

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor in Science (Diploma/Degree/Honors)		Semester - III	Session: 2024-2025
1	Course Code	CHSC-03T	
2	Course Title	INORGANIC AND PHYSICAL CHEMISTRY-I	
3	Course Type	DSC	
4	Pre-requisite(if,any)	As per Program	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> ➤ Understand fundamental chemical concepts of transition elements and their applications. ➤ Master the principles of coordination chemistry. ➤ Grasp the core principles of thermodynamics and apply them to various phenomena. ➤ Explore the world of electrochemistry and its applications. 	
6	Credit Value	3 Credits	Credit = 15 Hours -learning & Observation
7	Total Marks	Max.Marks: 100	Min Passing Marks:40
PART -B: Content of the Course			
Total No.of Teaching-learning Periods(01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics(Course contents)		No. of Periods
I	<p>Chemistry of d & f-block elements</p> <p>A. d-block elements (5 hrs.)</p> <p>(i) Chemistry of elements of first transition series: Characteristic properties of the elements of first transition series with reference to their: Electronic configuration, Atomic and ionic radii, Ionization potential, Variable oxidation states, Magnetic properties, Color, Complex formation tendency and catalytic activity.</p> <p>(ii) Chemistry of elements of second and third transition series: Electronic configuration of 4d and 5d transition series. Comparative treatment with their 3d-analogous (Group Cr- Mo-W, Co-Rh-Ir) in respect of oxidation states and magnetic behavior.</p> <p>B. f-block elements (6 hrs.)</p> <p>Chemistry of Lanthanide & Actinides: Electronic structure, oxidation states, ionic radii, magnetic, and spectral properties. Lanthanide contraction and its consequences, complex formation, occurrence and isolation, Separation of lanthanides: solvent extraction and ion exchange method. General features and chemistry of actinides, Transuranic elements, chemistry of separation of Np, Pu and Am from uranium, similarities between the later actinides and the later lanthanides.</p>		12
II	<p>Oxidation and reduction (5 hrs)</p> <p>Various definitions of oxidation and reduction, Balancing of redox reaction by ion-electron method, Latimer diagram of Chlorine and Oxygen, Frost diagram of Nitrogen and Oxygen, and Pourbaix diagrams of Iron. Predicting disproportionation and comproportionation phenomena.</p> <p>Coordination Chemistry (6 hrs)</p> <p>A. Coordination compounds:Distinction among simple salts, double salts, and coordination compounds. Terminology and nomenclature of Coordination</p>		11

	<p>compounds. Types of ligands based on denticity. Werner's Coordination theory and its experimental verification. Sidgwick's electronic interpretation, EAN rule with examples. Electroneutrality principle, Valence Bond Theory of transition metal complexes. Determination of structures and magnetic properties of complexes based on VBT. Chelates: Classification and their application.</p> <p>B) Isomerism in coordination compounds: Structural isomerism and Stereoisomerism (Geometrical and optical) in coordination compounds with four and six coordination numbers.</p>	
III	<p>Thermodynamics-I: (5 hrs)</p> <p>A. Basic concept of thermodynamics: System, surrounding, types of system (closed, open & isolated). Intensive & extensive properties. Thermodynamic processes: isothermal, adiabatic, isobaric, isochoric, cyclic, reversible & irreversible. State function & path functions and their differentiation, concept of heat & work. Zeroth law of thermodynamics, First law of thermodynamics. Definition of internal energy & enthalpy. Concept of heat capacity, heat capacity at constant volume & at constant pressure, and their relationship.</p> <p>Joule-Thomson experiment, Joule-Thomson coefficient (no derivation) & inversion temperature. Calculations of w, q, E & H for expansion of gases for isothermal & adiabatic conditions for reversible process.</p> <p>B. Thermochemistry(2 hrs.)</p> <p>Standard states, Heat of reaction, enthalpy of formation, enthalpy of combustion, enthalpy of solution, enthalpy of neutralization, Hess's law of constant heat of summation & its applications. Variation of enthalpy change of reaction with temperature (Kirchoff's equation).</p> <p>C. Thermodynamics II (4 hrs.)</p> <p>Second law of thermodynamics: Limitations of first law and need for the second law. Statements of second law. Carnot cycle & Efficiency of heat engine. Thermodynamic principle of working of a refrigerator (Carnot theorem). Concept of entropy: entropy change in a reversible and irreversible process; entropy change in isothermal reversible expansion of an ideal gas. Physical significance of entropy. Gibbs free energy, Gibbs-Helmholtz equation.</p> <p>D. Third law of thermodynamics (1 hr)</p> <p>Statement of third law, Nernst heat theorem, Absolute entropy of solids, liquids, and gases.</p>	12
IV	<p>Electrochemistry-1</p> <p>Electrolyte conductance: specific and equivalent conductance, measurement of equivalent conductance, effect of dilution on conductance, Kohlrausch law, application of Kohlrausch law in determination of dissociation constant of weak electrolyte, solubility of sparingly soluble electrolyte, absolute velocity of ions, ionic product of water, conductometric titrations.</p> <p>Single electrode potential, standard electrode potential, electrochemical series and its applications. Concept of overvoltage.</p> <p>Theory of strong electrolyte: limitation of Ostwald's dilution law weak and strong electrolyte, Debye-Huckel-Onsager's (DHO) equation for strong electrolytes, relaxation, and electrophoretic effect.</p> <p>Migration of ions: Transport number-definition and determination by Hittorf method and moving boundary method.</p> <p>Electrochemical cells or Galvanic cells: reversible and irreversible cells, conventional Representation of electrochemical cells. EMF of a cell, effect of temperature on EMF of cell, Nernst equation calculation of ΔG, ΔH and ΔS for cell reaction, polarization, Over potential and hydrogen overvoltage.</p>	11
Keywords	<p><i>D & f-block elements, Coordination compounds, Werner's theory, VBT, Isomerism, Thermodynamics, Thermochemistry, Electrical/electrolytical conductance, Transport number.</i></p>	

