & self forms • Grammatical items given in Textbook 'Flaminso'	1x25=25	27	1.5
Total	75	90	05
Recommended Books- 1. Essential English Grammar, 2nd Edition by Raymond Murphy, Cambridge Publication 2. English Grammar in use 5th edition by Raymond Murphy, Cambridge Publication. 3. Advanced English Grammar by Martine Hewings Cambridge University Press.			

(Dr. Sushama Mishra)

2/6/23

(P. Choubey)

Scheme of B. Sc. Physics

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	PHY-1T	Mechanics	Theory	4	50	17
	PHY-2T	Electricity and Magnetism	Theory	4	50	17
	PHY-1P	LAB 1: Mechanics, Electricity and Magnetism	Practical	2	50	17

Part A: Introduction				
Program: Certificate Course		Class: B.Sc.	Year: First	Session: 2022-2023
1	Course Code	PHY – 1T		
2	Course Title	MECHANICS		
3	Course Type	Theory		
4	Pre-requisite (if any)	No		
5	Course Learning Outcomes (CLO)	After completion of the course students will be able to: • Get knowledge about the vectors and differential equations used in physics. • Get an idea of different types of motions and conservation laws. • Get an idea about rotational motion and various properties of matter like elasticity and viscosity. • Understand various types of oscillatory motion and GPS system. • Get an idea about Frame of reference and special theory of relativity. • Solve numerical problems based on entire syllabus.		
6	Credit Value	Theory : 4		
7	Total Marks	Max. Marks: 50		Min Passing Marks : 17

Part B: Content of the Course		
Total Periods: 60		
Unit	Topic	Number of Periods
I	**Vectors:** Vector algebra, Derivatives of a vector with respect to a parameter, Scalar and vector products of two, three and four vectors, Gradient, divergence and curl of vectors fields, Polar and Axial vectors. **Ordinary Differential Equations:** 1st order homogeneous differential equations, exact and non-exact differential equations, 2nd order homogeneous and nonhomogeneous differential equations with constant coefficients (Operator Method Only).	12
II	**Laws of Motion:** Review of Newton's Laws of motion, Dynamics of a system of particles, Concept of Centre of Mass, determination of center of mass for discrete and continuous systems having cylindrical and spherical symmetry. **Work and Energy:** Motion of rocket, Work-Energy theorem for conservative forces, Force as a gradient of Potential Energy, Conservation of momentum	12

		and energy, Elastic and in-elastic Collisions.	
III		**Rotational Dynamics:** Angular velocity, Angular momentum, Torque, Conservation of angular momentum, Moment of Inertia, Theorem of parallel and perpendicular axes (statements only), Calculation of Moment of Inertia of discrete and continuous objects (rod, disc, cylinder, solid sphere).	12
		Elasticity: Hooke's Law – Stress – strain diagram – Elastic moduli – Relation between elastic constants – Poisson's Ratio – Expression for Poisson's Ratio in terms of Elastic Constants – Work done in stretching and work done in twisting a wire – Twisting couple on a cylinder – Determination of Rigidity modules, Elementary idea of Surface tension and Viscosity, flow of fluids, coefficient of viscosity, Stoke's law, expression for terminal velocity, wetting.	
IV		**Gravitation:** Newton's Law of Gravitation, Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant), Kepler's Laws (statements only), Satellite in circular orbit and applications, Geosynchronous orbits.	12
		Oscillations: Simple harmonic motion, Differential equation of SHM and its solutions, Kinetic and Potential Energy, Total Energy and their time averages, Compound pendulum, Differential equations of damped oscillations and forced oscillations (Conceptual only).	
V		**Special Theory of Relativity:** Frame of reference, Galilean Transformations, Inertial and Non-inertial frames, Outcomes of Michelson Morley's Experiment, Postulates of Special Theory of Relativity, Length contraction, Time dilation, Relativistic transformation of velocity, Relativistic variation of mass, Mass-energy equivalence, Transformation of Energy and Momentum.	12

Part C - Learning Resource
Text Books, Reference Books, Other Resources

Reference Books:

1. University Physics, FW Sears, MW Zemansky & HD Young 13/e, 1986, Addison Wesley
2. Mechanics Berkeley Physics course, v.1:Charles Kittel, et.al. 2007, Tata McGrawHill
3. Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley
4. Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford University Press
5. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

Link for e-Books for Physics:

1. *All e-books of physics https://www.e-booksdirectory.com/listing.php?category=2*
2. *Free physics text book in PDF https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB_EiwAjkNDp5v8Yv6xK1s0*

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3. *Cambridge University Books for Physics https://www.cambridgeindia.org/*
4. *Books for solving physics problems   https://bookboon.com/en/physics-ebooks*

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods: Maximum Marks: 50 Min Marks : 17 Continuous Comprehensive Evaluation (CCE): As per University Guideline University Exam(UE): 50 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	As per University Guideline

Part A: Introduction

Program: Certificate Course		Class: B.Sc.	Year: First	Session: 2022-2023
1	Course Code	PHY – 2T		
2	Course Title	ELECTRICITY AND MAGNETISM		
3	Course Type	Theory		
4	Pre-requisite (if any)	No		
5	Course Learning Outcomes (CLO)	After completion of the course students will be able to – • Get knowledge about the vectors analysis and able to apply in electrostatic and Magnetostatics. • Get idea about electric fields, force and potential. • Get idea about Dielectric and Electric currents and also the application in AC circuits. • Get idea about Magnetic properties of material. • To get idea about Electromagnetic Induction and Maxwell's equation and Electromagnetic wave propagation. • Solve numerical problems based on entire syllabus.		
6	Credit Value	Theory : 4		
7	Total Marks	Max. Marks: 50		Min Passing Marks : 17

Part B: Content of the Course

Total Periods: 60

Unit	Topic	Number of Periods
I	**Vector Analysis:** Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors and its application in electrostatics and magnetostatics.	12
II	**Electrostatics:** Electrostatic Field, electric flux. Gauss's theorem of electrostatics, Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere, Calculation of electric field from potential, Capacitance of an isolated spherical conductor, Parallel plate, spherical and cylindrical condenser, Energy per unit volume in electrostatic field.	12

III	**Dielectric & Electric Currents:** Dielectric medium, Polarisation, Displacement vector, Gauss's theorem in dielectrics, Parallel plate capacitor completely filled with dielectric. Steady current, current density J, non – steady current an ontinuity equation, Kirchoff's law (statement only), Ideal constant – voltage and constant – current sources, Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem and maximum power transfer theorem, Rise and decay of current in LR, CR, LCR circuits.	12
IV	**Magnetism:** Magnetostatics: Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current, Divergence and curl of magnetic field, Magnetic vector potential, Ampere's circuital law. Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility, Brief introduction of dia, para and ferro-magnetic materials.	12
V	**Electromagnetic Induction:** Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils, Energy stored in magnetic field. **Maxwell's equations and Electromagnetic wave propagation:** Equation of continuity of current, Displacement current, Maxwell's equations, Wave equation in free space.	12

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Reference Books:

1. Vector analysis – Schaum's Outline, M.R. Spiegel, S. Lipschutz, D. Spellman, 2nd Edn., 2009, McGraw- Hill Education.
2. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
3. Electricity & Magnetism, J.H. Fewkes & J.Yarwood. Vol. I, 1991, Oxford Univ. Press
4. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
5. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
6. D.J.Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.

Link for e-Books for Physics:

1. *All e-books of physics https://www.e-booksdirectory.com/listing.php?category=2*
2. *Free physics text book in PDF*
   https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB_EiwAjkNDp5v8Yv6xK1s0K ma0VR0AWGlichRwFfCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD_BwE

3. *Cambridge University Books for Physics https://www.cambridgeindia.org/*
4. *Books for solving physics problems https://bookboon.com/en/physics-ebooks*

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods: Maximum Marks: 50 Min Marks: 17 Continuous Comprehensive Evaluation (CCE): As per University Guideline University Exam(UE): 50 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Prese ntation	As per University Guideline

Program: Certificate Course		Part A: Introduction			
		Class: B.Se.		Year: First	Session: 2022-2023
1	Course Code			PHY 1P	
2	Course Title		LAB 1: Mechanics, Electricity and Magnetism		
3	Course Type		Practical		
4	Pre-requisite (if any)		NO		
5	Course Learning Outcomes (CLO)	Expected Outcomes: • To get knowledge about the use of various measuring instruments. • To get understanding about the simple harmonic motion, elasticity, surface tension and viscosity. • Students will be able to understand applications of basic principle of Electricity and Magnetism theory in real world.			
6	Credit Value		Practical : 2		
7	Total Marks		Max. Marks: 50		Min Passing Marks : 17

Part B: Content of the Course	
	Total Lectures: 30
Tentative Practical List	At least 14 experiments from the following: 1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope. 2. To study the random error in observations.

3. To study the motion of the spring and calculate
(a) Spring constant and. (b) g.
4. To determine the Moment of Inertia of a Flywheel.
5. To determine g and velocity for a freely falling body using Digital Timing Technique.
6. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).
7. To determine the Young's Modulus of a Wire by Optical Lever Method.
8. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
9. To determine the elastic constants of a wire by Searle's method.
10. To determine the value of g using Bar Pendulum.
11. To determine the value of g using Kater's Pendulum.
12. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c)DC Current, and (d) checking electrical fuses.
13. To compare capacitances using De'Sauty's bridge.
14. Measurement of field strength B and its variation in a Solenoid (DeterminedB/dx).
15. To study the Characteristics of a Series RC Circuit.
16. To study the) series LCR circuit and determine its (a) Resonant Frequency, (b)Quality Factor.
17. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q.
18. To determine a Low Resistance by Carey Foster's Bridge.
19. To verify the Thevenin and Norton theorem.
20. To verify the Superposition, and Maximum Power Transfer Theorem.

Part C - Learning Resource
Text Books. Reference Books, Other Resources

Reference Books:

1. Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop. 1971, Asia Publishing House.

2. Engineering Practical Physics, S.Panigrahi & B.Mallick,2015, Cengage Learning India Pvt. Ltd.

3. A Text Book of Practical Physics, Indu Prakash and Ramakrishna. 11th Edition. 2011. Kitab Mahal, New Delhi.

Link for e-Books for Physics:

Physics Practical: https://www.uou.ac.in/sites//default/files/slm/BSCPH-104.pdf		
Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Continuous Comprehensive Evaluation (CCE): As per University Guideline University Exam(UE): 50 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Prese ntation	As per University Guideline

Scheme of B. Sc. Chemistry

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	CHEM-1T	Inorganic and Physical Chemistry	Theory	4	50	17
	CHEM-2T	Organic and Physical Chemistry	Theory	4	50	17
	CHEM-1P	LAB I : General Chemistry-1	Practical	2	50	17

Chem-Prod

Part A: Introduction				
Program: Certificate Course		Class: B.Sc. I Year	Year: 2022	Session:2022-23
1.	Course Code	CHEM-1T		
2.	Course Title	Inorganic and Physical Chemistry		
3.	Course Type	Theory		
4.	Pre-requisite (if any)	To Study this course our students must have had the subject chemistry in class +2 or equivalent		
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to learn the following aspects of Chemistry - To learn basic concept of atomic structure and the periodic properties of elements - To understand chemical bonding in ionic and covalent compounds - To study group trends for *s* and *p*-block elements in the periodic table - learn properties and bonding of compounds of the noble gases - Understand the metallurgical extraction of metals. - Basic concepts of Mathematics and Computer for Chemists. - Basics and mechanism of chemical kinetics and catalysis.		
6.	Credit Value	Theory: 4		
7.	Total Marks	Max. Marks: 50		Min. Passing Marks: 17

Part B: Content of the Course		
Total No. of Lecturers: 90		
Unit	Topics	No. of Lectures
I	**Atomic structure :** Bohr's theory and its limitation. General idea of de-Broglie matter-waves, Heisenberg uncertainty principle, Schrödinger wave equation, significance of Ψ and Ψ^2, radial & angular wave functions and probability distribution curves, quantum numbers, Atomicorbital and shapes of *s, p, d* orbitals, Aufbau and Pauli exclusion principles, Hund's Multiplicity rule, electronic configuration of the elements. **Periodic properties:** Detailed discussion of the following periodic properties of the elements, with reference to *s*- and *p*- block. Trends in periodic table and applications in predicting and explaining the chemical behavior. a. Atomic and ionic radii, b. Ionization enthalpy, c. Electron gain enthalpy, d. Electronegativity, Pauling's. Mulliken's, Allred Rochow's scales. Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table.	15
II	**Chemical bonding- I: Ionic bond:** Ionic Solids - Ionic structures, radius ratio & co-ordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy Born-Haber cycle. Solvation energy and solubility of ionic solids, polarizing power & polarizability of ions. Fajan's rule. Ionic character in covalent compounds: Bond moment and dipole	15

	moment. Percentage ionic character from dipole moment and electronegativity difference. Metallic bond-free electron and band theories.	
III	**Chemical bonding-II: Covalent bond:** Valence bond theory and its limitations. Concept of hybridization, equivalent and non-equivalent hybrid orbitals. 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_3, H_3O^+, SF_4, ClF_3, ICl_2^-, XeF_2, XeF_4, XeF_6, $XeOF_2$, $XeOF_4$. Molecular orbital theory. Bond order and bond strength. Molecular orbital diagrams of diatomic and simple heteroatomic molecules N_2, O_2, F_2, CO, NO.	15
IV	**Chemistry of s- & p- block elements:** General concepts on group relationships and gradation properties, Comparative study, salient features of hydrides, solvation & complexation tendencies, General concepts on group relationships and gradation properties. Halides, hydrides, oxides and oxyacids of Boron, Aluminum, Nitrogen and Phosphorus. Boranes, borazines, fullerenes, graphene and silicates, interhalogens and pseudohalogens. Chemical properties of the noble gases. **Metallurgical extraction of Fe, Al and Cu :** Principle of extraction of metal, The occurrence, extraction & isolation of Fe, Al, and Cu	15
V	**Mathematical concepts for chemist:** Basic Mathematical Concepts: Logarithmic relations, curve sketching, linear graphs, Properties of straight line, slope and intercept, Functions, Differentiation of functions, maxima and minima; integrals; ordinary differential equations; vectors and matrices; determinants; Permutation and combination and probability theory. Significant figures and their applications. **Computer for chemists:** Introduction to computer, introduction to operating systems like DOS, Windows, Linux **Use of computer programs:** Running up standard programs & packages such as MS –Word, MS- Excel, Power Point. Execution of linear regression x-y plot, use of software for drawing structures and molecular formulae	15
VI	**Chemical kinetics :** Rate of reaction, Factors influencing rate of reaction, rate law, rate constant, Order and molecularity of reactions, rate determining step, Zero, First and Second order reactions, Rate and Rate Law, methods of determining order of reaction. Chain reactions. Temperature dependence of reaction rate. Arrhenius theory, Physical significance of Activation energy, collision theory, demerits of collision theory, non-mathematical concept of transition state theory. **Catalysis:** Homogeneous and Heterogeneous Catalysis. types of catalyst, characteristics of catalyst, Enzyme catalyzed reactions, Micellar catalyzed reactions, Industrial applications of catalysis.	15

Keywords: Atomic structure, Periodic properties, ionic bonding, covalent bonding, diagonal relationship, metallurgy, computer, memory, chemical kinetics, catalysis

Part C : Learning Resources
Text Books, Reference Books, Other Resources

Suggested Readings :
1. Lee, J. D. Concise Inorganic Chemistry, Wiley, 5th Edition, 2008.
2. Douglas, B.; McDaniel, D. and Alexander J. Concepts & Models of Inorganic
3. Chemistry, Wiley, 3rd Edition, 2006
4. Atkins, P.W. & Paula, J. Physical Chemistry, 10th Ed., Oxford University Press, 2014.
5. Puri, B. R., Sharma, L. R. and Kalia, K. C., Principles of Inorganic Chemistry, Milestone Publishers/ Vishal Publishing Co.; 33rd Edition 2016
6. Madan, R. D. Modern Inorganic Chemistry, S Chand Publishing, 1987.

7. Rodger, G.E. Inorganic and Solid State Chemistry, Cengage Learning India Edition, 2002.
8. Pfennig, B. W. Principles of Inorganic Chemistry, Wiley, 2015.
9. Housecroft, C. E. and Sharpe, A. G. Inorganic Chemistry, Pearson, 4th Edition, 2012
10. Rajarammana, V.,Computers for beginners, PHI Learniong Private Publishers, New Delhi, 2021
11. Tebbutt, P., Basic mathematics for Chemists, IInd Edn. ELBS, 1999
12. Khera, H.C., Gurtu, J.N., Singh, J., Chemistry for B.Sc. Ist Year, Pragati Prakashan
13. Bariyar, A. & Goyal, S., B.Sc. Chemistry Combined (in Hindi), Krishna Educational Publishers Year 2019
14. Puri, B.R., Pathania, M.S., Sharama, L.R., Principles of Physical Chemistry, Vishal Publishing Company 2020
15. Gurtu, J.N., Gurtu, A., Advanced Physical Chemistry, Pragati Prakashan, Meerut, Edition IV, 2017
16. Atkins' Physical Chemistry, 10th Edition, Oxford University Press, 2014
17. Barrow, G.M., Physical Chemistry Tata McGraw-Hill, 2007
18. Ball, D.W., Physical Chemistry, Thomson Press, India. 2007
19. Castellan, G.W., Physical Chemistry, 4th Edition, Narosa, 2004
20. Mortimer, R.G., Physical Chemistry, 3rd Edition, Elsevier, Noida, UP, 2009
21. Levine, I.N., Physical Chemistry, 6th Edition, Tata McGraw-Hill, 2010
22. Metz, C.R., 2000 Solved Problems in Chemistry, Sahaun Series, 2006
23. Engel, T. and Reid, P., Physical Chemistry, 3rd Edition, Prentice Hall, 2012
24. Negi, A.S. & Anand, S.C., A Text Book of Physical Chemistry, 3rd Edition, New Age International Publication
25. Bajpai, D.N., Advanced Physical Chemistry, S. Chand, 2019
26. Bahal & Tuli, Essential of Physical Chemsitry, 2020

E- Learning Resources:

1. http://heecontent.upsdc.gov.in/Home.aspx
2. https://nptel.ac.in/courses/104/106/104106096/
3. http://heecontent.upsdc.gov.in/Home.aspx
4. https://nptel.ac.in/courses/104/106/104106096/
5. https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
6. https://nptel.ac.in/courses/104/103/104103071/#

Fundamental Chemistry related topics on SWAYAM platform and E-pathshala

Part D: Assessment and Evaluation
Maximum Marks: 50

Part A: Introduction

Program: **Certificate Course**		Class: **B.Sc. I Year**	Year: **2022**	Session:**2022-23**
1.	Course Code	CHEM-2T		
2.	Course Title	Organic and Physical Chemistry		
3.	Course Type	Theory		
4.	Pre-requisite (if any)	To Study this course our students must have had the subject chemistry in class +2 or equivalent		
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to learn the following aspects of Chemistry • Understand the fundamentals of physical organic chemistry • Stereochemistry of carbon compounds • Chemistry of Alkenes and Alkynes • Chemistry of Alicyclic and aromatic Hydrocarbons • Understanding kinetic model of gases and its properties. Behavior of real gases, its derivation from ideal behavior, equation of state, isotherms and Law of corresponding states and molecular velocities. • Fundamental concepts of liquid state and colloids & surface chemistry. • Solids. Lattice parameters – its calculation, application of symmetry, solid characteristics of simple salts.		
6.	Credit Value	Theory: 4		
7.	Total Marks	Max. Marks: 50		Min. Passing Marks: 17

Part B: Content of the Course

Total No. of Lecturers: 90

Unit	Topics	No. of Lectures
I	**Basics of organic chemistry**: Influence of hybridization on bond properties (as applicable to ethane, ethene, and ethyne). Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbocations. Resonance or Mesomeric effect, application to (a) acidity of phenol, and (b) acidity of carboxylic acids. Hyper conjugation and its application to stability of carbocations. Free radicals and alkenes. Reactive intermediates: carbanions, carbenes, Nitrene, Basic concept of S_N1, S_N2, E1, E2, E1cb reactions and Neighboring group Participation (NGP). Electrophiles and Nucleophiles: Nucleophilicity and basicity.	15
II	**Introduction to stereochemistry**: Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two or more chiral-centres, Diastereoisomers, meso compounds, Relative and absolute configuration: Fischer, Newman and Sawhorse Projection formulae and their interconversions: Erythrose and threose, D/L, d/l system of nomenclature, Cahn-Ingold-Prelog system of nomenclature (C.I.P rules).	15

	R/S nomenclature. Geometrical isomerism: cis–trans, syn-anti and E/Z notations. Stereospecific and stereoselective synthesis. Asymmetric synthesis.	
III	**Acyclic hydrocarbons:** Alkenes - Preparation of alkenes. Properties: Addition of hydrogen - heat of hydrogenation and stability of alkenes. Addition of halogen and its mechanism. Addition of HX, Markonikov's rule, addition of H_2O, (Oxymercuration-reduction and hydroboration -oxidation). HOX, H_2SO_4 with mechanism and addition of HBr in the presence of peroxide (anti - Markonikov's addition). Dienes - Types of dienes, reactions of conjugated dienes - 1,2 and 1,4 addition of HBr to 1,3 - butadiene and Diel's - Alder reaction. Alkynes: Preparation by dehydrohalogenation of dihalides, dehalogenation of tetrahalides. Properties: Acidity of acetylenic hydrogen (formation of Metal acetylides). Preparation of higher acetylenes, Metal ammonia reductions, Physical properties. Chemical reactivity - electrophilic addition of X_2, HX, H_2O (Tautomerism), Oxidation with $KMnO_4$, OsO_4, reduction and Polymerization, reaction of acetylene.	15
IV	**Alicyclic hydrocarbons (cycloalkanes):** Nomenclature, Preparation by Freunds method, Wislicenus method. Properties - reactivity of cyclopropane and cyclobutane by comparing with alkanes. Stability of cycloalkanes - Baeyer's strain theory, Sachse and Mohr predictions and Pitzer's strain theory. Conformational structures of cyclobutane, cyclopentane, cyclohexane. Confirmers: in substituted cyclohexane, decalins. **Aromatic hydrocarbons:** Aromaticity: Hückel's rule, aromatic character of arenes, cyclic carbocations/ carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directive effects of the groups.	15
V	**Gaseous state chemistry:** Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path; Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy. law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Joule Thomson effect, Liquification of Gases. **Behavior of real gases:** Deviations from ideal gas behavior, compressibility factor (Z), and its variation with pressure and temperature for different gases. Causes of deviation from ideal behavior. Vander Waals equation of state, its derivation and application in explaining real gas behavior, calculation of Boyle temperature. Isotherms of real gases and their comparison with Vander Waals isotherms, continuity of states, critical state, relation between critical constants and Vander Waals constants, law of corresponding states.	15
VI	**Liquid state chemistry:** Intermolecular forces, magnitude of intermolecular force, structure of liquids. Properties of liquids, viscosity and surface tension. **Colloids and surface chemistry:** Classification. Optical, Kinetic and Electrical Properties of colloids. Coagulation. Hardy Schulze law, flocculation value. Protection, Gold number, Emulsion, micelles and types, Gel, Syneresis and thixotropy. Application of colloids. Physical adsorption, chemisorption, adsorption isotherms (Langmuir and Freundlich). Qualitative	15

discussion of BET.	
Solid state chemistry: Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of rotating crystal method and powder pattern method. Crystal defects.	

Keywords: Electronic effect, Reactive intermediates, Stereochemistry, Alkenes, Alkynes, Cycloalkanes, Aromaticity, Gas, Liquid, Colloidal state and Solid

Part C: Learning Resource

Text Books, Reference Books, Other Resources

Suggested Readings :

1. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd.(Pearson Education).
2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Eliel, E. L. &Wilen, S. H. Stereochemistry of Organic Compounds, Wiley: London, 1994.
5. Kalsi, P. S. Stereochemistry Conformation and Mechanism, New Age International, 2005.
6. McMurry, J.E. Fundamentals of Organic Chemistry. 7th Ed. Cengage Learning India Edition, 2013.
7. Bruice, P. Y. Organic Chemistry, 2nd Edition, Prentice-Hall, International Edition (1998).
8. Atkins' Physical Chemistry, 10th Edition, Oxford University Press, 2014
9. Barrow, G.M., Physical Chemistry Tata McGraw-Hill, 2007
10. Ball, D.W., Physical Chemistry, Thomson Press, India, 2007
11. Castellan, G.W., Physical Chemistry, 4th Edition, Narosa, 2004
12. Mortimer, R.G., Physical Chemistry, 3rd Edition, Elsevier, Noida, UP, 2009
13. Levine, I.N., Physical Chemistry, 6th Edition, Tata McGraw-Hill, 2010
14. Metz, C.R., 2000 Solved Problems in Chemistry, Sahaun Series, 2006
15. Negi, A.S. & Anand, S.C., A Text Book of Physical Chemistry, 3rd Edition, New Age International Publication
16. Bajpai, D.N., Advanced Physical Chemistry, S. Chand, 2019
17. Bahal & Tuli, Essential of Physical Chemistry, 2020

E- Learning Resources:

1. http://heecontent.upsdc.gov.in/Home.aspx
2. https://nptel.ac.in/courses/104/106/104106096/
3. http://heecontent.upsdc.gov.in/Home.aspx
4. https://nptel.ac.in/courses/104/106/104106096/
5. https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
6. https://nptel.ac.in/courses/104/103/104103071/#

Fundamental Chemistry related topics on SWAYAM platform and E-pathshala

Part D: Assessment and Evaluation

Maximum Marks: 50

PRACTICAL EXAMINATION B. Sc. – I	05 Hrs. M.M. 50
Three experiments are to be performed 1. Inorganic Mixture Analysis, four radicals two basic & two acid (excluding insoluble, Interfering & combination of acid radicals) OR Two Titrations (Acid Bases, Redox and Iodo/Iodiometry/Complexometric titration)	12 marks
2. Detection of functional group in the given organic compound and determine its MPt/BPt. OR Crystallization of any one compound as given in the prospectus along with the determination of mixed MPt. OR Decolorisation of brown sugar along with sublimation of camphor/ Naphthlene.	8 marks 14 marks
3. Any one physical experiment that can be completed in two hours including calculations. 4. Viva 5. Sessionals	10 marks 06 marks
In case of Ex-Students two marks will be added to each of the experiments	

Part A: Introduction

Program: **Certificate Course**	Class: B.Sc. I Year	Year: **2022**	Session:2022-23
1.	Course Code	CHEM-1P	
2.	Course Title	Lab. 1	
3.	Course Type	Practical	
4.	Pre-requisite (if any)	To Study this course our students must have had the subject chemistry in class +2 or equivalent	
5.	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to learn the following aspects of Chemistry - To analyse the given mixture for anions (acid radicals) and cations (basic radicals). - Titrations - Qualitative Analysis - Surface tension measurements. - Viscosity measurement - Chemical Kinetics	
6.	Credit Value	Practical: 2	
7.	Total Marks	Max. Marks: 50	Min Passing Marks: 17

Part B: Content of the Course

Total No. of Lecturers: 30

LABATORY COURSE		No. of Lectures
Tentative list of Practical	**A. Inorganic chemistry** Semi-micro qualitative analysis (using H_2S or other methods) of mixtures - not more than four ionic species (two anions and two cations, excluding interfering, insoluble salts) out of the following: Cations : NH_4^+ , Pb^{2+}, Bi^{3+}, Cu^{2+}, Cd^{2+}, Fe^{3+}, Al^{3+}, Co^{2+}, Ni^{2+}, Mn^{2+}, Zn^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Na^+ Anions : CO_3^{2-}, S^{2-}, SO_3^{2-}, NO_2^-, CH_3COO^-, Cl^-, Br^-, I^-, NO_3^-, SO_4^{2-} (Spot tests may be carried out wherever feasible) **B. Acid-Base Titrations** • Standardization of sodium hydroxide by oxalic acid solution. • Determination of strength of HCl solution using sodium hydroxide as intermediate. • Estimation of carbonate and hydroxide present together in mixture. • Estimation of carbonate and bicarbonate present together in a mixture. • Estimation of free alkali present in different soaps/detergents	10

	C. Redox Titrations • Standardization of KMnO$_4$ by oxalic acid solution. • Estimation of Fe(II) using standardized KMnO$_4$ solution. • Estimation of oxalic acid and sodium oxalate in a given mixture. •Estimation of Fe(II) with K$_2$Cr$_2$O$_7$ using internal (diphenylamine, anthranilic acid) and external indicator.	