Signature of Convener & Members (CBoS) :

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Jauhar, S. P. (2010). *Modern Approach to Inorganic Chemistry: A Textbook for B. Sc. I Students*. Modern publishers
2. Bajpai, D. N. (1992). *Advanced book of physical chemistry*. S Chand publishing.
3. Sharma, K. K. & Sharma, L. K. (2016). *A textbook of physical chemistry*. Vikas publishing.
4. Bhasin, K. K. (2018). *Pradeep's Inorganic Chemistry Vol.III*. Pradeep publications.
5. Puri, S., & Sharma, L. R. (2008). *Kalia "Principles of Inorganic Chemistry"*.

Reference Books recommended-

Inorganic Chemistry

1. Lee, J. D. (2008). *Concise inorganic chemistry*. John Wiley & Sons.
2. Cotton, F. A., Wilkinson, G., & Gaus, P. L. (1995). *Basic inorganic chemistry*. John Wiley & Sons.
3. Huheey, J. E., Keiter, E. A., Keiter, R. L., & Medhi, O. K. (2006). *Inorganic chemistry: principles of structure and reactivity*. Pearson Education India.
4. Douglas, B. E., McDaniel, D. H., & Alexander, J. J. (1994). *Concepts and models of inorganic chemistry*, John Wiley & Sons

Physical Chemistry

1. Puri, L. B., Sharma, L. R., & Pathania, M. S. (2013). *Principles of physical chemistry*. Vishal Publishing Co.
2. Atkins, P. W., De Paula, J., & Keeler, J. (2023). *Atkins' physical chemistry*. Oxford university press.
3. McQuarrie, D. A., & Simon, J. D. (2004). *Molecular Thermodynamics* Viva Books Pvt. Ltd.: New Delhi.

Online Resources–

- e-Resources / e-books and e-learning portals
- <https://www.geeksforgeeks.org/d-block-elements/>
- <https://www.vedantu.com/evs/lanthanides-vs-actinides>
- <https://www.livescience.com/50776-thermodynamics.html>
- <https://byjus.com/jee/electrochemistry/>