Organic chemistry
1. Demonstration of laboratory Glassware's and Equipments.
2. Calibration of the thermometer. 80° –82° (Naphthalene), 113.5° – 114° (Acetanilide), 132.5° -133° (Urea), 100° (Distilled Water).)
3. Purification of organic compounds by crystallization using different solvents.
Phthalic acid from hot water (using fluted filter paper and stemless funnel). Acetanilide from boiling water.
Naphthalene from ethanol.
Benzoic acid from water.
4. Determination of the melting points of organic compounds.
Naphthalene 80° –82°, Benzoic acid 121.5° –122°, Urea 132.5° –133° Succinic acid 184.5° – 185°, Cinnamic acid 132.5° –133°, Salicylic acid 157.5° –158°, Acetanilide 113.5° –114°, m-Dinitrobenzene 90°, p-Dichlorobenzene 52°, Aspirin 135°.
5. Effect of impurities on the melting point –
mixed melting point of two unknown organic compounds.
Urea–Cinnamic acid mixture of various compositions (1:4, 1:1, 4:1).
6. Determination of boiling point of liquid compounds. (boiling point lower than and more than 100°C by distillation and capillary method).
Ethanol 78°, Cyclohexane 81.4°, Toluene 110.6°, Benzene 80°.
i. Distillation (Demonstration)
Simple distillation of ethanol-water mixture using water condenser.
Distillation of nitrobenzene and aniline using air condenser.
ii. Sublimation
Camphor, Naphthalene, Phthalic acid and Succinic acid.
iii. Decolorisation and crystallization using charcoal.
Decolorisation of brown sugar with animal charcoal using gravity filtrations crystallization and decolorisation of impure naphthalene (100 g of naphthalene mixed with 0.3 g of Congo red using 1 g of decolorizing carbon) from ethanol.
7. Qualitative Analysis
Detection of elements (N, S and halogens) and functional groups (Phenolic, Carboxylic, Carbonyl, Esters, Carbohydrates, Amines, Amides, Nitro and Anilide) in simple organic compounds.
8.   Preparation and characterization of biodiesel from vegetable oil.
9.   Preparation of soap.

10

Physical chemistry
1. Surface tension measurements.
Determine the surface tension by (i) drop number (ii) drop weight method. • Surface tension composition curve for a binary liquid mixture.
2. Viscosity measurement using Ostwald's viscometer.
Determination of viscosity of aqueous solutions of (i) sugar (ii) ethanol at room temperature.
Study of the variation of viscosity of sucrose solution with the concentration of solute.
Viscosity Composition curve for a binary liquid mixture.

10

	3. Chemical Kinetics
	To determine the specific rate of hydrolysis of methyl/ethyl acetate catalysed by hydrogen ions at room temperature.
	To study the effect of acid strength on the hydrolysis of an ester.
	To compare the strengths of HCl & H_2SO_4 by studying the kinetics of hydrolysis of ethyl acetate.
	4. Colloids
	To prepare colloidal solution of silver nanoparticles (reduction method) and other metal nanoparticles using capping agents.

Keywords: Semi-micro qualitative analysis, Qualitative analysis, Titrations, Chemical Kinetics, Colloids, Viscosity, Surface tension, Decolorization and crystallization, Distillation, Sublimation, Soap, biodiesel.

Part C: Learning Resource

Text Books, Reference Books, Other Resources

Suggested Readings :

1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009.

2. Ahluwalia, V. K., Dhingra, S. and Gulati, A. College practical Chemistry, University Press.

3. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009).

4. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012)

5. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).

6. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. Experiments in Physical Chemistry 8th Ed.; McGraw-Hill: New York (2003).

7. Halpern, A. M. & McBane, G. C. Experimental Physical Chemistry 3rd Ed.; W.H. Freeman & Co.: New York (2003).

Sidhwani, I.T., Saini, G., Chowdhury, S., Garg, D.. Malovika, Garg, N. Wealth from waste: 8.A green method to produce biodiesel from waste cooking oil and generation of useful products from waste further generated "A Social Awareness Project", Delhi University Journal of Undergraduate Research and Innovation.

9.Carpenter, William Lant; Leask, Henry (1895). A treatise on the manufacture of soap and candles, lubricants and glycerin. Free ebook at Google Books.

E- Learning Resources:

1. http://heecontent.upsdc.gov.in/Home.aspx
2. https://nptel.ac.in/courses/104/106/104106096/
3. http://heecontent.upsdc.gov.in/Home.aspx
4. https://nptel.ac.in/courses/104/106/104106096/
5. https://www2.chemistry.msu.edu/faculty/reusch/VirTxtJml/intro1.htm
6. https://nptel.ac.in/courses/104/103/104103071/#

Fundamental Chemistry related topics on SWAYAM platform and E-pathshala

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Part D: Assessment and Evaluation

Maximum Marks: 50

PRACTICAL EXAMINATION B. Sc. – I	05 Hrs. M.M. 50

Three experiments are to be performed

1. Inorganic Mixture Analysis, four radicals two basic & two acid (excluding insoluble, Interfering & combination of acid radicals)

   OR

   Two Titrations (Acid Bases, Redox and Iodo/Iodiometry/Complexometric titration) — **12 marks**

2. Detection of functional group in the given organic compound and determine its MPt/BPt. — **8 marks**

   OR

   Crystallization of any one compound as given in the prospectus along with the determination of mixed MPt.

   OR

   Decolorisation of brown sugar along with sublimation of camphor/ Naphthlene. — **14 marks**

3. Any one physical experiment that can be completed in two hours including calculations. — **10 marks**

4. Viva — **06 marks**
5. Sessionals

In case of Ex-Students two marks will be added to each of the experiments

Scheme of B.Sc. Botany

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	BOT-1T	Microbial Diversity and Plant Pathology	Theory	4	50	17
	BOT--2T	Archegoniateae and Plant Architecture	Theory	4	50	17
	BOT--1P	LAB 1 : Microbial Techniques and Archegoniate identification	Practical	2	50	17

Part A: Introduction

Program: Certificate course in Microbial Techniques and Archaegoniate identification	Class: B.Sc.I Year		Year: 2022	Session:2022-2023
1.	Course Code		BOT-1T	
2.	Course Title		Microbial Diversity and Plant Pathology	
3.	Course Type		Theory	
4.	Pre-requisite (if any)		NO	
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to - Understand the Viruses, Bacteria, Phycology, Mycology and Plant pathology - Learn microbial techniques which will be beneficial for agriculture and industry. - Learn life cycles of selected genera of different groups - Understand etiology of plant diseases - Apply their knowledge in the crop fields to eradicate or avoid the diseases - Apply different biofertilizers to enhance productivity			
6.	Credit Value		Theory: 4	
7.	Total Marks		Max. Marks: 50	Min Passing Marks: 17

Part B: Content of the Course

Total Periods: 60

Unit	Topics	No. of Period
I	**Microbial Techniques & instrumentation:** Microscopy – Light, phase contrast, scanning and transmission electron microscopy, staining techniques for light microscopy. Common equipment of microbiology lab and principle of their working – autoclave, oven, laminar air flow, centrifuge, colorimetry, spectrophotometry, electrophoresis, immobilization methods, fermentation and fermenters.	12
II	**Microbial world:** Cell structure of Eukaryotic and prokaryotic cells, Gram positive and Gram-negative bacteria. Structure of bacteria; Bacterial Growth curve, factors affecting growth of microbes; Sporulation, reproduction, recombination in bacteria. Viruses, general characteristics. Structure of viruses, Bacteriophages and TMV; Lytic and Lysogenic cycles, viroid, Prions & mycoplasma, phytoplasma, actinomycetes and their economic uses. **Applied Microbiology:** Food fermentations and food produced by microbes. Production of antibiotics, enzymes, alcoholic beverages, Lactic acid and Acetic acid production. Antigen, antibody and production of monoclonal antibodies (Hybridoma techniques).	12
III	**Phycology:** General characteristic features, classification and range of thallus organization. Classification and life cycle of –*Volvox, Oedogonium, Chara, Vaucheria, Ectocarpus* and *Polysiphonia.* Economic importance of algae - Role of algae in soil fertility, algae as biofertilizer , blue green algae and nitrogen economy of soil; algae as biofuel	12

For _____ 13.6.22

IV	Mycology , Mushroom Cultivation, Lichenology & Mycorrhiza: General characteristic features, Economic importance and Classification of Fungi. Distinguishing characters of Myxomycota: General characters of Mastigomycota: *Phytophthora* and *Albugo*, Zygomycota: *Rhizopus* and *Mucor*, Ascomycota: *Saccharomyces*, *Penicillium*, *Peziza*. Basidiomycota: *Ustilago, Puccinia, Agaricus*; Deuteromycota: *Colletotrichum, Fusarium, Alternaria*. Heterothallism, Physiological specialization, Heterokaryosis & Parasexuality, Mushroom cultivation- Button and Oyster mushroom General account of lichens, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance.	12
V	Plant Pathology: Disease concept, Symptoms, Etiology, Primary and secondary inoculum, pathogenesis, Koch's Postulates. Mechanism of infection and predisposing factors. Disease reoccurrence, Defence mechanism : physical and biochemical, Disease Resistance, Systemic fungicides,Organomercurials and sulphur containing fungicides **Diseases and Control**: Symptoms, Causal organism, Disease cycle and Control measures of – Early & Late Blight of Potato, Damping of seedlings, False Smut of Rice/ Brown spot of rice, Black Stem Rust of Wheat, Alternaria spot and White rust of Crucifers, Red Rot of Sugarcane, Wilting of Arhar, Mosaic diseases on tobacco and cucumber, yellow vein mosaic of bhindi; Citrus Canker, Little leaf of brinjal; Disease management; Quarantine organizationand Integrated plant disease management, Biological control	12

Keywords:Microbial techniques, Mushroom cultivation. Mycology,Lichenology & Mycorrhiza, Plant diseases

Part C -Learning Resources

Suggested Readings:
1. Microbiology Fundamental and Applications (hindi) (pb) 9. ISBN: 9788188826230 Edition: 03Year : 2016Author : Dr. Purohit SS , Dr. Deo Publisher : Student Edition Language : Hindi
2. Modern Microbiology (hindi) (hb) ISBN: 9788177543599Edition : 1Year : 2018Author : Dr. Purohit SS , Dr. Singh T Publisher : Agrobios (India)
3. Plant pathology by R.S. Mehrotra, Tata McGraw-Hill Publication

Text Books:
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. 10th edition.
3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. Aggarwal, S. K. 2009. Foundation Course in Biology, A one books Pvt. Ltd., New Delhi.
5. Aneja, K. R. 1993. Experiments in Microbiology, Pathology and Tissue Culture, Vishwa Prakashan, NewDelhi.
6. Annie Ragland, 2012. Algae and Bryophytes, Saras Publication, Kanyakumari, India.
7. Basu, A. N. 1993. Essentials of Plant Viruses, Vectors and Plant diseases, New Age International, New Delhi.
8. Chopra. G. L. 1984. A text book of Algae, Rastogi publications, Meerut,India.
9. Dubey, R. C. and Maheshwari. D.K. 2012. Practical Microbiology, S. Chand & Company, Pvt. Ltd., NewDelhi.
10. Fritsch, R. E. 1977. Structure and Reproduction of Algae, Cambridge University Press, London.
11. Sharma, P.D. (2011). Plant Pathology. Meerut, U.P.: Rastogi Publication.
12. Webster, J., Weber, R. (2007). Introduction to Fungi, 3rd edition. Cambridge, U.K.: Cambridge University Press..
13. Pandey B.P. 2001. College Botany Volume 1, S Chand & Company Pvt.Ltd, New Delhi.
14. Pandey. B.P. 2014 Modern Practical Botany, (Vol-I) S. Chand and Company Pvt. Ltd., New Delhi.
15. Pelzar, 1963. Microbiology. Tata Mc Graw Hill, New Delhi
5. Rangaswamy. G. 2009. Disease of Crop Plants in India, Prientice Hall of India, New Delhi.

Online Resources
i. https://indianculture.gov.in/rarebooks/economic-botany-india

ii. https://www.infinityfoundation.com/mandala/t_es/t_es_tiwar_botany_frameset.htm
iii. 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
iv. https://www.scribd.com/presentation/81269920/Botany-of-Ancient-India
v. https://insa.nic.in/writereaddata/UpLoadedFiles/IJHS/Vol17_2_17_PKBhattacharyya.pdf

Suggested equivalent online courses:

1. https://indianculture.gov.in/rarebooks/economic-botany-india
2. https://community.plantae.org/tags/mooc   futurelearn.com/courses/teaching-biology-inspiring-students-with-plants-in-science
3. https://www.coursera.org/courses?query=plants
4. http://egyankosh.ac.in/handle/123456789/53530
5. https://www.classcentral.com/tag/microbiology
6. https://www.edx.org/learn/microbiology
7. https://www.mooc-list.com/tags/microbiology
8. https://www.udemy.com/topic/microbiology/ https://ucmp.berkeley.edu/bacteria/bacteria.html
9. https://www.livescience.com/53272-what-is-a-virus.html
10. https://gclambathach.in/lms/Economic%20importance%20of%20Algae.pdf
11. https://www.slideshare.net/sardar1109/algae-notes-1
12. https://www.onlinebiologynotes.com/algae-general-characteristics-classification/
13. https://www.sciencedirect.com/topics/immunology-and-microbiology/fungus
14. https://ucmp.berkeley.edu/fungi/fungi.html
15. https://agrimoon.com/wp-content/uploads/Mashroom-culture.pdf
16. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=11293
17. http://www.hillagric.ac.in/edu/coa/ppath/lect/plpath111/Lect.%201%20%20Introduction-Pl%20Path%20111.pdf
18. http://www.jnkvv.org/PDF/11042020102651plant_pathology.pdf
19. https://www.apsnet.org/edcenter/disimpactmngmnt/topc/EpidemiologyTemporal/Pages/ManagementStrategies.aspx
20. https://learn.saylor.org/course/view.php?id=23&sectionid=6821
21. https://www.sciencedirect.com/topics/earth-and-planetary-sciences/microscopy
22. http://physics.fe.uni-lj.si/students/predavanja/Microscopy_Kulkarni.pdf
23. https://lipidnanostructuresgroup.weebly.com/
24. https://zoology4civilservices.wordpress.com/2016/06/18/65/
25. https://microbenotes.com/laminar-flow-hood

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50

Continuous Comprehensive Evaluation (CCE):As per rule

University Exam(UE): 50Marks

12.6.22

Part A: Introduction

Program:Certificate course in Microbial techniques and Archaegoniate identification	Class: B.Sc. I Year	Year: 2022	Session:2022-2023
1.	Course Code	BOT-2T		
2.	Course Title	**Archegoniateae and Plant Architecture**		
3.	Course Type	Theory		
4.	Pre-requisite (if any)	NO		
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to • Understand the General characteristics and affinities of Bryophytes, Pteridophytes and Gymnosperms • Phylogenetic relationships with the help of Palaeobotanical studies • Learn morphology, and- flower architecture of angiosperms		
6.	Credit Value	Theory: 4		
7.	Total Marks	Max. Marks: 50	Min Passing Marks: 17	

Part B: Content of the Course

Total Periods: 60

Unit	Topics	No. ofPeriod
I	**Introduction to Archegoniates & Bryophytes:** Unique features of archegoniates, Bryophytes: General characteristic features and Affinities, adaptations to land habit, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction *of Riccia, Marchantia , Anthoceros* and *Sphagnum.* (Developmental details not to be included). Economic importance of bryophytes.	12
II	**Pteridophytes:** General characteristic features and affinities, Classification (up to family) with examples, Heterospory and seed habit, stelar evolution, economic importance of Pteridophytes, Morphology, anatomy and life cycle of *Psilotum, Lycopodium, Selaginella, Equisetum, Pteris* and *Marselia.*	12
III	**Gymnosperms:** Classification and distribution of gymnosperms; Salient features of Cycadales, Ginkgoales, Coniferales and Gnetales, their examples, structure and reproduction; economic importance, Morphology, anatomy and life cycle of *Cycas, Pinus* and *Ephedra.*	12
IV	**Palaeobotany:** General account, Geological time scale; Brief account of process of fossilization & types of fossils and their study techniques; Fossil plants: *Rhynia, Williamsonia, Cycadeoidea.* Contribution of Prof. BirbalSahni	12
V	**Angiosperm Morphology (Stem, Roots, Leaves, Flowers and Inflorescence:** Morphology and modifications of root; Stem, leaf and bud. Types of inflorescences; flowers, flower parts, fruits and types of placentation; Definition	12

	and types of seeds.	

Part C -Learning Resources

1. Gangulee H. S. and K. Kar 1992. College Botany Vol. I and II. (New Central Book Agency)
2. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers. New Delhi, India.
3. Pandey S.K. (2012). Quick Concept of Botany. Publisher LAP LAMBERT Academic Publishing GmbH & Co. KG, Germany (ISBN: 978-3-8484-3104-5).
4. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.
5. Rashid A (1999) An Introduction to Pteridophyta, Vikas Publishing House Pvt. Ltd. New Delhi.
6. Sharma OP (1990) Textbook of Pteridophyta. MacMillan India Ltd. Delhi.
7. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Pteridophyta. S. Chand and Company.
8. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Gymnosperms, S. Chand and
9. Parihar NS (1976) Biology and Morphology of Pteridophytes. Central Book Depot.
10. Bhatnagar SP (1996) Gymnosperms, New Age International Publisher.
11. Pandey BP (2010) College Botany Vol II S. Chand and Company, New Delhi .

Online Resources

1. https://www.anbg.gov.au/bryophyte/what-is-bryophyte.
2. https://pteridoportal.org/portal/index.php
3. https://www.conifers.org/zz/gymnosperms.php
4. http://www.mobot.org/MOBOT/research/APweb/
5. https://milneorchid.weebly.com/plant-id-for-beginners
6. http://webapp1.dlib.indiana.edu/inauthors/view?docId=VAC0868&doc.view=print
7. https://palynology.org/
8. http://www2.estrellamountain.edu/faculty/farabee/biobk/Biobookflowers.html
9. https://www.sciencelearn.org.nz/resources/100-plant-reproduction
10. https://palaeobotany.org

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50

Continuous Comprehensive Evaluation (CCE):As per rule

University Exam(UE): 50Marks

Part A : Introduction				
Programme: Certificate		Class B.Sc.-I	Year: 2022	Session: 2022-23
1.	Course Code	BOT-1P		
2.	Course Title	Microbial Techniques and Archegoniate identification		
3.	Course Type	Practical		
4.	Pre-requisite (if any)	No		
5.	Course outcomes:	After the completion of the course the students will be able to: - Understand the instruments, techniques and good lab practices for working in a microbiology laboratory. - Develop skills for identifying microbes and using them for Industrial, Agriculture and Environment purposes. - Practical skills in the field and laboratory experiments in Microbiology & Pathology. - learn to identify Algae, Lichens and plant pathogens along with their Symbiotic and Parasitic associations. - Can initiate his own Plant & Seed Diagnostic Clinic - Can start own enterprise on microbial products			
6.	Credit Value	2		
7.	Total Marks	Max. Marks: 50	Min. Passing Marks:17	

Part B : Content of the Course
Total No. of Periods – 30

Tentative Practical List	Topic * (Minimum Any three from each unit depending on facilities and syllabus. 20% for spotting, 10% each for viva and sessional and rest 60 % marks equally in each unit.)
	INSTRUMENTS & TECHNIQUES: 1. Laboratory safety and good laboratory practices. 2. Principles and application of Laboratory instruments-microscope, incubator, autoclave, centrifuge, Laminar air flow, filtration unit, shaker, pH meter. 3. Buffer preparation & titration 4. Cleaning and Sterilization of glassware 5. Preparation of media- PDA and NAM 6. Inoculation and culturing of Fungi and bacteria BACTERIAL IDENTIFICATION: 1. Isolation of bacteria. 2. Staining techniques: Gram's, staining
	MYCOLOGY: 1. Study/ Slide preparation and . Staining of fungi. *Rhizopus. Saccharomyces. Penicillium, Peziza, Ustilago, Puccinia; Fusarium, Alternaria. Agaricus:*

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2. . Lichens: crustose, foliose and fruticose specimens.

PHYCOLOGY:

1.Study / Slide preparation and Staining of algae –

Volvox, Oedogonium and *Chara; Vaucheria;Ectocarpus Polysiphonia*

EXPERIMENTAL PLANT PATHOLOGY

Isolation of pathogen from diseased leaf.

Identification: Pathological specimens of Brown spot of rice, Bacterial blight of rice, Loose smut of wheat, , red rot of sugar cane, Tikka disease of ground nut, Slides of uredial, telial, pycnial & aecial stages of *Puccinia*, Few viral and bacterial plant diseases. like- Leaf curl of Papaya, Citrus canker

PRACTICALS IN APPLIED MICROBIOLOGY

1. Isolation of rhizosphere to non rhizosphere population of bacteria.
2. Isolation of phyllosphere microflora.
3. Alcohol production from grapes in anaerobic condition
4. Isolation of lactic acid bacteria from curd.
5. Enzyme production and assay – catalase, protease and amylase.

Bryophyta:

Study of morphology and anatomy of :
1. *Riccia*
2. *Marchantia*
3. *Anthoceros*
4. *Sphagnum*

Pteridophyta:

Study of morphology and anatomy of :
1. *Lycopodium*
2. *Selaginella*
3. *Equisetum*
4. *Pteris*
5. *Marselia*

Gymnosperm:

Study of morphology and anatomy of :
1. *Cycas*
2. *Pinus*
3. *Ephedra*

Part C - Learning Resource
Text Books, Reference Books, Other Resources

Suggested Readings:

1. Practical Botany (Part 1) 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. Pandey S.K. (2012). Quick Concept of Botany. Publisher LAP LAMBERT Academic Publishing GmbH & Co. KG, Germany (ISBN: 978-3-8484-3104-5).

3. Dubey, R. C. and Maheshwari, D.K. 2012. Practical Microbiology. S. Chand & Company, Pvt. Ltd., New Delhi.

4. Pandey. B.P. 2014 Modern Practical Botany, (Vol-I) S. Chand and Company Pvt. Ltd., New Delhi.

E-learning Resources:
5. https://community.plantae.org/tags/mooc
6. futurelearn.com/courses/teaching-biology-inspiring-students-with-plants-in-science
7. https://microbiologysociety.org/publication/education-outreach-resources/basic-practical-microbiology-a-manual.html
8. https://microbiologyonline.org/file/7926d7789d8a2f7b2075109f68c3175e.pdf
9. http://allaboutalgae.com/benefits/
10. https://repository.cimmyt.org/xmlui/bitstream/handle/10883/3219/64331.pdf
11. https://www.mooc-list.com/tags/microbiology
12. http://www.agrifs.ir/sites/default/files/A%20text%20book%20of%20practical%20botany%201%20%7BAshok%20Bendre%7D%20%5B8
13. 171339239%5D%20%281984%29.pdf
14. https://www.coursera.org/courses?query=plants
15. http://egyankosh.ac.in/handle/123456789/53530
16. https://www.classcentral.com/tag/microbiology
17. https://www.edx.org/learn/microbiology
18. https://www.mooc-list.com/tags/microbiology
19. https://www.udemy.com/topic/microbiology/

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 50		
Continuous Comprehensive Evaluation (CCE): Not Applicable		
University Exam(UE): 50 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	As per rules

for *Unmais* 13.6.22

Scheme of B.Sc.
Zoology

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	ZOOL-1T	Animal Diversity:Non-Chordata and Chordata , Comparative Anatomy and Physiology of Non-chordates	Theory	4	50	17
	ZOOL-2T	Cell Biology , Histology and Comparative Anatomy & Physiology Of Chordates	Theory	4	50	17
	ZOOL-1P	Practical	Practical	2	50	17

Part A: Introduction

Program:Certificate Course		Class:B.Sc. I ⁿᵈYear	Year:2022	Session:2022-2023
1	Course Code	ZOOL-1T		
2	Course Title	Animal Diversity: Non-Chordata and Chordata, Comparative Anatomy and Physiology of Non-chordates		
3	Course Type	Theory		
4	Pre-requisite (if any)	No		
5	Course Learning Outcomes (CLO)	Upon completion of the course students should be able to : • Learn about the importance of systemic,taxonomy and phylogeny to get a concrete idea of evolution of non-chordate phyla. • Understand the various morphological, anatomical structures and functions ofanimals of different phyla. • Get the knowledge about economic,ecological and medical significance ofvarious animals in human welfare. • Understand the important parasites andtheir control measures. • Comparison of the anatomy and physiology of the different taxa of non-chordates.		
6	Credit Value	4		
7	Total Marks	Max. Marks: 50	Min Passing Marks : 17	

Part B: Content of the Course

Total Lectures: 60

Unit	Topics	No. of Lectures
I	**Taxonomy, Protozoa, Porifera** **Taxonomy-** Elementary knowledge of Zoological Nomenclature and International Code. Classification of Animal Kingdom upto Phylum of acoelomate and coelomate non-chordates according to Parker and Haswell7ᵗʰ edition. **Protozoa-** Phylum Protozoa: General characters of the phylum and classification up to order with characters and suitable examples. Structure, life history and pathogenicity of malaria parasite *(Plasmodium vivax)*. Protozoa and disease. **Porifera-** Phylum Porifera: General characters of the phylum and classification up to order with characters and suitable examples. Type study of Sycon.	12
II	**Coelenterata, Platyhelminthes, Nemathelminthes :** **Coelenterata-** PhylumCoelenterata: General characters of the phylum and classification up to order with characters and suitable examples. Type Study of Obelia. **Platyhelminthes** - Phylum Platyhelminthes: General characters of the phylum and classification up to order with characters and suitable examples. Type Studyof Liverfluke. **Nemathelminthes-** PhylumNemathelminthes: General characters of the phylum and classification up to order with characters and suitable examples. Pathogenic nematodes and diseases.	12
III	**Annelida, Arthropoda, Mollusca :** **Annelida-** Phylum Annelida: General Characters of the phylum and classification up to order with characters and suitable examples. Types study of Earthworm *(Pheretima)*. **Arthropoda** - Phylum Arthropoda: General Characters of the phylum and classification up to order with characters and suitable examples. Type study of Prawn. Insects as a vector of human disease. **Mollusca** - Phylum Mollusca: General characters of the phylum and classification up to order with characters and suitable examples. Type study of *Pila*.	12

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	Echinodermata, Hemichordata, Classification of Chordata :	
IV	Echinodermata - Phylum Echinodermata: General characters of the phylum and classification up to order with characters and suitable examples. Type study of Starfish*(Asterias)*. Hemichordata - PhylumHemichordata: General characters of the phylum hemichordate and relationship with non-chordates and chordates. Type study ofBalanoglossus Classification of Chordata - Classification of Chordata up to order withcharacters andsuitable examples. Brief account of Urochordata, Cephalochordata and Vertebrata.	11
V	Comparative Anatomy and Physiology of Non-chordates: Coelom and coelomductsin Non- chordate. Locomotory organs and locomotion in Non- chordate. Pattern of feeding and digestion in lower Metazoans. Comparative anatomy and physiology of respiration and excretion in Non- chordate. Primitive,diffused and advance nervous system in Non- chordate. Reproduction in Non-chordates.	13

Keywords :   Locomotary organ, feeding and digestion, respiration, International Comission on Zoological Nomenclature (ICZN), Classification, Protozoa, Classification, Liver Fluke, Trochophore, Arthropoda, Crustacea larva , Echinodermata larva

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Part C -Learning Resource

1. **Text Books, Reference Books, Other Resources –**
2. Parker, J, Haswell, WA, "A Text Book of Zoology", VII edition, Vol. I & II, Low Price Publications, Delhi, 1990.
3. Barnes, RD, "Invertebrate Zoology", VII Edition, Cengage Learning, India, 2006.
4. Pechenik, JA, "Biology of the Invertebrates" McGraw-Hill Educations, VII Edition, 2015.
5. Sedgwick, A, "A Students Text Book of Zoology", Vol.I, II & Vol. III., Low Price Publications, Delhi, 1990.
6. Dhami and Dhami, "Invertebrate Zoology" R., Chand & Co., India, 2009.
7. Jordan and Verma, "Invertebrate Zoology," S. Chand & Company, New Delhi, 2013.
8. Agarwal, VK, "Zoology for Degree Students: Non-Chordata", S Chand & Company, 2017.
9. Kotpal, R, "Modern Text Book of Invertebrates", Rastogi Publications, Meerut, 2017.
10. Kotpal, R, "Protozoa to Echinodermata (Phylum Series)", Rastogi Publications, Meerut, 2017.
11. Kardong, K.V. (2006) Vertebrates: Comparative Anatomy, Function, Evolution (4th edition). McGraw-Hill
12. Jordan, E. L. and Verma, P. S. (2013) Chordate Zoology (14th edition).
13. Saxena, R. K. and Saxena,S. (2015) Comparative Anatomy of Vertebrates (2nd edition).

E- Resources –
1. SWAYAM- .https://swayam.gov.in/explorer?searchText=
2. https://academic.oup.com
3. https://medineplus.gov
4. https://ncin.nlon.nih.gov
5. https://zoologylearningpoint.woodpress.com
6. https://zoologyresources.com
7. National digital library – https://ndl.iitkgp.ac.in
8. e-PG Pathshala (MHRD) Portal, https://epgp.inflibnet.ac.in
9. Science Direct Open Access Content – https://www.sciencedirect.com/book/9781843342038/ open – Access
10. https://egyankosh.ac.in

Part D: Assessment and Evaluation

Maximum Marks. University exam. - :50

Part A: Introduction

Program: Certificate Course		Class: B.Sc. I Year	Year: 2022	Session:2022-2023
1	Course Code	ZOOL- 2T		
2	Course Title	Cell Biology, Histology and Comparative Anatomy & Physiology of Chordates		
3	Course Type	Theory		
4	Pre-requisite (if any)	To study this course, a student must have/had the subject Biology in class 12th.		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able : • Understand the basic structure, functioning of the cell and cell organelles and understand the intricate cellular mechanisms involved. • Understand the tissues, how tissues are produced from cells in a normal course and about any malfunctioning which may lead to benign or malignant tumor. • Develop an understanding of the evolution of vertebrates thus integrating structure, function and development. • Understand the morphological, anatomical and physiological adaptation in diverse habitats. • 5. Develop an understanding of the evolution of vertebrates thus integrating structure, function and development.		
6	Credit Value	Theory : 4		
7	Total Marks	Max. Marks: 50	Min Passing Marks : 17	

Part B: Content of the Course

Total Lecturer: 60

Unit	Topics	No. of Lectures
I	**Prokaryotic and Eukaryotic cells** : General structure of prokaryotes, bacteria, archaea and eukaryotes. Ultra structure and function of endoplasmic reticulum, ribosomes, Golgi apparatus, lysosome. Mitochondria, nuclear apparatus. **Cell membrane and transport mechanism** : Structure, composition, models and function. Fluid mosaic model Junctional complexes, membrane receptor modifications : microvilli, desmosomes and plasmodesmata.	12
II	**Cell cycle, cell signaling and cell culturing** : Cell cycle, cell division – mitosis and meiosis. Cell division check points and their regulation. Role of growth factors. Programmed cell death (Apoptosis). **Cell regulation and cell signaling** : Signaling molecules and their receptors. Functions of cell surface receptors. Regulation of signaling pathways. **Cell culture** : Types of cell culture – monolayer and suspension culture. Types of culture media. Basic characteristics of tissue culture media. Tissue culture and engineering.	12
III	**Structure and functional significance of animal tissues** : Introduction to tissues. Epithelial tissue: types, structure and characteristics. Exocrine and endocrine glands: type and structure. Structure and function of loose, dense and adipose tissue. Muscular tissue: Ultra structure of smooth, skeletal and cardiac muscles. Muscle contraction. Membrane of the brain and spinal cord.	11
IV	**Structure and function of integument, skeletal, digestive, circulatory system :** **Integument** : Structure of integument from fish to mammals. Function of integument. Epidermal and dermal derivatives of integument and their functional significance. **Skeletal system** : Comparative account of pelvic and pectoral girdles from fishes (cartilaginous and bony) to mammals. **Digestive system** : Dentition in mammals. Comparative study of alimentary canal and digestive glands from fish to mammal. Physiology of digestion in mammal.	13

		Circulatory system: Evolution of aortic arches and their significance. Structure and evolution of heart in vertebrates. Cardiac cycle. Blood : Composition and function.	
V		Structure and function of circulatory, respiratory, excretory, reproductive and endocrine system : Respiratory system : Aquatic and terrestrial respiration. Comparative anatomy of lungs in amphibian, reptile, bird and mammals. Excretory system : Physiology of excretion, urine formation. Reproductive system : Comparative details of testes and ovaries from fishes to mammals. Estrous and menstrual cycle. Endocrine system : Types and functional significance of endocrine glands and hormones.	12

Keywords: Tissue, Endocrine glands, Girdles, Cell signaling, Cell culture, Excretion, Circulatory system, Aortic arches, Heart, Reproductive cycle.

Part C - Learning Resource

Text Books, Reference Books, Other Resources -

1. Books of M. P. Hindi Granth Academy
2. Rastogi V. B. : Introduction to Cytology
3. Cell Biology and Molecular Biology : N. Arumugam
4. Cell Biology : N. Arumugam
5. Molecular Cell Biology : N. Arumugam
6. Cell Biology, Genetics, Molecular Biology and Evolution : Verma P. S., Agrawal V. K.
7. Sheelar and Binachi : Cell and Molecular Biology
8. Karp : Cell and Molecular Biology
9. De Robertis : Cell and Molecular Bology
10. Powar C. B. : Cell Biology
11. A Textbook of Animal Histology : A. K. Berry, Emkey Publication, Delhi
12. A Textbook of Histology and Practical guide: J. P. Gunasegram
13. Animal Cell Culture : R. Freshney
14. Animal Cell and Tissue Culture : Shivangi Mathur
15. Chordate Zoology : R. L. Kotpal & P. S. Verma
16. Modern Text Book of Zoology – Vertebrate : R. L. Kotpal
17. A Text Book of Chordates : A. Thangamani, N. Arumugam, Saras Puplication
18. Biology of Animals, Volume – II, Sinha, Adhikari, Ganguly
19. Comparative Anatomy of vertebrates, 2nd edition : R. K. Saxena, Sunita Saxena
20. Comparative Anatomy and Developmental Biology : Kotpal, Shastry and Shukla
21. Chordata and Comparative Anatomy : R. L. Kotpal
22. Chordate Zoology : Jordan E. L. and Verma P. S.
23. Anatomy of Chordates, 4th edition : Weichert C. K.
24. Comparative vertebrate Anatomy : L. H. Hyman

E-Resources –

1. SWAYAM- .https://swayam.gov.in/explorer?searchText=
2. https://academic.oup.com
3. https://medineplus.gov
4. https://ncin.nlon.nih.gov
5. https://zoologylearningpoint.woodpress.com
6. https://zoologyresources.com
7. National digital library – https://ndl.iitkgp.ac.in
7. e-PG Pathshala (MHRD) Portal. https://egpg.inflibnet.ac.in
8. Science Direct Open Access Content – https://www.sciencedirect.com/book/9781843342038 open – Access
9. https://egyankosh.ac.in
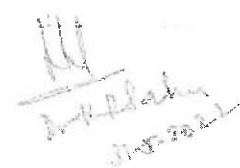
Part D: Assessment and Evaluation	
University Exam(UE): Maximum Marks:	50 Marks

Part A: Introduction		
Program: Certificate Course	Class: B.Sc. 1 Year	Year: 2022 Session:2022-2023

1	Course Code	ZOOL-IP
2	Course Title	Lab Course - 1
3	Course Type	Practical
4	Pre-requisite (if any)	No
5	Course Learning Outcomes (CLO)	After completion of practical work the outcome will be : - Able to know animal diversity in the form of museum/slide for invertebrate and invertebrates. - Capable to enumerate biology of invertebrates. - Capable to explore anatomy of animas. - Able to understand cytological, histological and osteological configuration for animal life. - Capable to explain hematology of animal system.
6	Credit Value	2
7	Total Marks	Max. Marks: 50 Min Passing Marks : 17

Part B: **Content of the Course**
Total classes: 30

Content	No. of classes

Tentative list of practical/exercise :.
The practical's work will be based on theory syllabus and the students will be required to show the knowledge of the following –
1. Study of museum specimens representing to invertebrate phyla.
2. Study of permanent slides :
   Paramecium, Euglena, T. S. Sycon, Sponge Spicules, Sponge gemmule, Obelia colony, Obelia medusa, Ephyra larva. Fasciola larval forms (miracidium, Radia, Cercaria,
   Metacercaria). Trochophore larva, Zoea larva, Bipinnaria larva.
3. Dissection/ demonstration/ clay model of –
   a) Phretima : Digestive system, Reproductive system. Nervous system
   b) Palaemon : Appendages, Nervous system
   c) Periplaneta : Mouth parts, Digestive system
   d) Pila : Nervous system
4. Exercise based on cytology : squash preparation from onion root tip and study of cell division.
5. Study of museum specimens representing the chordata from cyclostomes to mammals.
6. Study of permanent slides of chordates – Fish skin, scales, V. S. Skin of frog, reptile, bird,
   mammal, T.S. liver, pancreas. testes, ovary of frog and mammal.
7. Osteology : Study of girdles of amphibian, reptile, bird and mammal.
8. Temporary mounting :
   a) Palaemon : Statocyst
   b) Pila : Ctenidium, osphradium
   c) Pheretima : Septal nephridia
   d) Fish scale : Placoid, Cycloid, Ctenoid
9. Exercise based on blood : blood group, blood pressure measure
10. Field visit report : Photography & identification of any five local invertebrate or vertebrate fauna.
	30

Part C - Learning Resource

Text Books, Reference Books, Other Resources -
1. Practical zoology Invertebrate : S. S. Lal
2. Practical zoology vertebrate : S. S. Lal
3. A Manual of practical zoology invertebrates : P. S. Verma
4. A Manual of practical zoology Chordates : P. S. Verma
5. Saras Practical zoology Vol. I, Vol. II, N. Arumugam

Part D: Assessment and Evaluation

University Exam(UE): Maximum Marks: 50 Marks

Scheme of B. Sc. Mathematics

Year	Course Code	Subject Name	Theory/Practical	Total Credit	Total Marks Max	Min
First year	MATH-1T	Calculus	Theory	4	50	33
	MATH-2T	Algebra	Theory	4	50	
	MATH-1P (Any One)	Lab 1 : Calculus and Algebra	Practical	2	50	17
		Project 1 : History of Mathematicians	Project	2	50	17

Part A: Introduction

Program: Certificate Course	Class: B. A. / B.Sc. Part I	Year: 2022	Session:2022-2023
1	Course Code	Paper – MATH- 1T	
2	Course Title	Calculus	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	This Course will enable the students to: - Calculate the limit and examine the continuity and understand the geometrical interpretation of differentiability. - Understand the consequences of various mean value theorems. - Draw curves in cartesian and polar coordinate systems. - Understand conceptual variations while advancing from one variable to several variables in calculus. - Inter-relationship amongst the line integral, double and triple integral formulations. - Realize importance of Green, Gauss and Stokes' theorems in other branches of mathematics.	
6	Credit Value	4	
7	Total Marks	Maximum Marks : 50	Minimum Passing Marks : .....

Part B: Content of the Course

Total Periods: 60

Unit	Topics	No. of Periods
I	**Sequences, Continuity and Differentiability:** Notion of convergence of sequences and series of real numbers, ε-δ definition of limit and continuity of a real valued function; Differentiability and its geometrical interpretation: Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem and their geometrical interpretations, Darboux's theorem.	12
II	**Expansion of Functions:** Successive differentiation and Leibnitz theorem. Maclaurin's and Taylor's theorems for expansion of a function. Taylor's theorem in finite form with Lagrange, Cauchy and Roche–Schlömilch forms of remainder.	12
III	**Curvature, Asymptotes and Curve Tracing:** Curvature; Asymptotes of general algebraic curves, parallel asymptotes. Asymptotes parallel to axes; symmetry, concavity and convexity, points of inflexion, Tangents at origin, Multiple points, Position and nature of double points; Tracing of	12

	cartesian, polar and parametric curves; Envelopes and Evolutes.	
IV	**Functions of Several Variables:** Limit, continuity and first order partial derivatives, Higher order partial derivatives, Change of variables, Euler's theorem for homogeneous functions, Taylor's theorem, Total differentiation and Jacobians.	12
V	**Double and Triple Integrals:** Double integration over rectangular and non-rectangular regions, Double integrals in polar co-ordinates, Triple integral over a parallelepiped and solid regions, Volume by triple integrals, Line integrals, Green's theorem, Area as a line integral, Surface integrals, Stokes' theorem, The Gauss divergence theorem.	12

Part C - Learning Resource

Text Books and Reference Books:

1. Howard Anton, I. Bivens & Stephan Davis. Calculus (10th edition). Wiley India. 2016

2. Gabriel Klambauer. Aspects of Calculus. Springer-Verlag. 1986

3. Wieslaw Krawcewicz & Bindhyachal Rai. Calculus with Maple Labs. Narosa. 2003

4. Gorakh Prasad Differential Calculus (19th edition). Pothishala Pvt. Ltd. 2016

5. George B. Thomas Jr., Joel Hass, Christopher Heil & Maurice D. Weir. Thomas' Calculus (14th edition). Pearson Education 2018

6. Jerrold Marsden, Anthony J. Tromba & Alan Weinstein. Basic Multivariable Calculus, Springer India Pvt. Limited.2009

7. James Stewart. Multivariable Calculus (7th edition). Brooks/Cole. Cengage 2012.

8. Monty J. Strauss, Gerald L. Bradley & Karl J. Smith. Calculus (3rd edition). Pearson Education. Dorling Kindersley (India) Pvt. Ltd. 2011

E- Resources :

1. Suggested Equivalent online courses: Web link NPTEL/ SWAYAM/ MOOCs
2. https://www.youtube.com/watch?v=tffrrtzUhmw&list=PL7oBzLzHZIwXBSiJEgqz_iwVoLiY8qhbv
3. https://www.youtube.com/watch?v=XzaeYnZdK5o&list=PLtKWB-wrvn4nA2h8TFxzWL2zy8O9th_fy
4. https://www.youtube.com/watch?v=zxbHsPB8m-M&list=PLBCEh9iawVM75FaeqS-z7olBKTSLfAC4A

Part D: Assessment and Evaluation
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Marks

Part A: Introduction			
Program: Certificate Course	Class: B. A. / B.Sc. Part I	Year: 2022	Session:2022-2023
1	Course Code	Paper – MATH-2T	
2	Course Title	Algebra	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	**This Course will enable the students to:** • Employ De Moivre's theorem in a number of applications to solve numerical problems. • Learn about the fundamental concepts of groups, subgroups, normal subgroups. isomorphism theorems, cyclic and permutation groups. • Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank. • Find eigen values and corresponding eigen vectors for a square matrix. • Understand real vector spaces, subspaces, basis, dimension and their properties.	
6	Credit Value	4	
7	Total Marks	Maximum Marks : 50	Minimum Passing Marks : ....

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Periods
I	**Set Theory and Theory of Equations:** Sets, Relations, Equivalence relations, Equivalence classes; Finite, countable and uncountable sets; The division algorithm, Divisibility and the Euclidean algorithm, Modular arithmetic and basic properties of congruence's; Elementary theorems on the roots of polynomial equations. Imaginary roots. The fundamental theorem of algebra (statement only); The nth roots of unity. De Moivre's theorem for integer and rational indices and its applications.	12
II	**Groups, Subgroups, Normal Subgroups and Isomorphism Theorems :** Definition and properties of a group, Abelian groups. Examples of groups including D_n (dihedral groups), Q_8	12

		(quarternian group), $GL(n, \mathbb{R})$ (general linear groups) and $SL(n, \mathbb{R})$ (special linear groups); Subgroups and examples, Cosets and their properties, Lagrange's theorem and its applications, Normal subgroups and their properties, Simple groups, Factors groups; Group homomorphisms and isomorphisms with properties; First, second and third isomorphism theorems for groups.	
III		**Cyclic and Permutation Groups:** Cyclic groups and properties, Classifications of subgroup of cyclic groups, Cauchy theorem for finite abelian groups; Centralizer, Normalizer, Center of a group, Product of two subgroups, Permutation group and properties, Even and odd permutations, Cayley's theorem.	12
IV		**Row Echelon Form of Matrices and Applications:** Systems of linear equations, Row reduction and echelon forms, The rank of a matrix and its applications in solving system of linear equations; Matrix operations, Symmetric, skew- symmetric, self-adjoint, orthogonal, Hermition, skew-Hermition and unitary matrices; Determinant of a square matrix, The inverse of a square matrix, Eigen vectors and eigen values, The characteristic equation and the Cayley⬚Hamilton theorem, Applications of matrices to computer graphics and search engines.	12
V		**Vector Spaces and Linear Transformations:** Definitions of field and vector space with examples, Subspaces, Linear span, Quotient space and direct sum, Linearly independent and dependent sets, Bases and dimension, Linear transformation and matrix of a linear transformation, Change of coordinates, Rank and nullity of linear transformation, Rank-nullity theorem.	12

Part C - Learning Resource
Text Books and Reference Books   1. Michael Artin *Algebra* (2nd edition). Pearson 2014.   2. John B. Fraleigh. *A First Course in Abstract Algebra* (7th edition). Pearson 2007.   3. Stephen H. Friedberg, Arnold J.Insel& Lawrence E. Spence. *Linear Algebra* (4thedition). Prentice-Hall of India Pvt. Ltd. 2003   4. Joseph A. Gallian. *Contemporary Abstract Algebra* (9th edition). Cengage. 2017   5. Kenneth Hoffman & Ray Kunze. *Linear Algebra* (2nd edition). Prentice-Hall. 2015

6. I. N. Herstein. *Topics in Algebra* (2nd edition). Wiley India. 2006

7. Nathan Jacobson. *Basic Algebra I* (2nd edition). Dover Publications. 2009

8. Ramji Lal. *Algebra 1: Groups, Rings, Fields and Arithmetic*. Springer. 2017

9. I.S. Luthar & I.B.S. Passi. *Algebra: Volume I: Groups*. Narosa. 2013

E- Resources

1. Suggested Equivalent **online courses**: Web link NPTEL/ SWAYAM/ MOOCs
2. Linear Algebra
   https://www.youtube.com/watch?v=9h_Q-R6sXbM&list=PL7oBzLzHZ1wXQvQ938Wg1-soq09GywgOw
3. Group theory
   https://www.youtube.com/watch?v=pMzcLG6s3z0&list=PLEAYkSg4uSQ1Yhxu2U-BxtRjZElrfVVcO

Part D: Assessment and Evaluation	
Suggested Continuous Evaluation Methods: Maximum Marks:	50 Marks

Part A: Introduction				
Program: Certificate Course	Class: B.A./ B.Sc. I Year	Year: 2022		Session: 2022-2023
1	Course Code	MATH-1P (I)		
2	Course Title	I - Lab 01 - Calculus and Algebra		
3	Course Type	Practical		
4	Pre-requisite (if any)	No		
5	Course Learning Outcomes (CLO)	At the end of course, Students will be able to • Learn Free and Open Source Software (FOSS) tools for computer programming • Solve problems on Calculus and Algebra theories studied in Mathematics Paper 1 and 2 by using FOSS softwares. • Acquire knowledge of applications of Calculus and Algebra through FOSS.		
6	Credit Value	2		
7	Total Marks	Max. Marks: 50		Min Passing Marks : 17

Part B: Content of the Course	
Total Periods: 30	
Tentative Practical List	Mathematics practical with Free and Open Source Software (FOSS) tools for computer programs, such as GeoGebra/Maxima/Scilab/ Octave /Python/R. **Course Objectives:** • To learn Free and Open Source Software (FOSS) tools for computer programming • Acquire knowledge of applications of algebra and calculus through FOSS **List of Practicals: (At least 15 practicals)** • Programs to illustrate left hand and right hand limits for discontinuous functions. • Program to illustrate continuity of a function • Program to illustrate differentiability of a function • Program to verify Rolle's theorem • Program to verify Lagrange's theorem • Programs to verify Cauchy's mean value theorem and finding Taylor's theorem for a given function. • Program to illustrate nth derivative without Leibnitz rule.

- Program to construct series using Maclaurin's expansion for functions of two variables.

- Program to finding the asymptotes of curves.

- Program to finding radius of curvature of cycloid.

- Program to finding partial derivative of a given function.

- Program to calculating the area under two curves.

- Obtaining partial derivatives of some standard functions.

- Evaluation of the line integral with constant limits.

- Evaluation of the line integral with variable limits.

- Evaluation of the double integral with constant limits.

- Evaluation of the double integral with variable limits.

- Evaluation of the triple integral with constant limits.

- Evaluation of the triple integral with variable limits.

- Programs for area and volume.

- Verifying whether given operator is binary or not

- To find identity element of a group

- To find inverse element of a group.

- To construct Cayley's table

- Verification of a subgroup of a given subset of a group

- Finding all possible subgroups of a finite group.

- Examples to verify Lagrange's theorem.

- To find the left and right cosets and index of a subgroup

- To find all the cyclic subgroups of a given group

- Verification of normality of a given subgroup of a group

- Illustrating homomorphism and isomorphism of groups

- Examples on different types of rings.

	• Examples on integral domains and fields.
	• Examples on subrings, ideals and subrings which are not ideals.
	• Homomorphism and isomorphism of rings- illustrative examples.
	• Solving polynomial equations.
	• Finding G.C.D of polynomials.
	• Finding product of two matrices
	• To test linear independency of a given set of a vectors in a vector space.