Online Resources–

- e-Resources / e-books and e-learning portals

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment(CIA):30 Marks

EndSemester Exam(ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 / 20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10 Total Marks - 30	
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener & Members of CBoS:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor in Science (Diploma / Degree/Honors)		Semester - III	Session: 2024-2025
1	CourseCode	CHSC-03P	
2	CourseTitle	CHEMISTRY LAB. COURSE-III	
3	CourseType	DSC	
4	Pre-requisite(if,any)	-	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> ➤ Understand the principle of determining transition temperature of hydrated or other allotropic salts. ➤ Employ the principle of determination of solubility of a given salt at different temperatures. ➤ Apply Born-Haber cycle to determine enthalpy and lattice energy. ➤ Determine strength of an acid, ionization constant of weak acid and solubility product by conductometric or potentiometric titrations. 	
6	CreditValue	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	TotalMarks	Max.Marks:50	Min Passing Marks:20
PART -B: Content of the Course			
Total No. of learning-Training/performancePeriods:30 Periods (30 Hours)			
Module	Topics(Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	<p>Transition Temperature</p> <p>1) Transition temperature of a salt hydrate – determination of molecular weight.</p> <p>2) Determination of the transition temperature of the given substance by thermometric /dialometric method (e.g. SrBr₂.2H₂O or MnCl₂.4H₂O).</p> <p>Thermochemistry</p> <p>A. Determination of solubility:</p> <p>1) To determine the solubility of benzoic acid at different temperatures and to determine ΔH of the dissolution processes.</p> <p>B. Calorimetry:</p> <p>1) To determine the enthalpy of neutralization of hydrochloric acid (strong acid) by sodium hydroxide (strong base) solution.</p> <p>2)</p> <p>(a) To determine the enthalpy of neutralization of a weak acid (acetic acid) versus strong base (sodium hydroxide) and determine enthalpy of ionization of weak acid.</p> <p>(b) To determine the enthalpy of neutralization of a weak base (ammonium hydroxide) versus strong acid (hydrochloric acid) and determine enthalpy of ionization of weak base.</p> <p>3) To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy.</p> <p>Conductometry</p> <p>1) Conductometry – Determination of limiting molar conductance of a strong Electrolyte (KCl).</p> <p>2) To determine the strength of the given acid (HCl or CH₃COOH)conductometrically</p>		30

	using standard alkali (NaOH) solution. 3) To determine the strength of strong acid and a weak acid in the given mixture conductometrically against a standard alkali solution. 4) To determine the ionization constant of weak acid conductometrically. Solubility Product 1) To determine the solubility and solubility product of a sparingly soluble salt conductometrically. 2) Potentiometry – Determination of solubility product of a sparingly soluble substance.	
Keywords	<i>Solution, Acid, Alkali. Transition temperature, Thermochemistry, Temperature, Enthalpy, Conductometric titrations, Potentiometric titrations, Solubility product.</i>	

Signature of Convener & Members (CBoS) :

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Vishwanathan, B. & Raghavan, P. S. (2017). *Practical Physical Chemistry*. Viva books originals publishing.
2. Yadav, J. B. (2006). *Advanced Practical Physical Chemistry*. Krishna Prakashan Media.
3. Sahu, D. P. & Bapat, K. N. (2022) *Unified practical chemistry*, Navbodh Prakashan.

Reference Books recommended:

1. Moudgil, H. K. (2010). *Textbook of physical chemistry*. PHI Learning Pvt. Ltd.
2. Adamson, A. (2012). *A textbook of physical chemistry*. Elsevier.
3. Findlay, A. (1923). *Practical physical chemistry*. Longmans, Green.

Online Resources–

- e-Resources / e-books and e-learning portals
- <https://tech.chemistrydocs.com/Books/Physical/Advanced-Physical-Chemistry-Experiments-by-J-N-Gurtu-&-Amit-Gurtu.pdf>
- <https://byjus.com/chemistry/conductometric-titration/>
- [https://chem.libretexts.org/Courses/University_of_California_Davis/Chem_4B_Lab%3A_General_Chemistry_for_Majors_II/1%3A_Thermochemistry_\(Experiment\)](https://chem.libretexts.org/Courses/University_of_California_Davis/Chem_4B_Lab%3A_General_Chemistry_for_Majors_II/1%3A_Thermochemistry_(Experiment))
- https://www.ulm.edu/chemistry/courses/manuals/chem1010/experiment_10.pdf

Online Resources–

- e-Resources / e-books and e-learning portals

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment(CIA): 15 Marks

End Semester Exam(ESE): 35 Marks

Continuous Internal Assessment(CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz +obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05 Total Marks - 15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment	
	G. Performed the Task based on lab. work - 20 Marks	Managed by Course teacher as per lab. status
	H. Spotting based on tools & technology (written) – 10 Marks	
I. Viva-voce (based on principle/technology) - 05 Marks		

Name and Signature of Convener & Members of CBoS:

FOUR YEAR UNDERGRADUATE PROGRAM(2024 – 28)
DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM

PART-A: Introduction

Program: Bachelor in Science (Diploma / Degree/Honors)		Semester - III	Session: 2024-2025
1	Course Code	CHSE-01T	
2	Course Title	BASIC ANALYTICAL CHEMISTRY	
3	Course Type	DSE	
4	Pre-requisite(if,any)	As per Program	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> ➤ To understand the sampling, procedure and treatment of sample. ➤ To understand the analytical techniques for analysis in different types of chemical reactions. ➤ To understand the volumetric analysis technique. ➤ To understand the gravimetric analysis technique. 	
6	Credit Value	3 Credits	Credit = 15 Hours -learning & Observation
7	Total Marks	Max.Marks: 100	Min Passing Marks:40