Part C - Learning Resource
Text Books, Reference Books, Other Resources
SUPPORT FROM THE GOVT FOR STUDENTS AND TEACHERS IN UNDERSTANDING AND LEARNING FOSS TOOLS: As a national level initiative towards learning FOSS tools, IIT Bombay for MHRD, government of India is giving free training to teachers interested in learning open source software's like scilab, maxima, octave, geogebra and others. (Website: http://spoken-tutorial.org;)   (email: info@spokentutorial.org; contact@spoken-tutorial.org)

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Continuous Comprehensive Evaluation (CCE): Not Applicable University Exam(UE): 50 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable

Part A: Introduction

Program: **Certificate Course**		Class: **B.A./B.Sc. I Year**	Year: **2022**	Session: 2022-2023
1	Course Code		MATH-1P (II)	
2	Course Title	II - Project 01 - History of Mathematician		
3	Course Type	Project		
4	Pre-requisite (if any)	NIL		
5	Course Learning Outcomes (CLO)	Studying history of mathematicians help students: • Develop a deeper understanding of the mathematics they hare already studied by seeing how it was developed over time and in various places. • Know the rich intellectual heritage of the country. • Develop an appreciation of mathematics and build positive attitude towards mathematics increasing student's motivation decreasing anxiety related the subject. • To acquire knowledge about development of mathematics in ancient , medieval and modern period of history.		
6	Credit Value	2		
7	Total Marks	Max. Marks: 50		Min Passing Marks : 17

Part B: Content of the Course
Total Periods: 30

Project List	Course Objectives: An elective course designed to acquire special / advance knowledge, such as supplement study / support study to a project work and a candidate will study such a course on his own with an advisory support a teacher / faculty member. **Project** Contributions and biographies of Indian Mathematicians- Bodhayan, Apasthambh, Katyayan and Mahaveeracharya, Brahmagupta, and Bhaskaracharya in special context of Leelavati and contributions of mathematicians involved in context of the paper of calculus and algebra. (10 Mathematicians)

Part C - Learning Resource		
Text Books. Reference Books. Other Resources		
Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Continuous Comprehensive Evaluation (CCE): Not Applicable University Exam(UE): 50 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable

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Scheme of B. Sc./ B.Sc. (Hons.) Microbiology

Year	Course Code	Subject Name	Theory/ Practical/Project	Total Credit	Total Marks	
					Max	Min
First year	MICRO -1T	Microbial World and Microbial Techniques	Theory	4	50	17
	MICRO -2T	Bacteriology, Virology & Proto-zoology	Theory	4	50	17
	MICRO -1P	LAB 1: BASIC MICROBIOLOGY	Practical	2	50	17

Part-A: Introduction

Program: *Certificate Course*	Class: B. Sc. Part - I	Year: 2022, Session:2022-

1	Course Code	MICRO -1T	
2	Course Title	Microbial World and Microbial Techniques	
3	Course Type	Core Course	
4	Pre-requisite (if, any)	As per Government norms	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able - ➤ *to understand the nature, occurrence and diversity of Microorganisms in the environment* ➤ *to learn basic techniques microbial culture, identification and handling* ➤ *to become familiar with the eminent microbiologists, historical background and scope of microbiology.*	
6	Credit Value	04	
7	TotalMarks	Max.Marks:50	Min Passing Marks: 17

PART B: Content of the Course

Total No. of Teaching – Periods- 60 / Hours – 40

Unit	Topics (Course contents)	No. Periods / Hours
I	**Development of microbiology as a discipline:** Fundamental. History & Developments Introduction to various fields of Microbiology; Contributions of eminent scientists i.e. Antony von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming, Martinus W. Beijerinck, Sergei N. Winogradsky, Selman A. Waksman, Paul Ehrlich, Elie Metchnikoff, Edward Jenner. Hans Christian Gram.	12 Periods 08 Hours
II	**Systems of classification:** Binomial Nomenclature, Haeckel's three kingdom concept, Whittaker's five kingdom classification and Carl Woese's three domain classification system. Concept of prokaryotic and eukaryotic microorganisms.	12 Periods 08 Hours
III	**Diversity of Microbial World:** General features structure, reproduction and economic importance of major groups of microorganisms i.e.Virus, Bacteria, Fungi, Algae, Yeast, Protozoa, Cyanobacteria, Chlamydia. Actinomycetes, Mycoplasma.	12 Periods 08 Hours
IV	**Basic Microbial Techniques:** Introduction to Microscopy (Bright Field, Dark Field, Phase Contrast Fluorescent Microscope and Electron Microscope) Staining Techniques (Gram staining, negative staining, acid fast staining) and Sterilization techniques (Physical and Chemical).	12 Periods 08 Hours

	Pure Culture and Staining Techniques:	
V	Culture media and theirs types (Natural, Synthetic, Complex Media-Differential, Enriched, Enrichment, Selective Media) Pure culture isolation Technique: (Streak plate, Waskman serial dilution and plating methods) Maintenance and Preservation of pure culture.	12 Periods 08 Hour

Keywords	Microbial Diversity, Microbial world. Microbes, Microbial techniques, Microbial culture

PART – C

Learning Resources: Text Books, Reference Books and Others

Suggested Readings:

Text Books Recommended

1. General Microbiology; Vol I & II, Powar C.B. and Daginawala H.L, Himalay Pub House, Bombay.
2. A Text Book of Microbiology; Dubey & Maheshwari.
3. Microbiology: An Introduction; Tortora, G. J, Funke B. R. and Case C. L.
4. Practical Microbiology; Dubey and Maheshwari.
5. Experiments in Microbiology: Plant Pathology and Biotechnology; K. R. Aneja.
6. A Text Book of Microbiology; R. P. Singh.
7. Prescott's Microbiology. Wiley JM, Sherwood LM and Woolverton CJ
8. Microbiology. 5th edition. Pelczar MJ, Chan ECS and Krieg NR.
9. General Microbiology. 5th edition. Stanier RY, Ingraham JL, Wheelis ML. and Painter PR

Online Resources –

> e-Resources / e-books and e-learning portals
> Use of following sites

1. https://nptel.ac.in/courses/102103015

2. https://onlinecourses.swayam2.ac.in/cec19_bt11/preview

3. https://www.britannica.com

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE): Annual /University Exam(UE):	50 Marks NA 50 Marks	
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment /Field work	NA

Part-A: Introduction

Program: *Certificate Course* | **Class: B. Sc. Part - I** | **Year: 2022** Session 202...

1	Course Code	MICRO - 2T
2	Course Title	**Bacteriology, Virology & Proto-zoology**
3	Course Type	**Core Course**
4	Pre-requisite (if, any)	As per Government norms
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to - ➢ *understand ecological distribution of microorganism and their significance for society* ➢ *aware with the essential and current knowledge of bacteria, virus and protozoa* ➢ *become familiar with beneficial & harmful behavior of Viruses, Bacteria, Protozoan and other microbes*
6	Credit Value	04
7	Total Marks	**Max. Marks: 50** **Min Passing Marks:** 1?

PART B: Content of the Course

Total No. of Teaching Periods – 60 / Hours - 40

Unit	Topics (Course contents)	No. of Period / Hours
I	**Morphology and Ultra structure of Bacteria:** Cell size, shape and arrangements. Composition, structure and function of cell membrane and cell wall of gram-positive. gram-negative and archaea bacteria, capsule. flagella, pili. ribosomes. inclusions, nucleoid, plasmids. Structure and stages of spore formation.	12 . 08
II	**Ecological significance and economic importance Archaea:** methanogens, thermophiles and halophiles. Eubacteria: Gram negative(non-proteobacteria- *Deinococcus, Spirochetes.* Alpha proteobacteria-, *Rhizobium, Agrobacterium,* Gamma proteo-bacteria– *Escherichia, Pseudomonas).* Gram positive low G+C: *Bacillus, Clostridium, Staphylococcus.* High G+C: *Streptomyces, Frankia.*	12 08
III	**Morphology and ultrastructure of viruses;** General Introduction, morphologyand ultra- structure of viruses, capsid and their arrangements. types of envelopes and their composition. Viral genome; their types and structure, viral related forms-virions, viroids, virusoids, and prions.	12 08

IV	Classification and multiplication of viruses; Classification of Bacterial Plant and animal viruses. Salient features and life cycle of viruses: Bacteriophages (T4 & Lambda), Plant (TMV & CMV), Animal (Adenovirus, Pox virus & retrovirus).	12 / 08
V	Basic Introduction to protozoa; occurrence and classification of protozoa. Structure, reproduction, life cycle and diseases caused by important protozoans- *Entamoeba, Giardia, Leishmania, Trypanosoma* and *Plasmodium*.	12 / 08

Keywords *Bacteria, Virus, Protozoan,*

PART – C

Learning Resources: Text Books, Reference Books and Others

Suggested Readings:

Text Books Recommended -

1. General Microbiology; Vol I & II, Powar C.B. and Daginawala H.L., Himalay Pub. House, Bombay.

2. A Text Book of Microbiology; Dubey & Maheshwari.

3. Microbiology: An Introduction. Tortora GJ, Funke BR and Case CL.

4. Practical Microbiology; Dubey and Maheshwari.

5. Experiments in Microbiology: Plant Pathology and Biotechnology; K. R. Aneja.

6. A Text Book of Microbiology; R. P. Singh.

7. Prescott's Microbiology. Wiley JM, Sherwood LM and Woolverton CJ.

8. Microbiology. Pelczar MJ, Chan ECS and Krieg NR.

9. General Microbiology. Stanier RY, Ingraham JL, Wheelis ML. and Painter PR.

Online Resources –

  ➢ e-Resources / e-books and e-learning portals
  ➢ Use of following sites

1. *www.nos.org/media/documents/dmlt/microbiology*

2. *www.columbia.edu/itc/hs/medical/pathophys/id/2009*

3. *https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp content/botany/04. plant genetic engineering/strategies for resistance to plant viral diseases/lm/403 lm edited module m.pdf*

Total

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks:		50 Marks
Continuous Comprehensive Evaluation (CCE)/Field work		NA
Annual /University Exam(UE):		50 Marks
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Field work	NA

Part - A: Introduction

Program: *Certificate Course*		Class: B. Sc. Part - I	Year: 2022 Session:2022-1
1	Course Code	MICRO -1P	
2	Course Title	BASIC MICROBIOLOGY	
3	Course Type	Laboratory Course	
4	Pre-requisite (if any)	As per Govt. norms	
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to ➢ *handle instruments in microbiology lab.* ➢ *isolate, purify and observe microorganisms.* ➢ *maintain and preserve microbial culture*	
6	Credit Value	02	
7	Total Marks	Max. Marks: 50	Min Passing Marks: 17

PART -B: Content of the Course

Total No. of Teaching Hours – 20 / 30 Periods

Group	Topics (Course contents) • It is a tentative list that can be amended by teacher/ department concerned.	
A	1. Basic information about autoclave, hot air oven, laminar air flow and other laboratory instrument 2. Microscopy - Different parts of compound microscope. Handling and care of compound microscope 3. Preparation of solid &liquid culture media 4. Isolation of microorganism from soil, Isolation of single colonies on solid media by streak plate method. 5. Enumeration of bacteria by serial dilution and plating. 6. Measurement of microorganism (micrometry) and camera Lucida drawing of isolated organism. 7. Determination of bacterial growth by optical density measurements.	15 / 10
B	1. Preparation of laboratory Glass wares (Chemical washing, cleaning and drying) and Preparation of culture media (Liquid & solid). 2. Observation of microorganisms through permanent slides - Bacteria, Cyanobacteria, Protozoa, Fungi, Yeasts, and Algae 3. Observation of bacterial motility--Hanging drop technique / Agar Stab culture 4. Staining Techniques-Simple, Differential staining; Gram staining. Aseptic transfer techniques--types--Plate to slant/ slant to slant/ broth to broth. 5. Maintenance and preservation/stocking of pure cultures. 6. Study of the methods of isolation and propagation of plant viruses. 7. Study of cytopathic effects of viruses using photographs.	15 / 10
Keywords	*Isolation method, pure culture, culture media*	

PART – C
Learning Resources: Text Books, Reference Books and Others

Suggested Readings:

Text Books Recommended:

1. Laboratory Manual of Microbiology and Biotechnology. by Aneja K. R
2. Practical Microbiology, R. C. Dubey and D. K. Maheshwari.
3. Laboratory Manual In Microbiology. By P. Gunasekaran.

OnlineResources –

1. https://open.umn.edu/opentextbooks/textbooks/499
2. https://vlab.amrita.edu/?sub=3&brch=73&sim=720&cnt=1

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:

Continuous Comprehensive Evaluation (CCE):	50 Marks
Annual /University Exam(UE):	NA
	50 Marks

Internal Assessment:

Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment /Field work	NA

Scheme of Examination
B.Sc.
Geology

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
First Year	GEOL- 1 T	Geodynamics and Geomorphology	Theory	4	50	17
	GEOL- 2 T	Mineralogy and Crystallography	Theory	4	50	17
	GEOL-1 P	Geodynamics and Geomorphology Mineralogy and Crystallography	Practical	2	50	17

Part A				
Introduction				
Program: **Certificate Course**		Class: **B.Sc. I Year**	Year: **2022**	Session:**2022-2023**
S.No.				
1	Course Code	GEOL - 1T		
2	Course Title	Geodynamics&Geomorphology (Paper I)		
3	Course Type	Theory		
4	Pre-requisite (if any)	Tostudy this group, a student must have passed in the subject of **Mathematics Groupor Biology Group** in the class12[th].		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to- • Understand basics of Geology, Solar system and internal structure of the Earth, origin and age of the Earth • Understand the theories of continental drift and plate tectonics • Understand causes and effects of earthquakes and explain weathering and its products • Describe concepts of geomorphology and landforms developed by various geological agencies • Explain about the climate change and salient features of physiographic and tectonic divisions of India		
6	Credit Value	Theory : 4		
7	Total Marks	Maximum Marks: 50		Minimum Passing Marks : 17

Part B		
Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Periods
I	**Introduction to Geology:** Introduction to Geology and its branches and importance. Introduction to solar system: Star, planet, satellite, asteroid and meteorite Earth in the solar system; size, shape, mass, & density, Origin of Earth, Internal structure of Earth. Crust, Mantle and Core, Age of Earth: Various methods of determination of age of the Earth	12
II	**DynamicEarth:** Concept & theories of continental-drift, Sea floor spreading and evidences. Concept of plate tectonics, tectonic plates, types and plate boundaries, Introduction to paleomagnetism and polar wandering, Mid-oceanicridges, trenches and island arcs.	12
III	**GeomorphicProcesses:** Earthquakes: Causes and effects,	12

		EarthquakeBelts,measurementofEarthquakes. Seismic zones of India, Volcanoes:Types& distribution, Fundamentalconceptsof geomorphology, Geomorphologicalagentsandprocessesofrock weathering, Soilformation,soilprofileandtypesofsoil.	
IV	GeologicalWork: Geological work of rivers ; fluvial landforms, Drainage system, Geologicalworkofgroundwaterandkarst topography, Geologicalworkofwind;Aeolianlandforms, GeologicalworkofGlaciers;glaciallandforms.	12
V	Geologicalwork: Geologicalworkofoceans;coastal landforms. Volcanic landforms, Earth'sheatbudget, Climate change, global warming, greenhouse effect, Physiographicand tectonic divisionsofIndia.	12

Part C
Learning Resources
Suggested Readings

1. भौतिक–भूविज्ञान–डॉ. मुकुल घोष
2. भौतिक–भूविज्ञान–डॉ. जे.पी. तिवारी एवंबी.के. सिंह
3. भूआकृतिविज्ञान–डॉ.सविन्द्र सिंह
4. भूविज्ञान एक परिचय –डॉ. विद्यासागरदुबे
5. भूगतिकी एवंभूआकृतिविज्ञान–डॉ. दीपकराजतिवारी
6. Holmes, A. Doris L Holmes Edit., Principles of Physical Geology, Van Nostrand Reinhold, 1978.
7.Mahapatra. G.B., Text book of Physical Geology, CBS, India, 2018
8.Mathur, S.M., Physical Geology of India, NBT India, 1991
9. Miller, William J., Physical Geology : An Introduction. D Van Nostrand Co., 5th Ed.,1949
10. Mukerjee,P.K.,Text Book of Geology. World Press Private Ltd, 2013.
11. Thornbury, W.D., Principles of Geomorphology. New Age International, 2nd Edition.196
12. Principles of Geomorphology : A.F. Ahmad

e-book
1. JainSreepat.FundamentalsofPhysicalGeology. SpringerIndia.2013
E-resources

1. https://opentextbc.ca/physicalgeology2ed/front-matte/rdownload-a-pdf/
2. https://archive.org/details/in.ernet.dli.2015.233340/page/n15/mode/2up
3. https://egyankosh.ac.in/
4. https://sites.google.com/ignou.ac.in/bscgeology
5. SWAYAM – https://swayam.gov.in/explorer?searchtext
6. National digital library – https://ndl.iitkgp.ac.in
7. e-PG pathshala (MHRD) portal, https://egpg.inflibnet .ac.in

PartD		
AssessmentandEvaluation		
SuggestedContinuousEvaluationMethods: MaximumMarks:50 ContinuousComprehensiveEvaluation(CCE):NA UniversityExam(UE):　　50marks		
InternalAssessment: ContinuousComprehensive Evaluation(CCE)	Class Test Assignment/Presentation	NA

Part A			
Introduction			
Program: Certificate Course	Class: B.Sc. I Year	Year: 2022	Session:2022-2023
S.No.			
1	Course Code	GEOL-2T	
2	Course Title	Mineralogy and Crystallography (Paper II)	
3	Course Type	Theory	
4	Pre-requisite (if any)	To study this group, a student must have passed in the subject of **Mathematics Group** or **Biology Group** in the class 12th.	
5	Course Learning Outcomes (CLO)	On completion of this course, the students should be able to - • Explain about the basics of crystallography, various crystal forms, crystallographic axes and symmetry elements • Describe various forms of normal classes of various crystal systems • Classify the minerals in various silicate groups and explain their varieties • Describe the physical properties of various minerals. • Describe the optical characteristics of various minerals	
6	Credit Value	Theory : 4	
7	Total Marks	Maximum Marks: 50	Minimum Passing Marks : 17

Part B		
Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Periods
I	**IntroductiontoCrystallography:** Definition of Mineral and Crystal :Rockforming andoreminerals, Crystal structures, Unit cells. Elements of crystal. Crystal forms, Crystallographic axes and axial angles, Weiss'sParametersandMiller'sIndicessystemsof crystalnotations.	12
II	**Crystallography:** Interfacialangleand itsmeasurement, Laws of Crystallography. Crystal symmetry: Plane, axis and center of symmetry. Classificationofcrystalsintosystemsandclasses, Symmetryandformsofnormalclasses. Twinningincrystals.	12
III	**Mineralogy :** Silicate structures and classification of silicates, Bonding in Minerals, Isomorphism and Solid solution, Polymorphism andPseudomorphism, Physical properties of minerals.	12
IV	**OpticalMineralogy:**	12

		Nature of light : reflection and refraction of light, Refractive index, Critical angle. Total internal reflection and Beckeeffect, Double refraction. Nicol prism -it's construction and working, Polarizing Microscope- its parts & functions, Optical properties of minerals.	
V		**Minerals and lithosphere :** Study of Composition, Classification, physical and optical properties of the following Mineral groups - Olivine, Garnet and Mica groups, Pyroxenes and Amphiboles, Feldspars and Feldspathoids, Silica, Compositionoflithosphere, Industrial and other uses of various minerals.	12

PartC

LearningResources

SuggestedReadings

1. खनिजतथाक्रिस्टलविज्ञान–डॉ.बी.सी. जैश
2. खनिजविज्ञान के सिद्धांत–डॉ. ए.पी. अग्रवाल
3. प्रकाशीय खनिजविज्ञान के मूलतत्व–विंचेल
4. खनिजतथाक्रिस्टलविज्ञान–डॉ. दीपकराजतिवारी
5. Gribble,C.D.:Rutley'sElementsofMineralogy.CBS,2005.
6. FordW.E.;Dana'sTextBookofMineralogy.CBS,2006.
7. Perkins,D.:Mineralogy,PrenticeHallIndia,3rded.2012.
8. Rathore,B.S.;
BasicsofCrystallography,MineralogyandGeochemistry.NotionPressIndia,2020.
9. खनिजतथाक्रिस्टलविज्ञान–डॉ.बी.सी. जैश
10. खनिजविज्ञान के सिद्धांत–डॉ. ए.पी. अग्रवाल
11. प्रकाशीय खनिजविज्ञान के मूलतत्व–विंचेल
12. खनिजतथाक्रिस्टलविज्ञान–डॉ. दीपकराजतिवारी
13. Gribble,C.D.:Rutley'sElementsofMineralogy.CBS,2005.
14. FordW.E.;Dana'sTextBookofMineralogy.CBS,2006.
15. Perkins,D.:Mineralogy,PrenticeHallIndia,3rded.2012.
16. Rathore,B.S.;
BasicsofCrystallography.MineralogyandGeochemistry.NotionPressIndia.2020.
17. Sharma,R.S.andSharma,Anurag;CrystallographyandMineralogy-ConceptsandMethods.Geol.Soc.Ind.,Bengaluru,2013.

2.E-resources :

1. https://www.mindat.org
2. https://www.mooc-list.com/tags/minerals
3. https://epgp.inflibnet.ac.in/Home
4. https://archive.org/details/in.ernet.dli.2015.233340/page/n15/mode/2up
5. https://egyankosh.ac.in/
6. https://sites.google.com/ignou.ac.in/bscgeology
7. SWAYAM – https://swayam.gov.in/explorer?searchtext
8. National digital library – https://ndl.iitkgp.ac.in
9. e-PG pathshala (MHRD) portal, https://egpg.inflibnet .ac.in

PartD		
AssessmentandEvaluation		
SuggestedContinuousEvaluationMethods:		
MaximumMarks:50		
ContinuousComprehensiveEvaluation(CCE):NA		
UniversityExam(UE): 50marks		
InternalAssessment: ContinuousComprehensive Evaluation(CCE)	Class Test Assignment/Presentation	NA

Part A
Introduction

S.No.	Program: Certificate Course	Class: B.Sc. I Year	Year: 2022	Session:2022-2023
1	Course Code	GEOL-IP		
2	Course Title	Geodynamics, Geomorphology Mineralogy & Crystallography (Paper Practical)		
3	Course Type	Practical		
4	Pre-requisite (if any)	This practical course is related to theory course Geology Paper I & II.		
5	Course Learning Outcomes (CLO)	On completion of course, the students will be able to - • Understand the megascopic properties of Quartz and Feldspar group of minerals • Understand the megascopic properties of pyroxene group of minerals • Understand megascopic properties of Amphibole group of minerals • Describe the megascopic properties of olivine and Mica group of Minerals. • Describe microscopic identification of minerals. • Identify the various crystal Systems and Symmetry through crystal models • Assess the miller Indices of the crystal models • Identify Twining in crystals. • Identify and describe various landforms in geomorphologic models. • Interpret topographical maps		
6	Credit Value	Practical : 2		
7	Total Marks	Maximum Marks: 50		Minimum Passing Marks : 17

Part B1
Content of the Course
Geodynamics and Geomorphology

Topics	No. of Periods
Study of geomorphic features from models, map and photographs.	3
Numbering of Topographical maps (Survey of India Toposheets) on various scales.	3
Interpretation of various geomorphic landforms and drainage patterns on topographical maps.	3
Plotting of major mountain ranges, lakes and rivers on the outline map of India.	3
Plotting of seismic observatories on the outline map of India. Plotting of epicenter and magnitudes of major earthquakes of India.	3

Part B2	
Content of the Course	
Mineralogy and Crystallography	
Topics	**No. of Periods**
Study of symmetry elements of crystals/ crystal models of normal classes.	03
Study of fundamental forms of crystals/ crystal models of normal classes.	04
Verification of Euler's theorem.	01
Study of physical properties of minerals.	04
Study of optical properties of important rock forming minerals using polarizing microscope.	03
Field work of two days is compulsory for the students.	

Part C
Learning Resources
Suggested Readings:

1. भौतिक–भूविज्ञान– डॉ. मुकुल घोष
2. भौतिक भूविज्ञान–डॉ. जे.पी. तिवारी एव बी. के. सिंह
3. भूआकृतिविज्ञान –डॉ.सविन्द्र सिंह
4. भूविज्ञान एक परिचय –डॉ. विद्यासागरदुबे
5. भूगतिकी एवंभूआकृतिविज्ञान–डॉ. दीपकराजतिवारी
6. Holmes, A. Doris L. Holmes Edit., Principles of PhysicalGeology, Van Nostrand Reinhold,1978.
7. Mahapatra,G.B.,Textbook ofPhysicalGeology,CBS,India,2018
8. Mathur,S.M.,PhysicalGeologyofIndia,NBTIndia,1991
9. Miller,WilliamJ.,PhysicalGeology:An Introduction,DVanNostrandCo.,5thEd.,1949
10. Mukerjee,P.K.,TextBookofGeology,WorldPressPrivateLtd.2013
11. Thornbury,W.D.,PrinciplesofGeomorphology,NewAgeInternational ,2ndEdition,1969
12. PrinciplesofGeomorphology: A.F.Ahmad
13. प्रायोगिकभू–विज्ञान (भाग–1) –डॉ. र. प्र. मांजरेकर
14. खनिजतथाक्रिस्टलविज्ञान–डॉ.वी.सी. जैश
15. खनिजविज्ञान के सिद्धांत –डॉ. ए.पी. अग्रवाल
16. प्रकाशीय खनिजविज्ञान के मूलतत्व–विंचेल
17. खनिजतथाक्रिस्टलविज्ञान–डॉ. दीपकराजतिवारी
18. Gribble,C.D.;Rutley'sElementsofMineralogy,CBS,2005.
19. FordW.E.;Dana'sTextBookofMineralogy,CBS,2006.

20.	Perkins,D.;Mineralogy,PrenticeHallIndia,3rded.2012.
21.	Rathore.B.S.; BasicsofCrystallography.MineralogyandGeochemistry.NotionPressIndia,2020.
22.	Sharma,R.S.andSharma,Anurag;CrystallographyandMineralogy-ConceptsandMethods.Geol.Soc.Ind.,Bengaluru,2013.

E-resources

1. https://www.mindat.org

2. https://www.mooc-list.com/tags/minerals

3. https://epgp.inflibnet.ac.in/Home

4. https://archive.org/details/in.ernet.dli.2015.233340/page/n15/mode/2up

5. https://egyankosh.ac.in/

6. https://sites.google.com/ignou.ac.in/bscgeology

7. SWAYAM – https://swayam.gov.in/explorer?searchtext

8. National digital library – https://ndl.iitkgp.ac.in

9. e-PG pathshala (MHRD) portal, https://egpg.inflibnet .ac.in

PartD Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks:50 Continuous Comprehensive Evaluation(CCE):NA University Exam(UE): 50marks		
Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Class Test Assignment/Presentation	NA

SYLLABUS
OF
B.A./B.Sc. ANTHROPOLOGY

(ANNUAL PROGRAMME)
2023

Approved by Central Board of Studies in Anthropology

(Dated : 22.02.2023)

Preamble

The learning outcomes-based curriculum framework for a B.Sc. degree in Anthropology aimsfor a comprehensive and an integrated framework for understanding of human beings and humanities and its adaptabilities across time and space dimensions. It deals with all kinds of communities including tribal, rural as well as urban societies. The curriculum is a broad framework which exposes the students to this diversity and to help them understand the challenges, best practices as well as biological and cultural adaptive features of communities that have evolved in the process of adaptations and acclimatization.

Anthropology as a discipline is oriented towards a holistic and relativistic understanding of humanity from both biology and cultural perspectives on one hand and from distant past to the present and also future possibilities. As a discipline, it is divided into three sub-branches viz., biological anthropology, social/cultural anthropology and pre-historical archaeology, which aims to study the three facets of human beings i.e. biological, cultural and pre- historical. Thus it brings together perceptive drawn from natural sciences, social sciences and the humanities. As Eric Wolf puts it, "anthropology is the most scientific of humanities and the most humane of the sciences.

A Bachelors of Science (Honors) Program in anthropology covers all the three branches of anthropology as mentioned above as well as study of courses which draws in perspectives from other allied subjects. The courses in economic environmental, molecular, medical, genetics and development anthropologies draws in the perspectives of these disciplines to the understanding of anthropological issues and problems. The curriculum is designed to expose the students to deal with real life empirical problems through case studies as well as first handunderstanding through fieldwork.

Graduate Attributes in Subject

Some of the characteristic attributes of a graduate in anthropology may include the following Disciplinary knowledge and skills: ability to understand key concepts used in the study of a society, culture and various biological aspects of human beings ; understanding of various theories of society, culture, evolution, genetics and prehistoric archaeology. The students will also have some understandings of other related areas of interdisciplinary studies like social and life sciences, environmental studies and humanities.
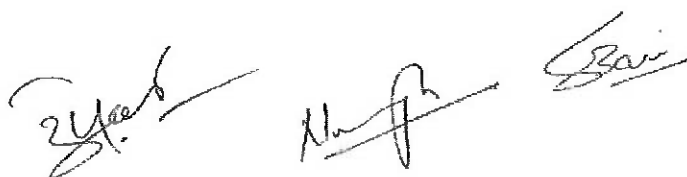
Communication Skills : To develop ability to communicate and express their ideas clearly and cogently both verbally as well in writing.

Critical thinking : To develop ability to think critically and understand the pros as well as criticisms relating to the key ideas and theoretical debates in anthropology. To be able to argues logically and support ones view point citing relevant data.

Problem solving : Capacity to apply the knowledge one has learned to solve problems of real life situations.

Analytical reasoning : The skill to shrift through mass of data and to identify what is relevant data relating to the problem under study; ability to judge others arguments and point out the logical flaws and contradictions if any.

Research-related skills : Ability to formulate a problem, and undertake a systematic and scientific

enquiry about it, which include the skill to generate hypotheses, prepare relevant questionnaire and schedules and apply them; ability to interpret the date, find out the relevant cause and effect relationship and based on finding draw the logical conclusions from the data Cooperation/Team work: Ability to work in a team and show the ability to cooperate with others, divide the work and work cohesively as a unit .

Cultural Relativism : Ability to appreciate the cultural backgrounds of others and appreciate the differences and put at back ones ethno-centricism and biases.

Scientific Temperament : The candidate must develop a scientific temperament and be sufficiently interested and inquisitive in things happening around them. They should have the ability to observe systematically, raise questions and search for answers.

B.A./B.Sc. in Anthropology
Scheme of Examination
2023

Class	Paper	Course Title	Course Code	Credit Value	Maximum Marks	Passing Marks
1st Year	I	Introduction to Biological Anthropology	ANTH-01T	04	50	17
	II	Introduction to Social-Cultural Anthropology	ANTH-02T	04	50	17
	III	Practical in Human Anatomy and Anthropometry	ANTH-01P	02	50	17

Part A : Introduction

Programme Certificate Course	Class B.A./B.Sc. 1st Year	Year 2023	Session

1. Course Code   : **ANTH-01T**

2. Course Title   : **INTRODUCTION TO BIOLOGICAL ANTHROPOLOGY**

3. Course Type   : **THEORY**

4. Course Objective   : The Course is designed to teach basics and fundamentals of biological anthropology and its scope. The course aims to sharpen the skills of the student so that they can explain biological diversity observed in human species. The students will learn about primate and human evolution, primate behavior and social diversity amongst the human populations. Related practical are an integral part of this Course.

5. Course Learning Outcome :

   * The students will learn about various theories related to human evolution and variation. They will learn about history of Physical Anthropology and its applications.
   * They will learn about relationship between non-human and human primates. They will learn about the origin of hominoid group, distribution and characteristics of extinct hominids and the process of hominization.
   * Some basic knowledge of genetics is also imparted through this paper.
   * From the practical components they will understand Craniometric measurements, study various parts of human body which is useful in studying evolutionary changes in modern humans.

1. Credit Value   : Theory-04

2. Total Marks   : Maximum Marks 50   Minimum Marks 17

Part B : Content of the Course

1. Total Units   : 05

2. Total Lectures   : 60

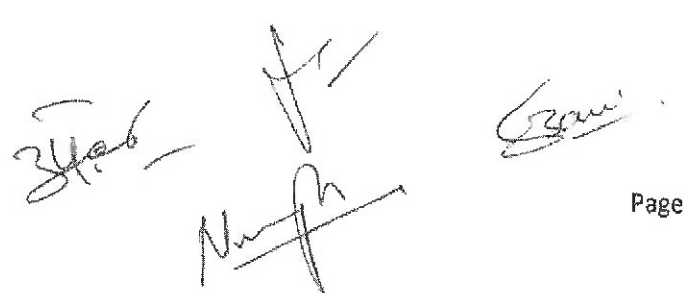| Unit	Topics	No. of Lectures
Units I, II, III, IV & V	Syllabus	12 Lectures each unit

Unit – I

* History, meaning, aims, scope of Physical Anthropology and its applications.
* Organic evolution : Meaning and evidences of organic evolution.
* Theories of Organic evolution : Lamarckism, Neo-Lamarckism, Darwinism, Neo-Darwinism and synthetic theory.

Unit – II

* Man's position in animal kingdom.

- Classification and characteristics of living primates (Prosimi and Anthropoidea).
- Comparative anatomy and behavior of human and non human primates.

Unit - III

- Miocene Hominoids : Ramapithecus.
- Pleistocene Hominoids : Australopithecus, Homo erecuts (Pithecanthropus & Sinanthropus), Neanderthal, Homo sapiens (Cromagnon, Grimaldi and Chancelade).

Unit – IV :

- Concept of Race : Meaning and definition.
- Race Formation.
- Criteria of racial classification (Anthrosopic, Anthropometric and genetical traits).
- UNESCO statement, Racisim.
- Major races of the world and their distribution (Caucasoid, Negroid & Mongoloid)
- Racial Classification of Indian population : Risley and B.S. Guha.

Unit – V

- Mendelism.
- Chromosome : Types and morphology of human chromosome.
- Structure of DNA & RNA.
- Types of inheritance : Autosomal (Dominant and recessive), Sex linked (Dominate and recessive).

Part C : Learning Resources

1. Ashley, Montague, Concept of Race.
2. Barnouw, V. 1979, Anthropology : A General Introduction, The DOrsey Press Illionis.
3. Das, B.M. 1985, Outlines of Physical Anthropology, Kitab Mahal, New Delhi.
4. Harrison, G.A., Weiner, J.S. Tanner, J.M. and Barnicot, N.A. Human Biology : An Introduction to Human Evolution, Variation and Growth, Clarenden Press, Oxford.
5. Hooton, E.A. Up from the Ape, The Macmillan Co., New York.
6. M. Ember and Ember. Anthropology
7. Sarkar S.S. Aboriginal races of India.
8. Sarkar, R.M. 1976, Fundamentals of Physical Anthropology, Blackie (India).
9. Shrivastav, A.R.N. 1994, Sharirik Manav Vigyan (in Hindi), Gyandeep Prakashan, Allabhabad.
10. Shukla, B.R.K. and Rastogi, S. Physical Anthropology and Human Genetics : An Introduction, Palka Prakashan, Delhi.ettner-Janusch, J. Origins of Man, Wiley Eastern Pvt. Ltd. New Delhi.

Part D : Assessment and Evaluation

University Exam. (UE) : Max. Marks : 50 Marks

Part A : Introduction

Programme Certificate Course	Class B.A./B.Sc. 1st Year	Year 2023	Session

1. Course Code   : ANTH-02T

2. Course Title   : INTRODUCTION TO SOCIAL-CULTURAL ANTHROPOLOGY

3. Course Type   : THEORY

4. Course Objective   : The Course introduces ideas about "Culture" and "Society" in order to understand their meaning and what role they play in shaping human lives. Explores some basic concept, methods and characteristics of social-cultural Anthropology. Understand nature and meaning of social, religious, political and economic institution. The objective of the paper is to introduce the students about foundation of social-cultural Anthropology and also to familiarize the students with basic categories which have emerged due to comparison of groups and institution in the global context particularly the simpler societies.

5. Course Learning Outcome :

- The Students will learn about the scope and relevance of Social-Cultural Anthropology in relationship with other branches of anthropology.
- The Students will learn about concept of society, culture and social institutions.
- They will also learn about economic social and political organization.
- Understand and describe basic concepts and methods of social-cultural Anthropology, along with its past and future.
- Comparative study of culture and society of different ethnic groups.

1. Credit Value   : Theory-04

2. Total Marks   : Maximum Marks 50   Minimum Marks 17

Part B : Content of the Course

1. Total Units   : 05
2. Total Lectures   : 60

Unit	Topics	No. of Lectures
Units I, II, III, IV & V	Syllabus	12 Lectures each unit

Unit – I

- Meaning, aims and scope of social-cultural Anthropology.
- Social Anthropology : Definition, scope and importance.
- Ethnology : Definition, scope and importance.
- Linguistics Anthropology : Definition, Structure and Linguistic Family

- Relation of Social-Cultural Anthropology with sociallogy, psychology, history, economics and demography.

Unit – II

- Culture : Definition, characteristics and component of culture.
- Society : Definition, characteristics, importance and types of society.
- Community : Definition, characteristics, importance.
- Institution : Definition, characteristics, importance.

Unit - III

- Marriage : Meaning, aims and types of marriage, marriage rules, preferential marriage and ways of acquiring mates.
- Family : Definition, Characteristics, types and function of family.
- Kinship : Definition, types, kinship terminology, degree of kinship. kinship usage.
- Status and Role : Definition and Types.

Unit – IV :

- Religion : Definition, Characteristics and function.
- Magic : Definition, types and elements of magic.
- Custom : Definition, origins, and role.
- Mythology : Definition, characteristics and importance.

Unit – V

- Economic organization: Characteristics of simple economy, stages of economic development. Barter and ceremonial exchange.
- Political organization: State and stateless society, primitive law and justice.

Part C : Learning Resources

1. A. N. Sharma. Bharatiya Manav Vigyan.
2. Davis, K. 1981. Human society, new delhi : Surjeet publications.
3. Durkheim, E. 2013. The rules of sociallogical method and selected texts on sociallogy and its method edited by steven luke (Second Edition). Pulgrave macmillan. 20-49, 78-100.
4. Ember, C.R. et. al. 2011. Anthropology, New Delhi, Dorling Kindersley.
5. Long, G. 1956. Concept of Status and role in Anthropology. Their definition and use. The American catholic sociallogical Review. 17 (3) : 206-218.
6. Makhan Jha : Samajik Manav Vigyan.
7. Nadeem Hasnain. Indian Anthropology.
8. Vandana Sharma & Ramesh Choubey : Samajik Sanskritik Manav Vigyan.

Part D : Assessment and Evaluation

University Exam. (UE) : Max. Marks : 50 Marks

Part A : Introduction

Programme Certificate Course	Class B.A./B.Sc. 1st Year	Year 2023	Session

1. Course Code   : ANTH-01P

2. Course Title   : PRACTICAL IN HUMAN ANATOMY AND ANTHROPOMETRY

3. Course Objectives : The objective of this practical course is to introduce the student with the human skeleton system and its importance and to learn anthropometric techniques used in living and non-living human for assessment of ethnic variation. This will be helpful to make student skill-full for further anthropological study and research.

4. Course Type   : Practical

1. Credit Value   : Practical - 02

2. Total Marks   : Maximum Marks 50   Minimum Marks 17

Part B : Content of the Course

1. Total Units   :
2. Total Lectures   : 30

Unit	Topics	No. of Lectures
-	Syllabus	30 Lectures

Part – I : Craniology and Osteology :

- Overview of bones of human Skeleton.
- Sketching and labeling of various norm's of skull.
- Identification and description of pectoral girdle, pelvic girdle and long bones of human Skeleton.

Part – II : Craniometry :

- Maximum Cranial length.
- Maximum Cranial Breadth.
- Maximum frontal Breadth.
- Bizygomatic Breadth.
- Nasal Height.
- Nasal Breadth
- Minimum frontal breadth

- Bimaxillary Breadth.
- Biorbital Breadth
- Length of foramen magnum.

Part – III : Somatometry :

- Maximum head length
- Maximum head breadth
- Maximum Frontal breadth
- Maximum bizygomatic breadth
- Bigonial breadth.
- Nasal height
- Nasal length
- Nasal breadth
- Physiognomic facial height
- Morphological facial height

Part – IV : Craniometric indices

- Cranial Index
- Nasal Index

Part C : Learning Resources

1. Das, B.M. 2013. Outlines of Physical Anthropology. Allahabad : Kitab Mahal.
2. Jurmain, R., Kilgore, L., Trevathan, W., Ciochon, R.L. 2012. Introduction to Physical Anthropology. Oxford & IBH Publishing Co. Molnar, Stephen. 1975. Human Variations : Race Types and Ethnic Groups. London : Routledge.
3. Seth, P.K. and Seth, S. 1986. The Primates. New Delhi : Northern Book Centre.
4. Singh, I.P. and Bhasin, M.K. 1989. Anthropometry : A Laboratory Manual on Biological Anthropology. Delhi : Kamla-Raj Enterprises.

Part D : Assessment and Evaluation

University Exam. (UE) : Max. Marks : 50 Marks

Scheme of B. Sc./ B.Sc. (Hons.) Biochemistry

Year	Course Code	Subject Name	Theory/ Practical/Project	Total Credit	Total Marks	
					Max	Min
First year	BIOC -1T	Chemistry of Biomolecules	Theory	4	50	17
	BIOC -2T	Biochemical Techniques	Theory	4	50	17
	BIOC -1P	LAB 1: Biomolecules and Biochemical Techniques Lab	Practical	2	50	1

Part A: Introduction

Program: Certificate Course		Class: B.Sc. I Year	Year: 2022	Session:2022-2023
1	Course Code	BIOC-1T		
2	Course Title	Chemistry of Biomolecules		
3	Course Type	Theory		
4	Pre-requisite (if any)	As per Govt. norms		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Understand on fundamentals of biological molecules. • Understand the concept of proteins, carbohydrates, lipids, vitamins and Poryphyrins. • Understand the types and structures of proteins, carbohydrates, lipids, vitamins and Poryphyrins. • Identify their chemical elements and the difference between simple sugars and complex • On the food labels, what do sugar or sugar alcohol, and fiber refer to? • Summarize the function of proteins and recognize the importance of the three dimensional shape of a protein on its function and the role of non-covalent bonds in maintaining the shape of a protein. • Explain protein denaturation and the effect of heat on protein structure and function.			
6	Credit Value	Theory: 4		
7	Total Marks	Max. Marks: 50		Min Passing Marks: 17

Part B: Content of the Course

Total No. of Teaching – Periods- 60 / Hours – 40

Unit	Topics	No. of Period / Hour
1	**The foundations of biochemistry:** Cellular and chemical foundations of life. Introduction to Biomolecules. Micromolecules and Macromolecules. **Water:** Unique properties, weak interactions in aqueous systems, ionization of water, buffers, water as a reactant and fitness of the aqueous environment. **Introduction to amino acids, peptides and proteins** Amino acids and their properties - Structure and classification of Amino acids, physical, chemical and optical properties of amino acids hydrophobic, polar and charged. Biologically important peptides - hormones, antibiotics and growth factors. Determination of the amino acid sequence of a polypeptide chain, specific chemical and enzymatic cleavage of a polypeptide, Structure of proteins, Multimeric proteins, conjugated proteins and metalloproteins. Diversity of function	12 Periods / 08 Hours
2	**Carbohydrates and glycobiology :** Monosaccharides - structure of aldoses and ketoses, ring structure of sugars, conformations of sugars, mutarotation, anomers, epimers and enantiomers, structure of biologically important sugar derivatives, oxidation of sugars. Formation of disaccharides, reducing and nonreducing disaccharides. **Polysaccharides** – homo- and heteropolysaccharides, structural and storage polysaccharides. Structure and role of proteoglycans, glycoproteins and glycolipids	12 Periods / 08 Hours

	(gangliosides and lipopolysaccharides). Carbohydrates as informational molecules, working with carbohydrates	
3	**Lipids:** Building blocks of lipids - fatty acids, glycerol, ceramide. Storage lipids - triacyl glycerol and waxes. **Structural lipids in membranes** – glycerophospholipids, galactolipids and sulpholipids, sphingolipids and sterols, structure, distribution and role of membrane lipids. Plant steroids. Lipids as signals, cofactors and pigments	12 Periods / 08 Hours
4	Nucleotides - structure and properties. Nucleic acid structure – Watson-Crick model of DNA. **Structure of major species of RNA** - mRNA, tRNA and rRNA. **Nucleic acid chemistry** - UV absorption, effect of acid and alkali on DNA. **Other functions of nucleotides** - source of energy, component of coenzymes, second messengers.	12 Periods / 08 Hours
5	**Vitamins:** Structure and active forms of water soluble and fat soluble vitamins, deficiency diseases and symptoms, hypervitaminosis **Porphyrins**-Poryphyrin nucleus and classification of porphyrins, important metalloporphyrins occurring in nature. Detection of porphyrins spectrophotometrically and by fluorescence methods.	12 Periods / 08 Hours

Keywords: Biomolecules, nucleotides, proteins, carbohydrates, lipids, vitamins, Poryphyrins

Part C - Learning Resource
Text Books, Reference Books, Other Resources

Suggested Readings:

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H.Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292-3414-8.
2. Physical Biochemistry (2009) 2nd ed., Sheehan, D., Wiley-Blackwell (West Sussex),ISBN 9780470856024 / ISBN: 9780470856031.
3. The Tools of Biochemistry (1977; Reprint 2011) Cooper, T.G., Wiley India Pvt. Ltd. (New Delhi), ISBN: 978-81-265-3016-8.
4. Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., John Wiley & Sons, Inc. (New York), ISBN:978-0-470-28173-4.
5. G. L. Zubay Biochemistry , Wm.C. Brown Publishers, 1998
6. Jeremy M. Berg,, Lubert Stryer, John Tymoczko, Gregory Gatto, Biochemistry, WH Freeman; 9th ed. 2019.
7. Garrett and Grisham Biochemistry, Brooks/Cole; 6th edition, 2016
8. D. Voet and J C Voet Principles of Biochemistry, Wiley; 5th edition

E-learning Resources

https://ncert.nic.in/textbook/pdf/lech205.pdf
https://www.pdfdrive.com/biomolecules-books.html
https://schools.aglasem.com/ncert-books-class-11-biology-chapter-9/
https://swayam.gov.in/
https://www.edx.org/search?q=biomolecules&tab=course
https://britannica.com
https://en.wikibooks.org/wiki/Biochemistry
https://nptel.ac.in
https://drive.google.com/file/d/0B9Hi1Cv7Y34ERXJJXzRGSjd5bin8/view?resourcekey=0-SgrHs9064AQKVk4Go-65mw

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 50
Continuous Comprehensive Evaluation (CCE): Not Applicable
University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable
External assessment University Exam (UE)		-------------------------------
Any remarks/ Suggestions: -		

Part A: Introduction			
Program: Certificate Course	Class: B.Sc. I Year	Year: 2022	Session:2022-2023

1	Course Code	BIOC-2T	
2	Course Title	Biochemical Techniques	
3	Course Type	Theory	
4	Pre-requisite (if any)	As per Govt. norms	
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: - Describe basic concepts of biophysics. - Discuss canonical and non-canonical structures of Biomolecules - Explain basic ideas of diffusion, thermodynamics and kinetics in the context of biological processes. - Differentiate working principle, instrumentation and applications of various bio-analytical instruments. - Outline formation and diffusion pattern of stripes on animals	
6	Credit Value	Theory: 4	
7	Total Marks	Max. Marks: 50	Min Passing Marks: 17

Part B: Content of the Course		
Total No. of Teaching – Periods- 60 / Hours – 40		
Unit	Topics	No. of Lectures
1	Safety practices in the laboratory. Preparation and storage of solutions. Concepts of solution concentration and storing solutions. Quantitative transfer of liquids. Concept of a buffer, Henderson-Hasselbach equation, working of a pH meter	12 Periods / 08 Hours
2	Microscopy: Simple microscopy, phase contrast microscopy, florescence and electron microscopy (TEM and SEM), pH meter	12 Periods / 08 Hours
3	Preliminary Biochemical Techniques: Absorption and emission spectroscopy, Principle and law of absorption fluorimetry, colorimetry, spectrophotometry (visible, UV, infrared), centrifugation, cell fractionation techniques, isolation of sub-cellular organelles and particles	12 Periods / 08 Hours
4	Introduction to the principle of chromatography: Paper chromatography, thin layer chromatography, column chromatography: silica and gel filtration, affinity and ion exchange chromatography, gas chromatography, HPLC.	12 Periods / 08 Hours
5	Advanced Techniques: Introduction to electrophoresis. Starch-gel, polyacrylamide gel (native and SDS-PAGE), agarose-gel electrophoresis, pulse field gel electrophoresis, immuno- electrophoresis, isoelectric focusing, Western blotting. Introduction to Biosensors and Nanotechnology and their applications. Radioactivity measurement and applications. introduction and importance of virtual labs in biochemistry	12 Periods / 08 Hours

Keywords: pH meter, Microscopy, Spectroscopy, Chromatography, Electrophoresis

Part C - Learning Resource
Text Books, Reference Books, Other Resources

Suggested Readings:

1. Lehninger: Principles of Biochemistry (2013) 6th ed., /Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292- 3414-8.
2. K Wilson and John Walker Practical Biochemistry: Principles & Techniques
3. RF Boyer   Biochemistry Laboratory: Modern Theory & Techniques
4. S Carson, H Miller and D Scott   Molecular Biology Techniques: A Classroom Laboratory Manual
5. Physical biochemistry by D Friefelder , WH Freeman & Co., USA..
6. Outlines of biochemistry by Eric E Conn, PK Stumpf, G Bruening and Ray H Doi , John Wiley & sons NY
7. Chromatography : A laboratory handbook of chromatography and electrophoretic methods by Erich Heftman, van Nostrand Reinhold, NY.

learning Resources

https://britannica.com
https://en.wikibooks.org/wiki/Biochemistry
https://nptel.ac.in

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 50
Continuous Comprehensive Evaluation (CCE): Not Applicable
University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable
External assessment University Exam (UE)		

Any remarks/ Suggestions: -

Part A: Introduction				

1	Course Code	BIOC-1P
2	Course Title	LAB 1 : Chemistry of Biomolecules and Biochemical techniques lab
3	Course Type	Practical
4	Pre-requisite (if any)	As per Govt. norms
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: - Describe the basic lab requirements and their uses. - Examine various instruments using in separation and isolation of various analytical compounds. - Analyze the characteristics of the compound on the basis of their pH. - Examine different components present in the extract of radish leaves by using chromatography technique. - Analysis independently of various biomolecules in the laboratory. - Demonstrate the effect of inorganic compound and its percent purities in various types of sample. - Analyze characteristics of UV absorption spectra of by different methods in samples in different biomolecules. - Examine quality of the lipids by different parameters. - Examine quantity of the nucleic acid present in the sample. - Analyze characteristics and quantity of protein by different methods.
6	Credit Value	Practical: 2
7	Total Marks	Max. Marks: 50	Min Passing Marks : 17

Part B: Content of the Course		
Total No. of Teaching Hours – 20 / 30 Periods		
Tentative Practical List	Note: This is tentative list; the teachers concern can add more practical's as per requirement. 1. Safety measures in laboratories. 2. Preparation of normal and molar solutions. 3. Preparation of buffers. 4. Determination of pKa of acetic acid and glycine. 5. Qualitative tests for carbohydrates, lipids, amino acids, proteins and nucleic acids. 6. Separation of amino acids/ sugars/ bases by thin layer chromatography. 7. Estimation of vitamin 8. Native gel electrophoresis of proteins 9. SDS-polyacrylamide slab gel electrophoresis of proteins under reducing conditions. 10. Preparation of protoplasts from leaves. 11. Separation of amino acids by paper chromatography. 12. To identify lipids in a given sample by TLC. 13. Separation of plant pigments by column chromatography 14. Differential centrifugation for organelle separation 15. Verification of Beer-Lambert law 16. Colorimetric estimation of sugars, aminoacids and proteins