PART -B: Content of the Course

Total No. of Teaching-learning Periods(01 Hr. per period) - 45 Periods (45 Hours)		
Unit	Topics(Course contents)	No. of Period
I	Qualitative and quantitative aspects of analysis Classification of analytical Techniques, Qualitative and quantitative analysis. Classical and instrumental methods. Factors affecting choice of analytical method. Errors in chemical analysis. Types of errors: Systematic and random, Absolute and relative, Additive and proportional. Normal distribution of indeterminate errors. Statistical parameters for data evaluation: Mean, median, average deviation, standard deviation, coefficient of variation, relative standard deviation. Accuracy and precision of results. Comparison of data using F and t-test, rejection of data using Q test. Numerical problems.	12
II	Sampling and sample treatment Criteria for representative sample. Bulk, gross, incremental and analysis sample. Sampling statistics. Techniques of sampling of ambient air, water and soil samples. Methods of sample size reduction: Coning and quartering, rolling and quartering. Hazards in sampling. Sample dissolution methods for elemental analysis: Dry and wet washing, acid digestion, fusion processes and dissolution of organic samples. Types of analysis: Macro, semi-micro, micro, sub-micro and ultramicro. Major, minor and trace constituents of a sample.	11
III	Volumetric analysis General principle. Criteria for reactions used in titrimetric analysis. Primary standards and secondary standards. Concepts of equivalent weight and molecular weight, normality, molarity and various methods of expressing concentrations. Internal and external indicators. Theories of indicators in acid-base, precipitation, redox and complexometric titrations. Calculations involving preparation of standard solutions. Stoichiometric calculations in various types of titrations.	11
IV	Gravimetric analysis General principles and conditions of precipitation. Concepts of solubility, solubility product and precipitation equilibrium. Numerical problems based on solubility and solubility product. Purity of precipitate: Co-precipitation and post-precipitation. Super saturation and peptization. Criteria of selection of wash liquids. Steps involved in gravimetric analysis of barium as barium sulphate.	11

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DEPARTMENT OF CHEMISTRY

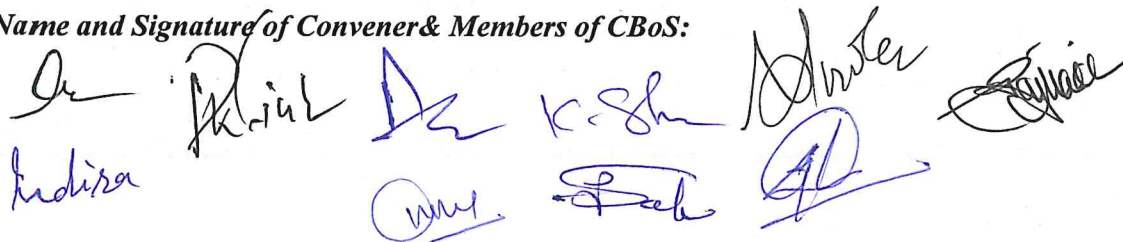
COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor in Science <i>(Diploma / Degree/Honors)</i>		Semester- III	Session: 2024-2025
1	Course Code	CHSE-01P	
2	Course Title	BASIC ANALYTICAL CHEMISTRY LAB. COURSE	
3	Course Type	DSE	
4	Pre-requisite(if,any)	<i>As per Program</i>	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> ➤ <i>To make the student aware of Common analytical method.</i> ➤ <i>To demonstrate the volumetric titration.</i> ➤ <i>To demonstrate the students about gravimetric analysis.</i> ➤ <i>To learn the testing of solubility, pH of soil and water.</i> 	
6	Credit Value	1 Credits	<i>Credit =30 Hours Laboratory or Field learning/Training</i>
7	TotalMarks	Max.Marks:50	Min Passing Marks:20
PART -B: Content of the Course			
Total No. of learning-Training/performance Periods:30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	<ol style="list-style-type: none"> 1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture by volumetric titration. 2. Estimation of oxalic acid by titrating it with KMnO_4 (potassium permanganate) by volumetric titration. 3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO_4 (potassium permanganate). 4. Estimation of Fe(II) ions by titrating it with $\text{K}_2\text{Cr}_2\text{O}_7$ (potassium dichromate) using an internal indicator. 5. Estimation of Cu(II) ions iodometrically using $\text{Na}_2\text{S}_2\text{O}_3$ (sodium thiosulfate). 6. Determination of heat capacity of a calorimeter for different volumes. 7. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide. 8. Determination of ionization of acetic acid. 9. Determination of solubility of benzoic acid in water and determination of enthalpy of solubilization. 10. Analysis of soil: <ol style="list-style-type: none"> (a) Determination of pH of soil. (b) Determination of total soluble salts. (c) Determination of carbonate and bicarbonate. (d) Determination of calcium, magnesium, and iron. 		30
Keywords	<i>Volumetric analysis, gravimetric analysis, water testing, soil testing.</i>		