Part C - Learning Resource
Text Books, Reference Books, Other Resources

Suggested Readings:

1. Lehninger: Principles of Biochemistry (2013) 6th ed., /Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292- 3414-8.
2. Textbook of Biochemistry with Clinical Correlations (2011)
3. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley& Sons. Inc.
4. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
5. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
6. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 The World of the Cell.7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

E-learning Resources:

https://britannica.com
https://en.wikibooks.org/wiki/Biochemistry
https://nptel.ac.in

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 50
Continuous Comprehensive Evaluation (CCE): Not Applicable
University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable
External assessment University Exam (UE)		

Scheme of B.Sc./ B.Sc. (Hons.) Biotechnology

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	BIOT -1T	Biochemistry, Biostatics and Computers	Theory	4	50	1⁻
	BIOT -2T	Cell Biology, Genetics and Microbiology	Theory	4	50	1⁻
	BIOT -1P	LAB 1: Microbiology and Biochemical Techniques	Practical	2	50	1⁻

Part A: Introduction				
Program: Certificate Course		Class: B.Sc. I Year	Year: 2022	Session:2022-2023
1	Course Code	BIOT-1T		
2	Course Title	Biochemistry, Biostatistics and Computers		
3	Course Type	Theory		
4	Pre-requisite (if any)	As per Govt. norms		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Understand on fundamentals of biological molecules. • Understand the concept of proteins, carbohydrates, lipids, vitamins and nucleic acid. • Understand the types and structures of proteins, carbohydrates, lipids, vitamins and nucleic acid.		
6	Credit Value	Theory: 4		
7	Total Marks	Max. Marks: 50		Min Passing Marks: 17

Part B: Content of the Course		
Total No. of Teaching – Periods- 60 / Hours – 40		
Unit	Topics	No. of Period / Hour
1	1. Introduction to Biochemistry: History, Scope and Development. 2. Carbohydrates: Classification, Structure and Function of Mono, Oligo and Polysaccharides. 3. Lipids: Structure, Classification and Function. 4. pH, pK, buffer, covalent and non-covalent bond.	12 Periods / 08 Hours
2	1. Amino acids and Proteins: Classification, Structure and Properties of amino acids, Types of Proteins and their Classification and Function. 2. Enzymes: Nomenclature and Classification of enzyme, Mechanism of enzyme action, Enzyme Kinetics and Factors affecting the enzymes action. Immobilization of enzyme and their application. 3. Enzyme inhibition: Competitive and non-competitive, feedback mechanism	12 Periods / 08 Hours
3	1. Carbohydrates, Proteins and Lipid Metabolism - Glycolysis, Glycogenesis, Glyconeogenesis, Glycogenolysis and Krebs cycle. Electron Transport Chain, β-oxidation of Fatty acids and Urea cycle 2. Vitamins - Structure, Classification and Function	12 Periods / 08 Hours
4	1. Scope of Biostatistics- types of data: graphical and tabular presentation, Collection of data-sampling techniques 2. Measures of Central Tendency: Mean, Median and Mode and Standard Deviation. 3. Probability Calculation: Addition and multiplication rule. 4. Chi square test, Correlation coefficient and regression lines, ANOVA	12 Periods / 08 Hours
5	1. Computers - Organization of computer, Digital and Analogue Computers, Concept of Hardware and Software, computer languages – high and low level 2. Word, spreadsheet and presentation software 3. Application of computer in online classrooms, meeting, test and e-library	12 Periods / 08 Hours

Keywords: Biomolecules, amino acids, carbohydrates, lipids, vitamins, Biostatistics, Computers

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Lehninger Principles of Biochemistry (4th Ed.) Nelson, D., and Cox, M.; W.H. Freeman and Company, New York, 2005
2. Todd and Howards Mason (2004) Text book of Biochemistry, Fourth Edition
3. Lubert Stryer and Berg ((2004) Biochemistry, Fifth Edition
4. Diana Rain, Marni Ayers Barby - (2006) Textbook on Q level Programming. 4th Edition.
5. Karl Schwartz: (2006) Guide of Micro Soft. Marina Raod, 4th Edition.
6. E Balaguruswamy by Programming in BASIC (1991).
7. RC Campbell by Statistics for Biologists. .
8. P Cassel et al by Inside Microsoft Office,
9. AC Wardlaw by Practical Statistics for Experimental Biologists,
10. JH Zar by Bio-statistical analysis
11. RR Sokal FJ Rohlf by Introduction to Biostatistics
12. L Y Kun (2003) Microbial Biotechnology: Principles and applications
13. Khan and Khanum (1994) Fundamental of Biostastics
14. Berg, J. M., Tymoczko, J. L. and Stryer, L.(2006). Biochemistry. 6th Edition. W.H Freeman & Co.
15. Buchanan, B., Gruissem, W. and Jones, R. (2000) Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists.
16. Hopkins, W.G. and Huner, P.A. (2008) Introduction to Plant Physiology. John Wiley and Sons
17. Salisbury, F.B. and Ross, C.W. (1991) Plant Physiology, Wadsworth Publishing Co. Ltd.
18. Le CT (2003) Introductory biostatistics. 1st edition, John Wiley, USA
19. Glaser AN (2001) High YieldTM Biostatistics. Lippincott Williams and Wilkins, USA
20. DSVGK Kaladhar, Molecular Biochemistry (2018) RBSA Publishers ISBN 9788176117708.
21. Edmondson A and Druce D (1996) Advanced Biology Statistics, Oxford University Press.
22. Danial W (2004) Biostatistics: A foundation for Analysis in Health Sciences, John Wiley and Sons Inc.

E-learning Resources

https://ncert.nic.in/textbook/pdf/lech205.pdf
https://www.pdfdrive.com/biomolecules-books.html
https://swayam.gov.in/
https://www.edx.org/search?q=biomolecules&tab=course
https://britannica.com
https://en.wikibooks.org/wiki/Biochemistry
https://nptel.ac.in

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 50
Continuous Comprehensive Evaluation (CCE): Not Applicable
University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable
External assessment University Exam (UE) Time		As per Govt. norms

Any remarks/ Suggestions: -

Part A: Introduction				
Program: Certificate Course		Class: B.Sc. I Year	Year: 2022	Session:2022-2023
1	Course Code	BIOT-2T		
2	Course Title	Cell Biology, Genetics and Microbiology		
3	Course Type	Theory		
4	Pre-requisite (if any)	As per Govt. norms		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Understand on fundamentals of cellular organization, microorganisms and inheritance • Understand the concept of genetics and microbial fundamentals • Understand the types of cell organelles and various microbes		
6	Credit Value	Theory: 4		
7	Total Marks	Max. Marks: 50		Min Passing Marks: 17

Part B: Content of the Course		
Total No. of Teaching – Periods- 60 / Hours – 40		
Unit	Topics	No. of Period / Hour
1	1. Cell theory and its modern interpretation 2. Diversity of Cell shape and size. 3. Prokaryotic cell structure: Function and ultra-structure of cell (Gram positive and Gram negative Bacteria), Flagella, Pilli, Endospore and Capsule. 4. Eukaryotic cell: Plants and animal.	12 Periods / 08 Hours
2	1. Cytoplasm: Structure and Functions of Endoplasmic reticulum, Ribosome, Golgi complex, Lysosomes, Nucleus, Mitochondria, Chloroplast and Chromosomes 2. Cytoskeleton: Microtubules, Microfilaments and Intermediate filaments. 3. Cell division: Mitosis and Meiosis. Cell cycle 4. Programmed Cell Death.	12 Periods / 08 Hours
3	1. Mendel's Laws of Inheritance. Non-mendelian inheritance 2. Linkage and Crossing over. 3. Chromosome variation in number and structure: Deletion, Duplication, Translocation, Inversion and Aneuploidy, Euploidy (Monoploidy, Polyploidy and its importance).	12 Periods / 08 Hours
4	1. History, Scope and Development of Microbiology. 2. Basic techniques of Microbial Culture 3. Microbial Growth & Nutrition of Bacteria: Isolation, media sterilization-physical and chemical agents, pure culture- pour plate method, streak plate method and spread plate method. 4. General features and Economic importance of Fungi, bacteria and cyanobacteria.	12 Periods / 08 Hours
5	1. Bacterial Reproduction: Conjugation, Transduction and Transformation. 2. Mycoplasma – History, Classification, Structure reproduction & Diseases. 3. Viruses – Basic features, Structure, Classification, Multiplication and Bacteriophages (Morphology, life cycle, infection and medicinal importance)	12 Periods / 08 Hours
Keywords: Cell, Cytoplasm, Law of inheritance, Gene interaction, Microbial culture, microbial reproduction.		

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Suggested Readings:

1. C.B. Power- Cell biology, First Edition (2005), Himalaya Publishing House.
2. Gereld Karp - Dell and molecular biology, 4th Edition (2005)
3. P.K. Gupta - Cell and molecular biology, Second Edition (2003), Rastogi publications.
4. S.S. Purohit - Microbiology : Fundamentals and Applications, 6th Edition (2004)
5. R.C. Dubey and D.K. Maheshwari: Practical Microbiology. S.Chand Publication.
6. Tortora, Funke and Case - Microbiology, An introduction, sixth Edition (1995), Benjamin/Cummings Publishing Company.
7. Prescott, Harlyey and Klein - Microbiology, Third Edition, Wm. C. Brown Publishers (1996).
8. P. Chakraoborthy - Textbook of microbiology, Second Edition (2007).
9. Microbial Genetics, David Freifelder, John P Cronan, Stanley R Maloy, Jones and Bartlett Publishers.
10. Elements of Human Genetics. L.L cavalla-Sfoeza, WA Benjamin Advanced Book Program.

E-learning Resources

https://www.easybiologyclass.com/topic-genetics/
https://freebookcentre.net/medical_text_books_journals/genetics_ebooks_online_texts_download.html
https://britannica.com
https://en.wikibooks.org/wiki/Biochemistry
https://nptel.ac.in

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 50
Continuous Comprehensive Evaluation (CCE): Not Applicable
University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable
External assessment University Exam (UE) Time 3 Hours		As per Govt. norms.

Any remarks/ Suggestions: -

Part A: Introduction			
Program: Certificate Course	Class: B.Sc. I Year	Year: 2022	Session: 2022-2023
1	Course Code	BIOT-1P	
2	Course Title	LAB 1 : Microbiology and Biochemical Techniques	
3	Course Type	Practical	
4	Pre-requisite (if any)	As per Govt. norms.	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: perform experiment related to biochemistry, microbial culture, statistical tools and computer applications	
6	Credit Value	Practical: 2	
7	Total Marks	Max. Marks: 50	Min Passing Marks : 17

Part B: Content of the Course
Total No. of Teaching Hours – 20 / 30 Periods

Tentative Practical List	Note: This is tentative list; the teachers concern can add more practical's as per requirement.
	1. Laboratory rules, Tools, Equipment and Other requirements in Microbiological laboratory.
	2. Counting of bacteria by counting chamber, by plate count.
	3. Preparation of media and cultivation techniques: (a) Basic liquid media (broth) (b) Basic Solid media, (agar slants and deep tubes) (c) Demonstration of selective and differential media (d) Isolation and enumeration of microorganisms (e) Isolation from air, water and Soil (f) Antibiotic sensitivity test
	4. Smears and staining methods: (a) Preparation of bacterial smear (b) Gram Negative & Positive staining
	5. Methods of obtaining pure cultures (a) Streak plate method (b) Pure plate method (c) Spread plate method (d) Broth cultures
	6. Growth & Biochemical techniques (a) Determination of bacterial growth curve (b) Amylase production test (c) Cellulose production test (d) Estimation of Sugar in given solution (e) Extraction and separation of lipids (f) Estimation of proteins
	7. Study of mitotic division
	8. Biostatistics: (a) Graphical and tabular presentation of data (b) Problems on mean, mode and median.
	9. Practical related to word, spreadsheet and presentation software

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education
2. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition
3. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited
4. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T.Brown Publishers.
5. Pelczar MJ; Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
6. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.
7. Carter J and Saunders V(2007). Virology; principles and Applications. John Wiley and Sons
8. Flint SJ, Enquist, LW, Krug, RM, Racaniello, VR Skalka, AM (2004) Principles of Virology, Molecular Biology, Pathogenesis and Control.2nd edition.ASM Press
9. Shors Teri (2013) Understanding Viruses 2nd edition Jones and Bartlett Learning Burlington USA
10. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.
11. Dimmock, NJ, Easton, AL, Leppard, KN (2007). Introduction to Modern Virology. 6th edition. Blackwell Publishing Ltd.
12. Cann AJ (2012) Principles of Molecular Virology, Academic Press Oxford UK

E-learning Resources:

https://www.coursehero.com/file/83673254/Genetics-Lab-Notespdf/
https://britannica.com
https://en.wikibooks.org/wiki/Biochemistry
https://nptel.ac.in
https://learn.genetics.utah.edu/content/labs/
https://onlinelabs.in/biology

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 50
Continuous Comprehensive Evaluation (CCE): Not Applicable
University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable
External assessment University Exam (UE)	As per Govt. norms.	

Scheme of B.Sc. Computer Science

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First	COMP-1T	Computer Fundamental and Operating System	Theory	4	50	17
	COMP-2T	Programming with C and C++	Theory	4	50	17
	COMP-1P	LAB 1: Programming with C and C++	Practical	2	50	17

Part A: Introduction				
Program: Certificate Course		Class: B.Sc.-CS I Year	Year: 2022	Session:2022-2023
1	Course Code	COMP-1T		
2	Course Title	Computer Fundamental and Operating System		
3	Course Type	Theory		
4	Pre-requisite (if any)	No		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Understand the history and types of computers and various input/output devices. • Understand the concept of memory and its types. • Understand the concept of operating system and process management with scheduling algorithms. • Understand the threads and their management with deadlock detection and prevention. • Understand the working principles of Operating System.		
6	Credit Value	Theory: 4		
7	Total Marks	Max. Marks: 50		Min Passing Marks: 17

Part B: Content of the Course		
Total No. of Periods: 60		
Unit	Topics	No. of Periods
I	**Fundamental of Computer:** History of computer, Generation of computer, Types of Computers, Block diagram of CPU, Digital and Analogue computers and its evolution. Major components of digital computers, types of digital computers, Memory addressing capability of CPU, Word length and processing speed of computers, Microprocessors, Single chip Microcomputer, Large and small computers. Users interface, hardware, software and firmware, multiprogramming multiuser system, Dumb smart and intelligent terminals, Number system & Computer Codes.	12
II	**Peripheral devices:** I/O devices-Keyboard, Mouse, Monitor, Impact and Non-Impact Printers, Plotters, Scanner. other Input/output devices: Scan method of Display, Raster Scan. Vector Scan, Bit Mapped Scan, CRT Controller, I/O Port. Programmable and Non Programmable I/O port, Inbuilt I/O ports, Parallel and Serial ports, USB, IEEE 1394, AGP, Serial data transfer scheme, Microcontroller, Signal Processor, I/O processor, Arithmetic Processor.	12
III	**Memory:** Memory hierarchy, Primary and Secondary Memory, Cache memory, Virtual Memory. Direct Access storage devices (DASD) Destructive and Non-destructive Readout, Program and data memory, Memory Management Unit (MMU), PCMCIA cards and Slots.	12
IV	**Operating System Concepts:** Evolution of Operating Systems: Types of operating systems - Different views of the operating systems, Principles of Design and Implementation. The process concept. operating system services for process management. Process scheduling, Schedulers, Scheduling Algorithms.	12
V	**Process Management and Deadlock:** Structural overview, Concept of process and Process synchronization, Process Management and Scheduling. Hardware requirements: protection, context switching, privileged mode; Threads and their Management: Tools and Constructs for Concurrency, Detection and Prevention of Deadlocks, Mutual Exclusion: Algorithms. semaphores.	12

Part C - Learning Resources

Text Books. Reference Books, Other Resources

Suggested Readings:

1. Computer Fundamentals, P.K. Sinha, BPB Publication, Sixth Edition.
2. Fundamentals of Computers, V. Rajaraman, PHI Sixth Edition.
3. Computer Fundamentals Architecture and Organization, B. Ram, New Age International Publishers, Fifth Edition.
4. Fundamental of Computers, Raja Raman V., Prentice Hall of India. New Delhi.
5. Operating System Concepts – Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 8th edition, Wiley-India, 2009.
6. Modern Operating Systems, Andrew S. Tanenbaum, 3rd Edition, PHI
7. Operating Systems: A Spiral Approach – Elmasri. Carrick, Levine, TMH Edition

E-learning Resources:

Introduction to Computer Fundamental:

1. https://www.w3schools.blog/computer-fundamentals-tutorial
2. https://vikaspedia.in/education/digital-litercy/it-literacy-courses-in-associating-with-msup/computer-fundamentals
3. https://www.tutorialspoint.com/computer_fundamentals/index.htm
4. https://vikaspedia.in/education/digital-litercy/it-literacy- courses-in-associating-with-msup/computer-fundamentals
5. https://nptel.ac.in/courses/106/103/106103068/
   Introduction to Operating System:
6. https://www.w3schools.in/operating-system/tutorials/

Part D: Assessment and Evaluation

Maximum Marks: 50

Part A: Introduction

Program: Certificate Course		Class: **B.Sc.-CS I Year**	Year: **2022**	Session:2022-2023
1.	Course Code	COMP-2T		
2.	Course Title	**Programming with C and C++**		
3.	Course Type	Theory		
4.	Pre-requisite (if any)	No		
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Develop programming skill and learn how to implement new software. • Develop programming and logical concepts which helps to build up source code of concern programming language. • Understand the concept of programming like Compilation, Debugging, Executing, Linking and Loading. • Familiar about the structure of C and C++ program. • Understand about the cursor movement and control structure of C and C++ program. • Write simple C and C++ programs using programming concepts. • Familiar about procedure oriented and object oriented concepts. • Understand the concept of inheritance and polymorphism which helps them to develop programs to solve real world problems. • Use file handling concepts in C and C++ to develop programs for real life projects. • Develop new applications with C and C++ which helps them to switch in Software Industry.		
6.	Credit Value	Theory : 4		
7.	Total Marks	Max. Marks: 50		Min Passing Marks : 17

Part B: Content of the Course

Total Periods: 60

Unit	Topics	No. of Periods
I	**Introduction and Programming Concepts** : Definition of Program, Source file, Object file, Executable file, Header file, Language Translator- Assembler, Interpreter, Compiler, Testing, Debugging, Linker and Loader, Algorithms, Flow Charts, History of C language, Structure of C program , C Tokens : Identifiers, Keywords, Constants, Variables, Operators , Data Types , Control structure: Conditional and looping statements, Operator Precedence and Associativity, Array and it's types.	12
II	**Core Concepts of C Programming** : **Functions** : Standard Library and User defined functions, function prototype, Call by value and Call by reference, recursive functions, String functions, **Structure** : Declaration and Definition, Nested structure, array within structure. **Union:** Declaration and Definition, union variables, **Pointers:** Declaration and Definition, using & and * operators, pointer arithmetic, pointer to pointer, **Dynamic memory allocation functions:** malloc, calloc, realloc, free, **File Handling:** Basics, File Pointer, various file accessing functions.	12

III	**Introduction to Object Oriented Programming:** Concepts, Features of C++, Bottom up Approach, Structure of C++ program, Data types, Class and Objects, Access Specifiers: Private, Public, Protected, I/O statements, Insertion and Extraction operator, Scope resolution operator, Array, this pointer, **Constructor:** Default constructor, Copy constructor, Parameterized constructor, Destructor.	12
IV.	**Inheritance:** Definition, Concept of base and derived class, Types of Inheritance: Single, Multilevel, Multiple, Hierarchical and Hybrid Inheritance. **Polymorphism:** Definition, Compile time polymorphism: Function overloading, Operator overloading, Run time polymorphism: Virtual Function, pure virtual function. Inline function, friend function, friend class.	12
V.	**Input-Output and File Handling :** I/O classes, File and Stream classes, Char I/O, String I/O, Object I/O, File Pointer, Opening and Closing file. **Exception Handling and Standard Template Library :** Definition, Exception basics, try, catch and throws keywords, Template, Components of STL.	12

Keywords: Token, Datatype, Operators, Functions, Class, Inheritance, Polymorphism.

Part C - Learning Resources
Text Books, Reference Books, Other Resources

Suggested Readings:

1. Program Design, Peter Juliff, PHI Publications .
2. Let us C: Yashwant Kanetkar, BPB Publications .
3. Programming in ANSI C , E. Balaguruswamy, Tata McGraw Hill
4. Let us C++ ,Y. Kanetkar, B.P.B Publication .
5. Programming in C++, E. Balaguruswamy, Tata McGraw Hill.

E Resources:

1. Introduction to C and C++ from SWAYAM/NPTEL
   https://onlinecourses.nptel.ac.in/noc19_cs38/preview
   https://onlinecourses.nptel.ac.in/noc22_cs103/preview
   https://www.youtube.com/watch?v=KG4hjVDw-p8&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=2
2. Constant and Inline Function
   https://www.youtube.com/watch?v=pX6LufLso2M&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=10
3. Pointer and Reference
   https://www.youtube.com/watch?v=GtsBZ5e1-cE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=12
4. Function Overloading
   https://www.youtube.com/watch?v=uJGmGAShHcU&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=13
5. Operator Overloading
   https://www.youtube.com/watch?v=0jpOwe4d-FE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=17

6. Dynamic Memory Management
   https://www.youtube.com/watch?v=lkFK2X6qlc0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=18

7. Class and Object
   https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24

8. Access Specifiers
   https://www.youtube.com/watch?v=6ki_W7cXdM0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=22

9. Constructor and Destructor
   https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24

10. C different topics from W3School
    https://www.w3schools.com/c/

11. C++ different topics from W3School
    https://www.w3schools.com/CPP/default.asp

12. C different topics from Javatpoint
    https://www.javatpoint.com/c-programming-language-tutorial

13. C++ different topics from Javatpoint
    https://www.javatpoint.com/cpp-tutorial

Part D: Assessment and Evaluation

Maximum Marks: 50

Part A: Introduction				
Program: Certificate Course	Class: B.Sc.-CS I Year		Year: 2022	Session: 2022-2023
1	Course Code	COMP-1P		
2	Course Title	LAB 1 : Programming with C and C++		
3	Course Type	Practical		
4	Pre-requisite (if any)	Theoretical knowledge of C and C++		
5	Course Learning Outcomes (CLO)	At the end of course, Students will be able to: • Understand the fundamental programming concepts and methodologies which are essential to create good C/C++ programs. • Code, test, and implement a well-structured, robust computer program using the C/C++ programming language. • Write reusable modules (collections of functions). • Understand design/implementation issues involved with variable allocation and binding, control flow, types, subroutines, parameter passing. • Develop an in-depth understanding of functional, logic, and object-oriented programming paradigms.		
6	Credit Value	Practical: 2		
7	Total Marks	Max. Marks: 50		Min Passing Marks : 17

Part B: Content of the Course
Total Periods: 30

Tentative Practical List	Note: This is tentative list; the teachers concern can add more program as per requirement. 1. Write a program in C/C++ for addition of two numbers using float data type. 2. Write a program in C/C++ to find the biggest number between two numbers. 3. Write a program in C/C++ to find the factorial value of any entered number using do – while loop. 4. Write a program in C/C++ for various arithmetic operations using switch case statements. 5. Write a program in C/C++ for Multiplication of two 3X3 matrix. 6. Write a program in C/C++ to store five books information using structure. 7. Write a program in C/C++ to store six employee information using union. 8. Write a program in C/C++ to calculate simple interest using call by value and call by reference method. 9. Write a program in C/C++ for swapping of two numbers using pointer. 10. Write a program in C/C++ to make a text file using file handling. 11. Write a program to count word, space and lines in a text file. 12. Write a program to demonstrate work of calloc(). 13. Write a program to demonstrate work of malloc(), realloc() and free().

14. Write a program in C++ to find the sum and average of five numbers using class and objects.
15. Write a program in C++ to multiply two numbers using private and public member functions.
16. Write a program in C++ to print structure like this using scope resolution operator
    1
    1 2
    1 2 3
    1 2 3 4
    1 2 3 4 5
17. Write a program in C++ for constructor and Destructor.
18. Write a program in C++ for multiple inheritance.
19. Write a program in C++ for operator overloading.
20. Write a program in C++ for friend class and friend function.
21. Write a program in C++ for virtual function and virtual class.
22. Write a program in C++ for Exception Handling.
23. Write a program in C++ to open and close a file using file Handling.
24. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.
25. WAP to display Fibonacci series (i) using recursion, (ii) using iteration
26. WAP to calculate Factorial of a number (i) using recursion, (ii) using iteration
27. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.
28. Create Matrix class using templates. Write a menu-driven program to perform following Matrix Operations (2-D array implementation): a) Sum b) Difference c) Product d) Transpose 22. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).
29. Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.
30. Create a class Box containing length, breath and height. Include following methods in it: a) Calculate surface Area b) Calculate Volume c) Increment, Overload ++ operator (both prefix & postfix) d) Decrement, Overload -- operator (both prefix & postfix) e) Overload operator == (to check equality of two boxes), as a friend function f) Overload Assignment operator g) Check if it is a Cube or cuboid Write a program which takes input from the user for length, breath and height to test the above class.
31. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
32. Write a program to retrieve the student information from file created in previous question and print it in following format: Roll No. Name Marks

	33. Copy the contents of one text file to another file, after removing all whitespaces.
	34. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void.
	35. Write a program for exception handling.

Part C - Learning Resources
Text Books, Reference Books, Other Resources

Suggested Readings:

1. Program Design, Peter Juliff, PHI Publications.
2. Let us C: Yashwant Kanetkar, BPB Publications.
3. Programming in ANSI C , E. Balaguruswamy, Tata McGraw Hill
4. Let us C++ ,Y. Kanetkar, B.P.B Publication.
5. Programming in C++, E. Balaguruswamy, Tata McGraw Hill.

E Resources:

1. Introduction from SWAYAM/NPTEL
   https://onlinecourses.nptel.ac.in/noc19_cs38/preview
   https://onlinecourses.nptel.ac.in/noc22_cs103/preview
   https://www.youtube.com/watch?v=KG4hjVDw-p8&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=2

2. Constant and Inline Function
   https://www.youtube.com/watch?v=pX6LufLso2M&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=10

3. Pointer and Reference
   https://www.youtube.com/watch?v=GtsBZ5e1-cE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=12

4. Function Overloading
   https://www.youtube.com/watch?v=uJGmGAShHeU&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=13

5. Operator Overloading
   https://www.youtube.com/watch?v=0jpOwe4d-FE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=17

6. Dynamic Memory Management
   https://www.youtube.com/watch?v=lkFK2X6qlc0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=18

B4KrM9uOEdvPIVFUkU3jNc6D2&index=18

7. Class and Object
    https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24

8. Access Specifiers
    https://www.youtube.com/watch?v=6ki_W7cXdM0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=22

9. Constructor and Destructor
    https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24

- **C different topics from W3School**
  https://www.w3schools.com/c/
- **C++ different topics from W3School**
  https://www.w3schools.com/CPP/default.asp
- **C different topics from Javatpoint**
  https://www.javatpoint.com/c-programming-language-tutorial
- **C++ different topics from Javatpoint**
  https://www.javatpoint.com/cpp-tutorial

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 50
Continuous Comprehensive Evaluation (CCE): Not Applicable
University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable

Scheme of B.Sc.-IT (Information Technology)

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
	BSCIT-1T	Computer Fundamental and Operating System	Theory	4	50	17
First	BSCIT-2T	Programming with C and C++	Theory	4	50	17
	BSCIT-1P	LAB 1: Programming with C and C++	Practical	2	50	17

Part A: Introduction

Program: **Certificate Course**	Class: **B.Sc.-IT I Year**	Year: **2022** Session:2022-2023

1	Course Code	**BSCIT-1T**
2	Course Title	Computer Fundamental and Operating System
3	Course Type	Theory
4	Pre-requisite (if any)	No
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Understand the history and types of computers and various input/output devices. • Understand the concept of memory and its types. • Understand the concept of operating system and process management with scheduling algorithms. • Understand the threads and their management with deadlock detection and prevention. • Understand the working principles of Operating System.
6	Credit Value	Theory: 4
7	Total Marks	Max. Marks: 50 Min Passing Marks: 17

Part B: Content of the Course

Total No. of Periods: 60

Unit	Topics	No. of Periods
I	**Fundamental of Computer:** History of computer, Generation of computer, Types of Computers, Block diagram of CPU, Digital and Analogue computers and its evolution. Major components of digital computers, types of digital computers, Memory addressing capability of CPU, Word length and processing speed of computers, Microprocessors, Single chip Microcomputer, Large and small computers. Users interface, hardware, software and firmware, multiprogramming multiuser system, Dumb smart and intelligent terminals, Number system & Computer Codes.	12
II	**Peripheral devices:** I/O devices-Keyboard, Mouse, Monitor, Impact and Non-Impact Printers, Plotters, Scanner, other Input/output devices: Scan method of Display, Raster Scan, Vector Scan, Bit Mapped Scan, CRT Controller. I/O Port, Programmable and Non Programmable I/O port, Inbuilt I/O ports, Parallel and Serial ports, USB, IEEE 1394, AGP. Serial data transfer scheme, Microcontroller, Signal Processor, I/O processor, Arithmetic Processor.	12
III	**Memory:** Memory hierarchy, Primary and Secondary Memory, Cache memory, Virtual Memory, Direct Access storage devices (DASD) Destructive and Non-destructive Readout, Program and data memory, Memory Management Unit (MMU), PCMCIA cards and Slots.	12
IV	**Operating System Concepts:** Evolution of Operating Systems: Types of operating systems - Different views of the operating systems, Principles of Design and Implementation. The process concept, operating system services for process management. Process scheduling, Schedulers, Scheduling Algorithms.	12
V	**Process Management and Deadlock:** Structural overview, Concept of process and Process synchronization, Process Management and Scheduling, Hardware requirements: protection, context switching, privileged mode; Threads and their Management: Tools and Constructs for Concurrency, Detection and Prevention of Deadlocks. Mutual Exclusion: Algorithms, semaphores.	12

Keywords: Computer, Input /Output Devices, Memory, Operating System, Process Management, Scheduling Algorithms, Semaphores, Deadlock.

Part C - Learning Resources
Text Books. Reference Books, Other Resources

Suggested Readings:

1. Computer Fundamentals, P.K. Sinha, BPB Publication, Sixth Edition.
2. Fundamentals of Computers, V. Rajaraman, PHI Sixth Edition.
3. Computer Fundamentals Architecture and Organization, B. Ram, New Age International Publishers, Fifth Edition.
4. Fundamental of Computers, Raja Raman V., Prentice Hall of India, New Delhi.
5. Operating System Concepts – Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 8th edition, Wiley-India, 2009.
6. Modern Operating Systems, Andrew S. Tanenbaum, 3rd Edition, PHI
7. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition

E-learning Resources:

Introduction to Computer Fundamental:

1. https://www.w3schools.blog/computer-fundamentals-tutorial
2. https://vikaspedia.in/education/digital-litercy/it-literacy-courses-in-associating-with-msup/computer-fundamentals
3. https://www.tutorialspoint.com/computer_fundamentals/index.htm
4. https://vikaspedia.in/education/digital-litercy/it-literacy- courses-in-associating-with-msup/computer-fundamentals
5. https://nptel.ac.in/courses/106/103/106103068/
Introduction to Operating System:
6. https://www.w3schools.in/operating-system/tutorials/

Part D: Assessment and Evaluation
Maximum Marks: 50

		Part A: Introduction		
	Program: **Certificate Course**	Class: **B.Sc.-IT I Year**	Year: **2022**	Session:**2022-2023**
1.	Course Code	BSCIT-2T		
2.	Course Title	Programming with C and C++		
3.	Course Type	Theory		
4.	Pre-requisite (if any)	No		
5.	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Develop programming skill and learn how to implement a new software. • Develop programming and logical concepts which helps to build up source code of concern programming language. • Understand the concept of programming like Compilation, Debugging, Executing, Linking and Loading. • Familiar about the structure of C and C++ program. • Understand about the cursor movement and control structure of C and C++ program. • Write simple C and C++ programs using programming concepts. • Familiar about procedure oriented and object oriented concepts. • Understand the concept of inheritance and polymorphism which helps them to develop programs to solve real world problems. • Use file handling concepts in C and C++ to develop programs for real life projects. • Develop new applications with C and C++ which helps them to switch in Software Industry.		
6.	Credit Value	Theory: 5		
7.	Total Marks	Max. Marks: 50	Min Passing Marks : 17	

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Periods
I	**Introduction and Programming Concepts** : Definition of Program, Source file, Object file, Executable file, Header file, Language Translator- Assembler, Interpreter, Compiler, Testing, Debugging, Linker and Loader, Algorithms, Flow Charts, History of C language, Structure of C program , C Tokens: Identifiers , Keywords, Constants, Variables, Operators , Data Types , Control structure : Conditional and looping statements, Operator Precedence and Associativity, Array and it's types.	12
II	**Core Concepts of C Programming:** Functions : Standard Library and User defined functions, function prototype, Call by value and Call by reference, recursive functions, String functions, Structure : Declaration and Definition, Nested structure, array within structure. Union: Declaration and Definition, union variables, Pointers: Declaration and Definition, using & and * operators, pointer arithmetic, pointer to pointer, Dynamic memory allocation functions: malloc, calloc, realloc, free, File Handling: Basics, File Pointer, various file accessing functions.	12

III.	**Introduction to Object Oriented Programming** : Concepts, Features of C++, Bottom up Approach, Structure of C++ program, Data types, Class and Objects, Access Specifiers : Private, Public, Protected, I/O statements, Insertion and Extraction operator, Scope resolution operator, Array, this pointer, **Constructor**, Default constructor, Copy constructor, Parameterized constructor , Destructor.	12
IV.	**Inheritance:** Definition, Concept of base and derived class, Types of Inheritance: Single, Multilevel, Multiple, Hierarchical and Hybrid Inheritance. **Polymorphism:** Definition, Compile time polymorphism: Function overloading, Operator overloading, Run time polymorphism: Virtual Function, pure virtual function. Inline function, friend function, friend class.	12
V.	**Input-Output and File Handling** : I/O classes, File and Stream classes, Char I/O, String I/O, Object I/O, File Pointer, Opening and Closing file. **Exception Handling and Standard Template Library** : Definition, Exception basics, try, catch and throws keywords, Template, Components of STL.	12

Keywords: Token, Datatypes, Operators, Functions, Class, Inheritance, Polymorphism, Friend function, Abstraction.

Part C - Learning Resources
Text Books, Reference Books. Other Resources

Suggested Readings:

1. Program Design, Peter Juliff, PHI Publications.
2. Let us C: Yashwant Kanetkar, BPB Publications.
3. Programming in ANSI C , E. Balaguruswamy, Tata McGraw Hill
4. Let us C++ ,Y. Kanetkar, B.P.B Publication.
5. Programming in C++, E. Balaguruswamy, Tata McGraw Hill.

E Resources:

1. Introduction (from SWAYAM/NPTEL)
   https://onlinecourses.nptel.ac.in/noc19_cs38/preview
   https://onlinecourses.nptel.ac.in/noc22_cs103/preview
   https://www.youtube.com/watch?v=KG4hjVDw-p8&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=2

2. Constant and Inline Function
   https://www.youtube.com/watch?v=pX6LufLso2M&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=10

3. Pointer and Reference
   https://www.youtube.com/watch?v=GtsBZ5c1-cE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=12

4. Function Overloading
   https://www.youtube.com/watch?v=uJGmGAShHeU&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=13

5. Operator Overloading
   https://www.youtube.com/watch?v=0jpOwe4d-FE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=17

6. Dynamic Memory Management
   https://www.youtube.com/watch?v=lkFK2X6qlc0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=18

7. Class and Object
   https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24

8. Access Specifiers
   https://www.youtube.com/watch?v=6kj_W7cXdM0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=22

9. Constructor and Destructor
   https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24

- C different topics from W3School
  https://www.w3schools.com/c/
- C++ different topics from W3School
  https://www.w3schools.com/CPP/default.asp
- C different topics from Javatpoint
  https://www.javatpoint.com/c-programming-language-tutorial
- C++ different topics from Javatpoint
  https://www.javatpoint.com/cpp-tutorial

Part D: Assessment and Evaluation

Maximum Marks: 50

		Part A: Introduction		
Program: Certificate Course		Class: B.Sc.-IT I Year	Year: 2022	Session: 2022-2023
1	Course Code	BSCIT-1P		
2	Course Title	LAB 1 : Programming with C and C++		
3	Course Type	Practical		
4	Pre-requisite (if any)	Theoretical knowledge of C and C++		
5	Course Learning Outcomes (CLO)	At the end of course, Students will be able to: - Understand the fundamental programming concepts and methodologies which are essential to create good C/C++ programs. - Code, test, and implement a well-structured, robust computer program using the C/C++ programming language. - Write reusable modules (collections of functions). - Understand design/implementation issues involved with variable allocation and binding, control flow, types, subroutines, parameter passing. - Develop an in-depth understanding of functional, logic, and object-oriented programming paradigms.		
6	Credit Value	Practical: 2		
7	Total Marks	Max. Marks: 50	Min Passing Marks : 17	

Part B: Content of the Course	
Total Periods: 30	
Tentative Practical List	Note: This is tentative list; the teachers concern can add more program as per requirement. - Write a program in C/C++ for addition of two numbers using float data type. - Write a program in C/C++ to find the biggest number between two numbers. - Write a program in C/C++ to find the factorial value of any entered number using do – while loop. - Write a program in C/C++ for various arithmetic operations using switch case statements. - Write a program in C/C++ for Multiplication of two 3X3 matrix. - Write a program in C/C++ to store five books information using structure. - Write a program in C/C++ to store six employee information using union. - Write a program in C/C++ to calculate simple interest using call by value and call by reference method. - Write a program in C/C++ for swapping of two numbers using pointer. - Write a program in C/C++ to make a text file using file handling. - Write a program to count word, space and lines in a text file. - Write a program to demonstrate work of calloc(). - Write a program to demonstrate work of malloc(), realloc() and free().

14. Write a program in C++ to find the sum and average of five numbers using class and objects.
15. Write a program in C++ to multiply two numbers using private and public member functions.
16. Write a program in C++ to print structure like this using scope resolution operator

    1
    1 2
    1 2 3
    1 2 3 4
    1 2 3 4 5

17. Write a program in C++ for constructor and Destructor.
18. Write a program in C++ for multiple inheritance.
19. Write a program in C++ for operator overloading.
20. Write a program in C++ for friend class and friend function.
21. Write a program in C++ for virtual function and virtual class.
22. Write a program in C++ for Exception Handling.
23. Write a program in C++ to open and close a file using file Handling.
24. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.
25. WAP to display Fibonacci series (i) using recursion, (ii) using iteration
26. WAP to calculate Factorial of a number (i) using recursion, (ii) using iteration
27. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.
28. Create Matrix class using templates. Write a menu-driven program to perform following Matrix Operations (2-D array implementation): a) Sum b) Difference c) Product d) Transpose 22. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).
29. Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.
30. Create a class Box containing length, breath and height. Include following methods in it: a) Calculate surface Area b) Calculate Volume c) Increment, Overload ++ operator (both prefix & postfix) d) Decrement, Overload -- operator (both prefix & postfix) e) Overload operator == (to check equality of two boxes), as a friend function f) Overload Assignment operator g) Check if it is a Cube or cuboid Write a program which takes input from the user for length, breath and height to test the above class.
31. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
32. Write a program to retrieve the student information from file created in previous

	question and print it in following format: Roll No. Name Marks
	33. Copy the contents of one text file to another file, after removing all whitespaces.
	34. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void.
	35. Write a program for exception handling.

Part C - Learning Resources
Text Books, Reference Books, Other Resources

Suggested Readings:

1. Program Design, Peter Juliff, PHI Publications .
2. Let us C: Yashwant Kanetkar, BPB Publications .
3. Programming in ANSI C , E. Balaguruswamy, Tata McGraw Hill
4. Let us C++ .Y. Kanetkar, B.P.B Publication .
5. Programming in C++, E. Balaguruswamy, Tata McGraw Hill.

E Resources:

C/C++ different topics from SWAYAM/NPTEL

1. Introduction
   https://onlinecourses.nptel.ac.in/noc19_cs38/preview
   https://onlinecourses.nptel.ac.in/noc22_cs103/preview
   https://www.youtube.com/watch?v=KG4hjVDw-p8&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=2

2. Constant and Inline Function
   https://www.youtube.com/watch?v=pX6LufLso2M&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=10

3. Pointer and Reference
   https://www.youtube.com/watch?v=GtsBZ5e1-cE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=12

4. Function Overloading
   https://www.youtube.com/watch?v=uJGmGAShHeU&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=13

5. Operator Overloading
   https://www.youtube.com/watch?v=0jpOwe4d-FE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=17

6. Dynamic Memory Management
   https://www.youtube.com/watch?v=lkFK2X6qIc0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=18

B4KrM9uOEdvPIVFUkU3jNc6D2&index=18

7. Class and Object
    https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24

8. Access Specifiers
    https://www.youtube.com/watch?v=6ki_W7cXdM0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=22

9. Constructor and Destructor
    https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24

10. C different topics from W3School
    https://www.w3schools.com/c/

11. C++ different topics from W3School
    https://www.w3schools.com/CPP/default.asp

12. C different topics from Javatpoint
    https://www.javatpoint.com/c-programming-language-tutorial

13. C++ different topics from Javatpoint
    https://www.javatpoint.com/cpp-tutorial

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 50
Continuous Comprehensive Evaluation (CCE): Not Applicable

Not Applicable

Scheme & Syllabus

Subject: Electronics

B.Sc. Electronics (Three Year)

Programme Outcomes (PO)

PO creates an educational environment to train the students to meet the challenges of modern Electronics & Communication industry through state of the art technical knowledge and present challenges. Following are the expected programme outcomes.

- Analyze, plan and apply the acquired knowledge in basic sciences and mathematics in solving Electronics and Communication Engineering problems with technical, economic, environmental and social contexts.
- Design, build and test analog & digital electronic systems for given specifications.
- Architect modern communication systems to meet stated requirements.
- Work in a team using technical knowhow, common tools and environments to achieve project objectives.
- Engage in lifelong learning, career enhancement and adapt to changing professional and societal needs.
- In addition the course caters to the requirements of providing complete exposure to NET/SET syllabus for Electronics farmed by the U.G.C.

Programme Specific Outcomes (PSO)

PSO enables the students

- To understand basic facts and concepts in Electronics while retaining the exciting aspects of Electronics so as to develop interest in the study of Electronics as a discipline.
- To develop the ability to apply the electronic circuits.
- To get benefited with the present state of art of the electronic based circuit and serve society with its applications.
- To develop the capability to work hands-on on the electronic circuits that is becoming vital for the mankind for the purpose of work regulation
- To be familiarized with the emerging areas of Electronics and their applications in various spheres of Electronic sciences.
- To appraise the capability of students to make its relevance in future studies.
- To develop skills in the building and studying the circuits along with the software implementation.
- To be exposed to get compete with present scenario of the industrial automation.

Three Year (Yearly) Syllabus for Undergraduates

As recommended by Central Board of Studies of Electronics
For approval of Kuladhipati, Governor of Chhattisgarh
For Three Years 2023-26
July 2023 onwards
Class: B.Sc. Electronics

Scheme of Examination

Paper Code	Course Opted	Title of Course	Theory	Practical	Grand Total	Minimum Passing Marks
First Year (Under Graduate Certificate in Electronics)						
ELC-101T	Core Course-1	Network Analysis and Analog Electronics	50	--	100	33
ELC-102T	Core Course-2	Digital Electronics	50	--		
ELC-103P	Core Course-1 &2 Practical/Tutorial	Network Analysis, Analog and Digital Lab	--	50	50	17

Syllabus
B.Sc. Part I
ELECTRONICS
Paper-I

ELC-101T: NETWORK ANALYSIS AND ANALOGELECTRONICS

Theory:

Maximum Marks 50

Aims & Objectives

To identify the electronics circuit components- active and passive, understand basic concept of circuits, filters, semiconductor diodes, transistor, power devices, amplifiers and oscillators.

Course Learning Outcomes:

After the completion of the course, Students will be able to

1. Apply their knowledge in analyzing Circuits by using network theorems.
2. Describe the behavior of semiconductor material.
3. Understand working and applications of semiconductor devices.
4. Understand the current voltage (I-V) characteristics of semiconductor devices (Diode/BJT/MOSFET)
5. Apply standard device models to explain/calculate critical internal parameters of semiconductor devices.
6. Explain the behavior and characteristics of power devices such as SCR/UJT etc.
7. Know the concept of feedback amplifier and their characteristics.

Unit-1

Components and Circuit Concepts: Resistors, Inductors and Capacitors (types and specifications) Voltage and Current Sources

AC Circuit Analysis: Sinusoidal Voltage and Current, Definition of Instantaneous, Peak, Peak to Peak, Root Mean Square and Average Values. Impedance and reactance, Series and parallel RLC circuit, Series and Parallel Resonance, condition for Resonance, Resonant Frequency, Bandwidth, and significance of Quality Factor (Q).

Passive Filters: Low Pass, High Pass and Band Pass

Network Theorems: Principal of Duality, Superposition Theorem, Thevenin's, Norton's Theorem, Reciprocity Theorem, Millman's Theorem, Maximum Power Transfer Theorem. AC circuit analysis using Network theorems.

Unit-2

Junction Diode and its Applications: Energy bands in Solids, Extrinsic and Intrinsic Semiconductor, P and N type semiconductors, Formation of PN junction, Shifting of Fermi level.

PN junction diode, Diode Equation and I-V characteristics. Idea of static and dynamic resistance, dc load line analysis, Quiescent (Q) point. Zener diode, Reverse saturation current, Zener and avalanche breakdown. Rectifiers- Half wave rectifier, Full wave rectifiers (center tapped and bridge), circuit diagrams, working and waveforms, ripple factor and efficiency. Filter-Shunt capacitor filter, its role in power supply, output waveform, and working. Regulation- Line and load regulation, Zener diode as voltage regulator

Unit-3

Bipolar Junction Transistor: PNP and NPN transistor, Basic Transistor action, Transistor biasing, CE, CB, CC configurations, Input and Output characteristics DC load line, operating point.

Field Effect Transistors: JFET, Construction, Idea of Channel formation, Pinch off and Saturation Voltages, Working and Characteristics. MOSFET(N channel and P channel), Construction, Working and Characteristics.

Power Devices: UJT, Construction, Working and Characteristics. SCR, Diac, Triac, Construction, Working and Characteristics.

Unit-4

Amplifiers: Transistor biasing and Stabilization circuits- Fixed Bias and Voltage Divider Bias. Thermal runaway, stability and stability factor, Current, voltage and Power gain, Transistor as a two port network, h-parameter equivalent circuit. Small signal analysis of single stage CE amplifier, Input and Output impedance, Class A, B and C Amplifiers. Application of common Collector Amplifier.

Cascaded Amplifiers: Two stage RC Coupled Amplifier and its Frequency Response.

Unit-5

Feedback in Amplifiers: Concept of feedback, negative and positive feedback, advantages of negative feedback (Qualitative only).

Sinusoidal Oscillators: Barkhausen criterion for sustained oscillations. Phase shift, Weinsbridge, Crystal and Colpitt's oscillator. Determination of Frequency and Condition of oscillation.

Reference Books:

[1] Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004)

[2] Electrical Circuits, M. Nahvi& J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005)

[3] Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press

[4] Network, Lines and Fields, J.D.Ryder, Prentice Hall of India.

[5] Electronic Devices and Circuits, David A. Bell, 5th Edition 2015, Oxford University Press.

[6] Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, Tata McGraw Hill

[7] Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning

[8] Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6thEdn., Oxford University Press.

[9] J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)

[10] J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, Tata McGraw Hill (1991)

Paper- II

ELC-102T: DIGITAL ELECTRONICS

Theory:

Aims & Objectives   **Maximum Marks 50**

To understand the digital electronics and its components namely building block, combinational & sequential circuits, analog to digital converter, digital to analog converter, clock and timer circuits.

Course Outcomes:

After the completion of the course, Students will be able to

1. Understand fundamentals of Number Systems, Boolean algebra and minimization techniques.

2. Design combinational and sequential digital circuits.

3. Understand working and applications of analog to digital and digital to analog converters.

Unit-1

Number System and Codes: Decimal, Binary, Octal and Hexadecimal number systems, base conversions, Representation of signed and unsigned numbers, BCD code, Binary, octal and hexadecimal arithmetic: addition, subtraction by 2's complement method, multiplication.

Logic Gates and Boolean Algebra: Truth Tables of OR, AND, NOT, NOR, NAND, XOR, XNOR, Universal Gates, Basic postulates and fundamental theorems of Boolean algebra.

Unit-2

Logic Families: Negative and Positive logic, Saturated and unsaturated logic gates, Logic families RTL, DTL, TTL, ECL, CMOS working, circuit and characteristics

Combinational Logic Analysis and Design: Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh map minimization up to 4variables for SOP). Arithmetic Circuits: Binary Addition, Half and Full Adder, Half and Full Subtractor, 4-bit binary Adder/Subtractor.

Unit-3

Data Processing Circuits: Multiplexers, De-multiplexers, Decoders, Encoders.

Sequential Circuits: One bit storage, Flip-flop, SR and JK Flip-Flops. Race-around conditions in JK Flip-Flop. Master-slave JK Flip-Flop. T and D flip-flop, Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations.

Unit-4

Shift Registers: Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits).

Counters (4 bits): Asynchronous counters, Ripple Counter, Decade Counter Ring Counter. Synchronous Counter.

Unit-5

Clock and Timer (IC 555): Introduction, Block diagram of IC 555, Astable and Monostable multivibrator circuits. **Basic Concept of Arithmetic Logic Unit**

D-A and A-D Conversion: 4 bit binary weighted and R-2R D-A converters, circuit and working, Accuracy and Resolution. A-D conversion characteristics, successive approximation ADC. (Mention of relevant ICs for all).

Reference Books:

[1] Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw

[2] Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.

[3] Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.

[4] Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.

[5] Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)

[6] R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994)

ELECTRONICS LABORATORY
ELC-103P: Network Analysis, Analog and Digital Lab

A student is required to do at least 15 experiment in an academic year. The scheme of practical examination will be as follows-

Experiment		30
Viva	—	10
Sessional	—	10
Total	—	50

List of Experiments:

1. Study of Electronic Components, Digital Multimeter, function Generator and Oscilloscope.
2. Determination of Energy Band –gap of a Diode.
3. Study of P-N Junction Diode Characteristics.
4. Study of Zener diode characteristics.
5. Study of tunnel diode characteristics.
6. Study of LED Characteristics.
7. Study of Transistor characteristics in Common Base Mode (CB).
8. Study of Transistor characteristics in Common Emitter Mode (CE).
9. Study of Transistor bias stability.
10. Study of Frequency response of a single CE amplifier.
11. Study of Field Effect Transistor Characteristics.
12. Verification of Norton's Theorem.
13. Verification of Super position Theorem.
14. Verification of Thevenin's Theorem.
15. Verification of Maximum Power Transfer Theorem.
16. Design a digital to Analog convertor (DAC) of given specifications.
17. Verification of Truth table of basic logic gates.
18. Verification of De Morgan's theorem.
19. Study of half adders and full adders using IC's
20. Study of RS flip-flops.
21. Study of D and T type flip fop.
22. Study of JK master slave flips flop.
23. Study of the decade counter as MOD-3and MOD-4 and verify the truth table.
24. Study of the decade counter as MOD-8 and MOD-9 and verify the truth table.
25. Study of seven segment Display.
26. Study of Binary Counter.

Note:

1. Out of above twenty six experiments at least fifteen experiments should be done, use of bread board and soldering is expected for at least four experiments.
2. Other experiments of equal standard may also be set.