Signature of Convener & Members (CBoS):

PART-C: Learning Resources		
Text Books, Reference Books and Others		
Text Books Recommended:		
<ol style="list-style-type: none"> 1. Chatwal, G. R., & Sharma, A. (2017). <i>Instrumental methods of chemical analysis</i>. Himalaya Publishing House. 2. Sharma, L. R. (2021). <i>Practical inorganic chemistry</i>. 3. Fernelius, W. G. (2009). <i>Experimental inorganic chemistry (Adapted by R. K. Sharma & G. Panda)</i>. New Age International Publishers. 4. Yadava, T. F. (2010). <i>A textbook of soil chemistry</i>. Kalyani Publishers. 		
Reference Books Recommended:		
<ol style="list-style-type: none"> 1. James, A. M., & Prichard, F. E. (1981). <i>Practical physical chemistry (3rd ed, repr)</i>. Longman. Bassett, J., Denney, R. C., Jeffery, G. H., & Mendham, J. (Eds.). (2000). <i>Vogel's textbook of quantitative chemical analysis (6th ed.)</i>. Pearson Education India. (Original work by A. I. Vogel) 2. Svehla, G. (Ed.). (1978). <i>A textbook of quantitative inorganic analysis (by A. I. Vogel)</i>. ELBS Publishers and Distributors. 		
Online Resources:		
<ul style="list-style-type: none"> ➤ https://swayam.gov.in/explorer ➤ https://in.indeed.com/career-advice/career-development/analytical-skills ➤ https://chemcollective.org/labtech 		
PART-D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 50 Marks		
Continuous Internal Assessment (CIA): 15 Marks		
End Semester Exam (ESE): 35 Marks		
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar + Attendance- 05 Total Marks -15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment A. Performed the Task based on lab. work - 20 Marks B. Spotting based on tools & technology (written) - 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	Managed by Course teacher as per lab. status

Name and Signature of Convener & Members of CBoS:



FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Sciences (Diploma / Degree/Honors)		Semester - III	Session: 2024-2025
1	Course Code	BOSC-03 T	
2	Course Title	Archegoniate and Fossils	
3	Course Type	Discipline Specific course (DSC)	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	<ul style="list-style-type: none"> ➤ students will be familiar with amphibians and reptiles plants ➤ progressive evolution in plants ➤ relics of past plants ➤ diversity in plants ➤ development of seeds. 	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40

PART -B: Content of the Course
 Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	Bryophyta: Morphology, structure, reproduction and life history, distribution, classification, evolution of gametophytes and sterilization of sporogenous tissue. General account of Riccia, Marchantia, Anthoceros and Funaria , Economic and ecological importance of bryophytes.	12
II	Pteridophytes: Morphology, anatomy and reproduction, classification, evolution of stele, heterospory, telome theory and origin of seed habit, general account and life history of of Psilotum, Lycopodium, Sellaginella, Equisetum Pteris, Marsilea	11
III	Gymnosperm : Characteristics of Gymnosperms, the vessel - less & fruitless seed plants, Classification of Gymnosperm; Polyembryony in Gymnosperms and its role; Distribution of Gymnosperm in India; Economic importance of Gymnosperm. General account of Cycas, Pinus, Gnetum Concepts of living fossil (Cycas & Ginkgo); Angiospermic characters of Gnetum.	11
IV	Fossil: Fossil and fossilization, types of fossils Geological time table Brief account of the families of Pteridospermales –Rhynia, Calamites. General Account and Affinities - Cycadeoidales Pentoxylales and Cordaitales	11

Keywords Archegonia, seedless, heterospory, fossils

Signature of Convener & Members (CBoS) :

- ① R. Sivas
- ② Suresh
- ③ Anil
- ④ M. Anil
- ⑤ Anand
- ⑥ S. S.
- ⑦ A.

⑧ Anil
 ⑨ Anil
 ⑩ Anil

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Puri, P. (1980) Bryophytes, Atma Ram and Sons, Delhi.
2. Vashishtha, B. R. (2005) Pteridophytes S. Chand and Co., Delhi.
3. Bhatnagar, S. P., Moitra, A. (1996) Gymnosperms, New Age International Pvt. Ltd., New Delhi.

Text Books Recommended –

4. Sporne, K. K. (1991) The Morphology of Gymnosperm. B. I. Publishing Pvt. Ltd., Bombay.
5. Stewart, W. N. and Ruthwell, G. W. (1993) Paleobotany and the Evolution of Plants. Cambridge Univ. Press, UK.
6. Singh, H. (1978) Embryology of Gymnosperms; Encyclopedia of Plant Anatomy X. Gebruder Bortraeger, Berlin.