Course curriculum B. Sc. -Subject- FORESTRY		
1st Year		
3.	**Paper-First** (Forestry & Silviculture)	1 - 8
4.	**Paper-Second** (Silvics and Watershed)	9 - 14
5.	Laboratory/practical	15 - 17

Program: **Undergraduate Certificate**	Class: **B.Sc. 1st Year, Paper- 1**	Year: 2023	Session:2023-2024
Subject : Forestry			
1	Course Code	BSLF11T	
2	Course Title	**Forestry & Silviculture**	
3	Course Type	**Core Course (Theory)**	
4	Pre-requisite (ifany)	To this course, a student must have the Science subjects (Biology) in Class 12th	
5	Course Learning Outcomes (CLO)	The graduates should be able to demonstrate the acquisition of: ▪ knowledge, concepts and principles on forest & Forestry ▪ understanding of the linkages between the forest and forestry ▪ develop knowledge on forest classification and skill on nursery establishment and quality planting development ▪ At the end of this course, the students will be ableto understand components of forest andunderstand classification & types of forest, learn the establishment of nursery and plantation technique for the supply of quality planting materials to fulfill the demand of people, society, Nation &industrial requirements.	
6	Credit Value	Theory : 4	
7	Total Marks	Max. Marks: 10+40	Min Passing Marks : 17

Part B: Content of the Course		
Total No. of Lectures (in hours per week): 3 hours per week Total Lectures: 60 hours		
Class - B. Sc. - 1st year, Paper-1 Course Name - Forestry & Silviculture Core Course (Theory)		
Course Code - BSLF11T		Credit - 4
Unit	Topics	No. of Lectures
I	**The forest and forestry (an introduction)** 1.1 Definition of Forest and forestry 1.2 Component of Forest 1.3 Classification of Forest 1.4 Growth and changes in the seedling, sapling, pole and tress	15
II	**Principle of Silviculture** 2.1 Introduction, definition, scope and objective of Silviculture, relation of Silviculture with forestry with branches 2.2 Influence of forest on environment 2.3 Factors of locality	15
III	**Forest vegetation and its distribution** 3.1 Biogeographic zone of India 3.2 Distribution and descriptions of forest type in India 3.3 Influence of forest on climate 3.4 Carbon sequestration and Storage in forest ecosystem	10
IV	**Plantation Forestry** 4.1 Nursery and its establishment 4.2 Method of sowing and plantation 4.3 Industrial plantation and energy plantation 4.4 Protection of plantation	10
V	**Geology and Forest soil** 5.1 Definition and introduction of Geology and Pedology 5.2 Soli profile and soil group 5.3 Soil formation 5.4 Soil properties (Physical & Chemical)	10
Keywords: Forest, Forestry, Silviculture, Plantation, Nursery, Forest Soil		

Part C - Learning Resource
Text Books, Reference Books, Other Resources

Suggested Readings:

Text Books:

1. Beazley, M. 1981. The International Book of Forest. Mitchell Beazly Publishers, London.
2. Champion, H, G and Seth, S.K. 1968. Forest types of India, revised survey of forest types of India, GOI Press,New Delhi, 404p.
3. Dwivedi, A. P. 1992. Principles and Practice of Indian Silviculture, Surya Publication, 420p.
4. Dwivedi, A.P. 1993. A Text Book of Silviculture, International Book Distributors, Dehradun.
5. Kanwar, J.S. 1976. Soil Fertility – Theory and practice ICAR publication, New Delhi.
6. Khanna, L.S. 1989. Principles and Practice of Silviculture. Khanna Bandhu, New Delhi, 473p.
7. Luna, R.K. 1988. Plantation Forestry In India. International Book Distributors, Dehradun. p 476.
8. Luna, R.K. Plantation Trees. International Book Distributors, Dehradun.
9. Negi, S.S. 1990. A Handbook of Forestry, International Book Distributors, Dehradun.
10. Persson, R. 1992. World forest resources. Periodical experts, New Delhi, 690p.
11. Ram Prakash and L.S. Khanna. 1991. Theory and Practice of Silvicultural systems. International Book Distributors, Dehra Dun. 298p.
12. Sagreiya, K.P. 1997. Forests and Forestry,National Book Trust India.
13. Shiva, M..P. 1986. A Handbook of Systematic Botany, .IBD Publisher, Dehradun.
14. Westoby, J. 1991. Introduction to World Forestry. Wiley, 240p.

Suggested Digital Platform Web inks:

14.Grebner, D.L., Bettinger, P and Siry, J.P. 2012. Introduction to Forestry and Natural Resources. Academic Press. 508p (Google eBook).

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks :		50 Marks
Continuous Comprehensive Evaluation (CCE) :		10 Marks
University Exam (UE) :		40 Marks
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	1. Class Test(1 mark/unit) :	05 Marks
	2. Assignment/Presentation :	05 Marks
		Total Marks: 10
External Assessment: University Exam (UE) Time: 02.00Hours	**Section (A):** Ten Objectives-Fill in the blanks/True&False/Match the following/MCQ	0.5 x 10 = 05
	Section (B): Three Very Short Questions (50 Words Each)	03x03 = 09
	Section (C): Four Short Questions (200 Words Each)	04x04 =16
	Section (D): Two Long Questions (500 Words Each)	02 x 05= 10
		Total Marks: 40

भाग एः परिचय				
पाठ्यक्रम : स्नातक प्रमाणपत्र	कक्षा : बी.एससी. प्रथम वर्ष, पेपर– प्रथम		वर्ष : 2023	सत्र : 2023-2024
विषय : वानिकी				
1	पाठ्यक्रम कोड	BSLF11T		
2	पाठ्यक्रम शीर्षक	वानिकी एवं वनवर्धन		
3	पाठ्यक्रम प्रकार	कोर कोर्स (सिद्धांत)		
4	पूर्व–अपेक्षित (यदि कोई हो)	इस कोर्स के लिए, छात्र कक्षा 12 वीं में विज्ञान विषय (जीवविज्ञान) में पास होना चाहिए		
5	पाठ्यक्रम अध्ययन की परिलब्धियां(CLO)	• स्नातकों के अधिग्रहण का प्रदर्शन करने में सक्षम होंगे। • वन और वानिकी पर ज्ञान, अवधारणाएं और सिद्धांत। • वन और वानिकी के बीच संबंधों की समझ। • नर्सरी स्थापना और गुणवत्ता रोपण विकास में वन वर्गीकरण और कौशल पर ज्ञान विकसित करना। • इस पाठ्यक्रम के अंत में, छात्र वन घटकों, वर्गीकरण और वन के प्रकारों को समझने और नर्सरी और वृक्षारोपण तकनीकों की स्थापना सीखने में सक्षम होंगे।		
6	क्रेडिट मान	सिद्धांत: 4		
7	कुल अंक	अधिकतम अंक:10+40	न्यूनतम उत्तीर्ण अंक:17	

<div align="center">

भाग बी : पाठ्यक्रम की विषयवस्तु

व्याख्यानकी कुल संख्या (प्रति सप्ताह घंटों में) : प्रति सप्ताह 3 घंटे

कुल व्याख्यान : 60 घंटे

कक्षा – बी.एससी.– प्रथम वर्ष, पेपर– प्रथम

पाठ्यक्रम का नाम –वानिकी एवं वनवर्धन

कोर कोर्स (सिद्धांत)

</div>

पाठ्यक्रम कोड:BSLF11T		क्रेडिट : 4
इकाई	विषय	व्याख्यान कीसंख्या
I	वन और वानिकी (एक परिचय) 1.1 वन और वानिकी की परिभाषा 1.2 वन के घटक 1.3 वन का वर्गीकरण 1.4 बिजौल या पौधा, केडा या बाल वृक्ष, वृक्षक या बल्ली एवं वृक्ष में वृद्धि एवं विकास	15
II	वनवर्धनका सिद्धांत 2.1 वनवर्धन का परिचय, परिभाषा, दायरा और उदेश्य, वानिकी शाखाओं के साथ वनवर्धनका संबंध 2.2 वन का पर्यावरण पर प्रभाव 2.3 स्थान कारक	15
III	वन वनस्पति और इसका वितरण 3.1 भारत का जैव–भौगोलिक क्षेत्र 3.2 भारत में वनोंके प्रकार का वितरण और विवरण 3.3 जलवायु पर वन का प्रभाव 3.4 वन पारिस्थितिकी तंत्र में कार्बन अवशोषिणऔर भंडारण	10
IV	वृक्षारोपण वानिकी 4.1 रोपणी और इसकी स्थापना 4.2 बुवाई और वृक्षारोपण की विधि 4.3 औद्योगिक वृक्षारोपण और ऊर्जा वृक्षारोपण 4.4 वृक्षारोपण का संरक्षण	10
V	भूविज्ञान और वन मिट्टी 5.1 भूविज्ञान और पेडोलॉजी की परिभाषा और परिचय 5.2 मृदा परिच्छेदिकाऔर मृदा समूह 5.3 मृदा निर्माण 5.4 मृदा गुण (भौतिक और रासायनिक)	10
कुंजी शब्द (कीवर्ड) : वन, वानिकी, वनवर्धन, वृक्षारोपण, नर्सरी, वन मृदा		

भाग सी –अनुशंसित अध्ययन संसाधन
पाठ्य पुस्तकें, संदर्भ पुस्तकें, अन्य संसाधन

अनुशंसित सहायक पाठ्य पुस्तकें, संदर्भ पुस्तकें, अन्य पाठ्य संसाधन/पाठ्य सामग्री

सुझाए गए पठन/पाठ्य सामग्री

पाठ्य पुस्तकें:

1. Khanna, L.S. 1989. Principles and Practice of Silviculture. Khanna Bandhu, New Delhi, 473p.
2. Ram Prakash and L.S. Khanna. 1991. Theory and Practice of Silvicultural systems. International Book Distributors, Dehra Dun. 298p.
3. Dwivedi, A.P. 1993. A Text Book of Silviculture, International Book Distributors, Dehradun.
4. Dwivedi, A. P. 1992. Principles and Practice of Indian Silviculture, Surya Publication, 420p.
5. Champion, H, G and Seth, S.K. 1968. Forest types of India, revised survey of forest types of India, GOI Press, New Delhi, 404p.
6. Negi, S.S. 1990. A Handbook of Forestry, International Book Distributors, Dehradun, 690p.
7. Shiva, M..P. 1986. A Handbook of Systematic Botany, .IBD Publisher, Dehradun. B.Sc.Forestry Syllabus, School of Forestry and Environment SHIATS-DU, Allahabad
8. Luna, R.K. 1988. Plantation Forestry In India. International Book Distributors, Dehradun. p 476.
9. Luna, R.K. Plantation Trees. International Book Distributors, Dehradun.
10. Sagreiya, K.P. Forests and Forestry, 1997. National Book Trust India.
11. Beazley, M. 1981. The International Book of Forest. Mitchell Beazly Publishers, London.
12. Kanwar, J.S. 1976. Soil Fertility – Theory and practice ICAR publication, New Delhi.
13. Persson, R. 1992. World forest resources. Periodical experts, New Delhi.
14. Westoby, J. 1991. Introduction to World Forestry. Wiley, 240p.

सुझाए गए डिजिटल प्लेटफॉर्म वेब लिंक्स

15. Grebner, D.L., Bettinger, P and Siry, J.P. 2012. Introduction to Forestry and Natural Resources. Academic Press. 508p (Google eBook).

भाग डी : अनुशंसित मूल्यांकन विधिया		
अनुशंसित सतत मूल्यांकन विधियाँ :		
अधिकतम अंक :		50 अंक
सतत व्यापक मूल्यांकन (CCE):		10 अंक
विश्वविद्यालय परीक्षा (UE):		40 अंक
आंतरिक मूल्यांकन : सतत व्यापक मूल्यांकन (CCE)	1. कक्षा परीक्षा(1अंक/ इकाई):	05 अंक
	2. असाइनमेंट / प्रस्तुतिकरणः	05 अंक
		कुल अंक: 10
आकलन : विश्वविद्यालय परीक्षा (UE) समय : 02.00 घंटे	अनुभाग (अ) : दस वस्तुनिष्ठ प्रश्न – रिक्त स्थान भरें / सही और गलत / MCQ	0.5 x 10 = 05
	अनुभाग (ब): तीन अति लघु प्रश्न (प्रत्येक में 50 शब्द)	03 x 03 = 09
	अनुभाग (स): चार लघु प्रश्न (प्रत्येक 200 शब्द)	04 x 04 =16
	अनुभाग (द): दो दीर्घ प्रश्न (प्रत्येक में 500 शब्द)	02 x 05 = 10
		कुल अंक : 40

Part A: Introduction			
Program: Undergraduate Certificate	Class: B.Sc. 1st Year, Paper-2	Year: 2023	Session:2023-2024
1	Course Code	BSLF12T	
2	Course Title	Silvics and Watershed	
3	Course Type	Core Course (Theory)	
4	Pre-requisite (if any)	To this course, a student must have the Science subjects (Biology) in Class 12th	
5	Course Learning Outcomes (CLO)	The graduates should be able to demonstrate the acquisition of: - Understand the regeneration of forest and methods of natural and artificial regeneration and different operations for its management - Learn the silvics of important species . Concepts and techniques of watershed and soil water conservation and forest seed handling. - At the end of this course, the students will be able understand the forest regeneration and tree feeling/harvesting systems and afforestation techniques in the problematic lands.	
6	Credit Value	Theory : 4	
7	Total Marks	Max. Marks: 10+40	Min Passing Marks : 17

Part B: Content of the Course		
Total No. of Lectures (in hours per week): 3 hours per week		
Total Lectures: 60 hours		
Class - B. Sc. - 1st year, Paper-2 Course Name - Silvics and Watershed Core Course (Theory)		
Course Code - BSLF12T		Credit - 4
Unit	Topics	No. of Lectures
I	**Regeneration of forest** 1.1 Natural regeneration 1.2 Artificial regeneration 1.3 Tending operation	15
II	**Silviculture system** Introduction of following system: 2.1 High forest system 2.2 Coppice system 2.3 Improvement felling	10
III	**Silvics of important tree species** 3.1 Sal 3.2 Teak 3.3 Sissoo 3.4 Bamboo 3.5 Pine 3.6 Casuarina 3.7 Khamar 3.8 Eucalyptus	10
IV	**Watershed and afforestation** 4.1 Introduction to soil erosion and importance of soil and water conservation 4.2 Concept and characteristics of watershed 4.3 Choice of species for problematic areas as Ravine land, saline & alkaline areas, mined areas & wet lands.	15
V	**Handling of Forestry Seeds** 5.1 Fruit & seed collection and processing 5.2 Storage of Seeds 5.3 Seed Dormancy & Testing	10
Keywords: ForestRegeneration, Silviculture system, Silvics, Watershed, Afforestation, Seed handling		

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Part C – Learning Resource
Text Books, Reference Books, Other Resources

Suggested Readings:

Text Books:

1. Champion, H, G and Seth, S.K. 1968. Forest types of India, revised survey of forest types of India, GOI Press,New Delhi, 404p.
2. David M. Smith. 1989. "The Practice of Silviculture". EBD Educational Pvt. Ltd. Dehradun, India.
3. Dhruva Narayana V. V., G. Sastry and U. S. Patnaik. 1997. Watershed Management. Indian Council of Agricultural Research, New Delhi, 176 p
4. Dwivedi, A. P. 1992. Principles and Practice of Indian Silviculture, Surya Publication, 420p.
5. Dwivedi, A.P. 1993. A Text Book of Silviculture, International Book Distributors, Dehradun.
6. Khanna, L.S. 1989. Principles and Practice of Silviculture. Khanna Bandhu, New Delhi, 473p.
7. Khullar, P. *et al*. 1992. Forest Seed. ICFRE, New Forest, Dehra Dun
8. Lal R. 2000. Integrated Watershed Management in the Global Ecosystem. CRC Press, London.
9. Luna, R.K. 1988. Plantation Forestry in India. International Book Distributors, Dehradun. p 476.
10. Mather, A.S. 1990. Global forest resources. Belhaven, London.
11. Mishra. S. R. 2010. Textbook of Dendrology. Discovery Publishing House Pvt. Ltd. New Delhi.
12. Persson, R. 1992. World forest resources. Periodical experts, New Delhi.
13. Ram Prakash and L.S. Khanna. 1991. Theory and Practice of Silvicultural systems. International Book Distributors, Dehra Dun. 298p.
14. Sagreiya, K.P. Forests and Forestry, 1997. National Book Trust India.
15. Shiva, M.P. A Handbook of Systematic Botany, 1986.IBD Publisher, Dehradun.
16. Tewari D. N. 1992. Tropical Forestry in India. International Book Distributors, Dehradun.
17. Troup, RS 1922. Silviculture of Indian Trees, Vol. 1-4, Revised and Enlarged Edition, Forest Research Institute and Colleges, Dehra Dun, 1975.
18. Westoby, J. 1991. Introduction to World Forestry. Wiley, 240p.

Suggested Digital Platform Web inks:

Forest Tree seeds Handbook (https://www.libraryofbook.com/pdf/download.php?book=forest-tree-seeds-handbook)

t types

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks	:	50 Marks
Continuous Comprehensive Evaluation (CCE)	:	10 Marks
University Exam (UE)	:	40 Marks
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	1. Class Test (1 mark/unit) :	05 Marks
	2. Assignment/Presentation :	05 Marks
		Total Marks: 10
External Assessment: University Exam (UE) Time: 02.00 Hours	**Section (A):** Ten Objectives-Fill in the blanks/True & False/Match the following/MCQ	0.5 x 10 = 05
	Section (B): Three Very Short Questions (50 Words Each)	03 x 03 = 09
	Section (C): Four Short Questions (200 Words Each)	04 x 04 =16
	Section (D): Two Long Questions (500 Words Each)	02 x 05 = 10
		Total Marks: 40

	भाग एः परिचय			
पाठ्यक्रम : स्नातक प्रमाणपत्र		कक्षा : बी.एससी. प्रथम वर्ष, पेपर— द्वितीय	वर्ष : 2023	सत्र : 2023-2024
विषय : वानिकी				
1	पाठ्यक्रम कोड	BSLF12T		
2	पाठ्यक्रम शीर्षक	सिल्विक्स एवं वाटरशेड		
3	पाठ्यक्रम प्रकार	कोर कोर्स (सिद्धांत)		
4	पूर्व–अपेक्षित (यदि कोई हो)	इस कोर्स के लिए, छात्र कक्षा 12 वीं में विज्ञान विषय(जीवविज्ञान) में पास होना चाहिए		
5	पाठ्यक्रम अध्ययन की परिलब्धियां(CLO)	स्नातकों को निम्नलिखित के अधिग्रहण का प्रदर्शन करने में सक्षम होंगे– ▪ वन के पुनर्जनन और प्राकृतिक और कृत्रिम पुनर्जनन के तरीकों और इसके प्रबंधन के लिए विभिन्न कार्यों ▪ को समझना महत्त्वपूर्ण प्रजातियों के सिल्विक्स को सीखना ▪ वाटरशेड और मृदा जल संरक्षण और वन की अवधारणाएं और तकनीकें बीज प्रबंधन। ▪ इस पाठ्यक्रम के अंत में, छात्र समस्याग्रस्त भूमि में वन पुनर्जनन और वृक्ष कटाई प्रणाली और वनीकरण तकनीक को समझने में सक्षम होंगे।		
6	क्रेडिट मान	सिद्धांत: 4		
7	कुल अंक	अधिकतम अंक:10+40	न्यूनतम उत्तीर्ण अंक:17	

भाग बी : पाठ्यक्रम की विषयवस्तु
व्याख्यानकी कुल संख्या (प्रति सप्ताह घंटों में) : प्रति सप्ताह 3 घंटे
कुल व्याख्यान : 60 घंटे
कक्षा – बी.एससी.– प्रथम वर्ष, पेपर– द्वितीय
पाठ्यक्रम का नाम –सिलविक्स एवं वाटरशेड
कोर कोर्स (सिद्धांत)

पाठ्यक्रम कोड:BSLF12T		क्रेडिट : 4
इकाई	विषय	व्याख्यान कीसंख्या
I	वन पुनरुत्पादन 1.1 प्राकृतिक पुनरुत्पादन 1.2 कृत्रिम पुनरुत्पादन 1.3 परिपालन कार्य	15
II	वनवर्धन प्रणाली निम्नलिखित प्रणाली का परिचय– 2.1 उच्च वन प्रणाली 2.2 कौपिस प्रणाली 2.3 सुधार पातन	10
III	महत्वपूर्ण वृक्ष प्रजातियों के वनवर्धन 3.1 साल 3.2 सागौन 3.3 सिस्सू 3.4 बांस 3.5 पाइन 3.6 कैसुरिना 3.7 खमार 3.8 यूकेलिप्टस	10
IV	वाटरशेड और वनीकरण 4.1 मिट्टी के कटाव का परिचय और मिट्टी और जल संरक्षण का महत्व 4.2 वाटरशेड की अवधारणा और विशेषताएं 4.3 समस्याग्रस्त क्षेत्रों के लिए प्रजातियों काचुनाव –उपजाऊ भूमि, लवणीय और क्षारीय क्षेत्र, खनन क्षेत्र और आर्द्र भूमि।	15
V	बीजों को संभालना(हैंडलिंग) 5.1 फल और बीज संग्रह और प्रसंस्करण 5.2 बीजों का भंडारण 5.3 बीज सुप्तता (डोरमैन्सी) और परीक्षण	10

कुंजी शब्द (कीवर्ड) :वन पुनरुत्पादन, वनवर्धन प्रणाली, सिल्विक्स, वाटरशेड, वनीकरण, सीड हैंडलिंग, बीज सुप्तता

Laboratory/Practical work

Maximum Marks: 50
Minimum Marks: 17
Total Lectures: 30
Credit: 2

1. Nursery Establishment and management
2. Nursery Trial seed germination study
3. Regeneration survey study
4. Identification of forest species and their economical importance
5. Field planting method
6. Visit to forest areas
7. Preparation of Herbarium and seed collection of important forest spp.

प्रयोगशाला / व्यावहारिक कार्य

अधिकतम अंक—50
न्यूनतम उत्तीर्ण अंक—17
कुल व्याख्यान —30
क्रेडिट—2

1. रोपणी स्थापना और प्रबंधन
2. रोपणी परीक्षण बीज अंकुरण अध्ययन
3. पुर्नत्पादन सर्वेक्षण अध्ययन
4. वन प्रजातियों की पहचान और उनके किफायती महत्व
5. क्षेत्र रोपण विधि
6. वन क्षेत्रों की यात्रा
7. वनस्पतियों का संग्रह (हरबेरियम बनाना) और महत्वपूर्ण वन प्रजातियों के बीज संग्रह की तैयारी.

Part C - Learning Resource
Text Books, Reference Books, Other Resources

Suggested Readings:

Text Books:

1. Champion, H, G and Seth, S.K. 1968. Forest types of India, revised survey of forest types of India, GOI Press,New Delhi, 404p.
2. David M. Smith. 1989. "The Practice of Silviculture". EBD Educational Pvt. Ltd. Dehradun, India.
3. Dhruva Narayana V. V., G. Sastry and U. S. Patnaik. 1997. Watershed Management. Indian Council of Agricultural Research, New Delhi, 176 p
4. Dwivedi, A. P. 1992. Principles and Practice of Indian Silviculture, Surya Publication, 420p.
5. Dwivedi, A.P. 1993. A Text Book of Silviculture, International Book Distributors, Dehradun.
6. Khanna, L.S. 1989. Principles and Practice of Silviculture. Khanna Bandhu, New Delhi, 473p.
7. Khullar, P. *et al*. 1992. Forest Seed. ICFRE, New Forest, Dehra Dun
8. Lal R. 2000. Integrated Watershed Management in the Global Ecosystem. CRC Press, London.
9. Luna, R.K. 1988. Plantation Forestry in India. International Book Distributors, Dehradun. p 476.
10. Mather, A.S. 1990. Global forest resources. Belhaven, London.
11. Mishra. S. R. 2010. Textbook of Dendrology. Discovery Publishing House Pvt. Ltd. New Delhi.
12. Persson, R. 1992. World forest resources. Periodical experts, New Delhi.
13. Ram Prakash and L.S. Khanna. 1991. Theory and Practice of Silvicultural systems. International Book Distributors, Dehra Dun. 298p.
14. Sagreiya, K.P. Forests and Forestry, 1997. National Book Trust India.
15. Shiva, M.P. A Handbook of Systematic Botany, 1986.IBD Publisher, Dehradun.
16. Tewari D. N. 1992. Tropical Forestry in India. International Book Distributors, Dehradun.
17. Troup, RS 1922. Silviculture of Indian Trees, Vol. 1-4, Revised and Enlarged Edition, Forest Research Institute and Colleges, Dehra Dun, 1975.
18. Westoby, J. 1991. Introduction to World Forestry. Wiley, 240p.

Suggested Digital Platform Web inks:

Forest Tree seeds Handbook (https://www.libraryofbook.com/pdf/download.php?book=forest-tree-seeds-handbook)

भाग डी : अनुशंसित मूल्यांकन विधियाँ		
अनुशंसित सतत मूल्यांकन विधियाँ :		
अधिकतम अंक :		50 अंक
सतत व्यापक मूल्यांकन (CCE):		10 अंक
विश्वविद्यालय परीक्षा (UE):		40 अंक
आंतरिक मूल्यांकन : सतत व्यापक मूल्यांकन (CCE)	1. कक्षा परीक्षा(1 अंक/ इकाई):	05 अंक
	2. असाइनमेंट / प्रस्तुतिकरण:	05 अंक
		कुल अंक: 10
आकलन : विश्वविद्यालय परीक्षा (UE) समय : 02.00 घंटे	अनुभाग (अ) : दस वस्तुनिष्ठ प्रश्न – रिक्त स्थान भरें / सही और गलत / MCQ	0.5 x 10 = 05
	अनुभाग (ब): तीन अति लघु प्रश्न (प्रत्येक में 50 शब्द)	03 x 03 = 09
	अनुभाग (स): चार लघु प्रश्न (प्रत्येक 200 शब्द)	04 x 04 =16
	अनुभाग (द): दो दीर्घ प्रश्न (प्रत्येक में 500 शब्द)	02 x 05 = 10 कुल अंक : 40