Online Resources–

- e-Resources / e-books and e-learning portals
- www.swayam.ac.in
- www.ignou.ac.in
- www.egyankosh.ac.in
- www.iitm.ac.in
- www.eskillindia.org
- www.eshiksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- www.ndl.iitkgp.ac.in

Online Resources–

e-Resources / e-books and e-learning portals

- <https://study.com/learn/lesson/bryophytes-characteristics-examples.html>
- [https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3AGeneral_Biology_\(Boundless\)/26%3A_Seed_Plants/26.02%3A_Gymnosperms/26.2A%3A_Characteristics_of_Gymnosperms](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3AGeneral_Biology_(Boundless)/26%3A_Seed_Plants/26.02%3A_Gymnosperms/26.2A%3A_Characteristics_of_Gymnosperms)
- https://www.google.com/search?q=fossils&scasv=09379ecd0b6efd91&rlz=1C1CHBD_enIN1091IN1093&sxsrf=ACQVn09ytizqRGwbydx-p0sOZFXGRnmfw%3A1713546819943&ei=Q6YiZvefOde5vr0PtMuvqAg&og=fossils&gs_l=EGxnd3Mtd216LXNlcniAiB2Zvc3NpbHMqAggAMg0QABiABbixAxDGIoFMgoQLhiABbHDGIoFMgUQABiABDIFEAAyGAQvBRAAGIAEMgoQABiABbHDGIoFMgUQABiABDIFEAAyGAQvBRAAGIAEMgUQABiABEihKIAAWPIUCAB4AJABAjgBgwKgAYcLqgEFMC41LjK4AQHIAOD4AQGYAggAukLwgIKECMYgAOYJxiKBclCBBajGCTCAhEQLhiABbixAxjRaxiDARjHAclCCBAAGIAEGLEDwglKEAAyGAOYFBIHAggDAJIHBTauMv40oAfsWw&scient=gws-wiz-serp
- https://www.google.com/search?q=fossils&scasv=09379ecd0b6efd91&rlz=1C1CHBD_enIN1091IN1093&sxsrf=ACQVn09ytizqRGwbydx-p0sOZFXGRnmfw%3A1713546819943&ei=Q6YiZvefOde5vr0PtMuvqAg&og=fossils&gs_l=EGxnd3Mtd216LXNlcniAiB2Zvc3NpbHMqAggAMg0QABiABbixAxDGIoFMgoQLhiABbHDGIoFMgUQABiABDIFEAAyGAQvBRAAGIAEMgoQABiABbHDGIoFMgUQABiABDIFEAAyGAQvBRAAGIAEMgUQABiABEihKIAAWPIUCAB4AJABAjgBgwKgAYcLqgEFMC41LjK4AQHIAOD4AQGYAggAukLwgIKECMYgAOYJxiKBclCBBajGCTCAhEQLhiABbixAxjRaxiDARjHAclCCBAAGIAEGLEDwglKEAAyGAOYFBIHAggDAJIHBTauMv40oAfsWw&scient=gws-wiz-serp
- https://www.google.com/search?q=pteridophytes&scasv=09379ecd0b6efd91&rlz=1C1CHBD_enIN1091IN1093&sxsrf=ACQVn0-V0lp75QZG3sbfKrfitXB0GPdZvA%3A1713546628592&ei=hKUiZuvFI9q-juMPkr-DkAY&og=pter&gs_l=EGxnd3Mtd216LXNlcniAiBbHDGIoFMgUQABiABDIFEAAyGAQvBRAAGIAEMgoQABiABbHDGIoFMgUQABiABDIFEAAyGAQvBRAAGIAEMgUQABiABEihKIAAWPIUCAB4AJABAjgBgwKgAYcLqgEFMC41LjK4AQHIAOD4AQGYAggAukLwgIKECMYgAOYJxiKBclCBBajGCTCAhEQLhiABbixAxjRaxiDARjHAclCCBAAGIAEGLEDwglKEAAyGAOYFBIHAggDAJIHBTauMv40oAfsWw&scient=gws-wiz-serp
- [https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3AGeneral_Biology_\(Boundless\)/26%3A_Seed_Plants/26.02%3A_Gymnosperms/26.2A%3A_Characteristics_of_Gymnosperms](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3AGeneral_Biology_(Boundless)/26%3A_Seed_Plants/26.02%3A_Gymnosperms/26.2A%3A_Characteristics_of_Gymnosperms)

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): 30 (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10 Total Marks - 30	
End Semester Exam (ESE): 70	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener & Members of CBoS:

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FOUR-YEAR UNDERGRADUATE PROGRAM (2024 – 28)

**DEPARTMENT OF BOTANY
COURSE CURRICULUM**

PART- A: Introduction			
Program: Bachelor in Life Sciences <i>(Diploma / Degree/Honors)</i>		Semester - III	Session: 2024-2025
1	Course Code	BOSC-03	
2	Course Title	Lab. Course-03 (Archegoniate and Fossils)	
3	Course Type	Laboratory course	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of the course students will be familiar > with amphibians and reptiles plants > progressive evolution in plants > relics of past plants > diversity in plants > Development of seeds.	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	Bryophyta: Comparative study of the anatomy of vegetative and reproductive parts of <i>Marchantia, Pellia, Anthoceros, Notothylus, Funaria, Polytrichum.</i> Pteridophyta: Comparative study of the anatomy of vegetative and reproductive parts of <i>Psilotum, Lycopodium, Selaginella, Equisetum, Gleichenia, Pteris, Ophioglossum, Isoetes.</i> Gymnosperms: Comparative study of the anatomy of vegetative and reproductive parts of <i>Cycas, Ginkgo, Cedrus, Abies, Picea, Cupressus, Araucaria, Cryptomeria, Taxodium, Podocarpus, Agathis, Taxus, Ephedra</i> and <i>Gnetum.</i> <ul style="list-style-type: none"> ▪ Collection of various gymnospermic plant materials. ▪ Field work – as far practicable conveniently. Fossil: Study of important fossil gymnosperms from prepared photographs, slides and specimens.		30
Keywords	Archegonia, venter, bryophytes, pteridophytes		

Signature of Convener & Members (CBoS) :

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- ③ *Arshin*
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- ⑤ *Arora*
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PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. The Practical Fossil Finder (Practical Handbook) Hardcover – 1 October 1991 by Steve Parker (Author) Publishers Facts On File Inc
2. Practical Botany (Part I) ISBN #:81-301-0008-8 Sunil D Purohit, Gotam K Kukda & Anamika Singhvi Edition:2013 Apex Publishing House Durga Nursery Road, Udaipur, Rajasthan (bilingual).
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. Dubey, R. C. and Maheshwari. D.K. 2012. Practical Microbiology, S. Chand & Company, Pvt. Ltd., New Delhi.
5. Pandey. B.P. 2014 Modern Practical Botany, (Vol-I) S. Chand and Company Pvt. Ltd., New Delhi.

Reference Books Recommended –

1. Principles of Paleontology Edition 3 Paperback–1 January 2006 by Arnold Miller, Michael Foote Publishers - W.H.Freeman & Co Lt

Online Resources–

- e-Resources / e-books and e-learning portals
- www.swayam.ac.in
- www.ignou.ac.in
- www.egyankosh.ac.in
- www.iitm.ac.in
- www.eskillindia.org
- www.eshiksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- www.ndl.iitkgp.ac.in

Online Resources–

- e-Resources / e-books and e-learning portals
1. <https://efaidnbmnnnibpcajpcglclefindmkaj/https://egyankosh.ac.in/bitstream/123456789/69611/1/Unit-9.pdf>
 2. <https://www.encyclopedia.com/science/encyclopedias-almanacs-transcripts-and-maps/fossil-and-fossilization>
 3. <https://palaeobotany.org>

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): 15 (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar + Attendance - 05 Total Marks - 15	
End Semester Exam (ESE): 30	Laboratory / Field Skill Performance: On spot Assessment	Managed by Course teacher as per lab. status
	A. Performed the Task based on lab. work - 20 Marks	
	B. Spotting based on tools & technology (written) – 10 Marks	
	C. Viva-voce (based on principle/technology) - 05 Marks	

Name and Signature of Convener & Members of CBoS:

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

**DEPARTMENT OF BOTANY
COURSE CURRICULUM**

PART- A: Introduction			
Program: Bachelor in Life Science <i>(Diploma / Degree/Honors)</i>		Semester - III	Session: 2024-2025
1	Course Code	BOSE- 01 T	
2	Course Title	Natural resources and management	
3	Course Type	Discipline specific Elective (DSE)	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to > Understand natural resources and their sustainable utilization. > Knowledge on land, water, energy, and forest resources. > Students will learn about the practices of natural resource management. > Knowledge on the international and national efforts of natural resource management.	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Natural resources > Definition and types. > Natural resources' conservation Role of an individual in conservation of natural resources, Significance, > Sustainable utilization of resources' : Concept, approaches economic, ecological, and socio-cultural activities.		12
II	Land and freshwater resources > Land as a resource > Soil erosion and desertification > Soil degradation and management. > Forest resources use and over exploitation, deforestation > Water resources, use and overutilization of surface and ground water > Fresh Marine and estuarine ecosystems; > Wetlands threats and management strategies		11
III	Biological Resources > Biodiversity-definition and types > Value of biodiversity > Biodiversity at global, national an regional levels > Threats; Management strategies; > Bioprospecting. IPR; CBD; National Biodiversity Action Plan). > Forests: Cover and its significance (with special reference to India); > Major and minor Forest products; > Renewable and non-renewable sources of energy.		11
IV	Contemporary practices in resource management > National and international efforts in resource management and conservation. > Waste management practices > Natural resource Accounting > Environmental impact assesement EIA > Geographical information System GIS > Participatory Appraisal of naturl Resource > Ecological Footprint with emphasis on carbon footprint,		11
Keywords	Resources, Biodiversity, Resources management, IPR, CBD.		

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PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Vasudevan, N. (2006). Essentials of Environmental Science. Narosa Publishing House, New Delhi.
2. Singh, J. S., Singh, S.P. and Gupta, S. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications, New Delhi.

Reference Books Recommended –

- 1, Rogers, P.P., Jalal, K.F. and Boyd, J.A. (2008). An Introduction to Sustainable Development. Prentice Hall of India Private Limited, New Delhi.

Online Resources–

- e-Resources / e-books and e-learning portals
- <https://www.sciencedirect.com/topics/social-sciences/natural-resource>
- <https://efaidnbmnnnibpcajpcglclefindmkaj/https://egyankosh.ac.in/bitstream/123456789/66166/2/Unit4.pdf>
- https://efaidnbmnnnibpcajpcglclefindmkaj/https://www.ers.usda.gov/webdocs/publications/41964/30289_biological.pdf?v=0#:~:text=16-What%20Are%20Biological%20Resources%3F,forests%2C%20and%20other%20natural%20lands.
- <http://surl.li/spcdd>
- <https://shorturl.at/ewyIP>
- <https://shorturl.at/cimof>

Online Resources–

- e-Resources / e-books and e-learning portals
- www.swayam.ac.in
- www.ignou.ac.in
- www.egyankosh.ac.in
- www.iitm.ac.in
- www.eskillindia.org
- www.eshiksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- www.ndl.iitkgp.ac.in

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): 30 (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10	
	Total Marks - 30	
End Semester Exam (ESE): 70	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener & Members of CBOs:

① R. S. ...
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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Diploma / Degree/ Honors)		Semester - III	Session: 2024-2025
1	Course Code	BOSE -01 P	
2	Course Title	Lab course -01 (Natural resources and management)	
3	Course Type	Laboratory course	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	at the end of then of the sesn ○ To understand natural resources and their sustainable utilization. ○ Acquire knowledge on land, water, energy, and forest resources. ○ Students will learn about the practices of natural resource management. ○ Acquire knowledge on the international and national efforts of natural resource management.	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20

PART -B: Content of the Course
 Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)

Module	Topics (Course contents)	No. of Period
Lab./Field Training/ Experiment Contents of Course	1) To compare protected and unprotected grassland stands using community coefficients 2) To estimate IVI of the species in a woodland using point centered quarter method. 3) To find out important grassland species using chi square test. 4) Scientific visits to a protected area, a wet land, a mangrove, NBPGR, BSI, CSIR, ICAR labs and a recognized botanical gardens or a museum. 5) To determine diversity indices (Shannon Wiener, concentration of dominance, species richness, equability and B diversity. 6) Field survey of a part of town or city to make the students aware of the diversity of plants in urban ecosystems. 7) Estimation of solid waste generated by a domestic system (biodegradable and non biodegradable) and its impact on land degradation. 8) Collection of data on forest covers of specific area. 9) Measurement of dominance of woody species by DBH (diameter at breast height) method. 10) Calculation and analysis of ecological footprint. 11) Ecological modeling.	30
Keywords	Community coefficient, IVI, diversity indices	

Signature of Convener & Members (CBoS) :

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PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. A Handbook of Human Resource Management Practice
2. Environmental and Natural Resource Economics_ A Contemporary Approach
3. Sustainable Management of Natural Resources_ Mathematical Models and Methods (Environmental Science and Engineering Environmental Science)

Online Resources–

➤ e-Resources / e-books and e-learning portals

- 1) <https://shorturl.at/uIMTW>
- 2) <https://shorturl.at/yFJM3>

Online Resources–

➤ e-Resources / e-books and e-learning portals

- www.swayam.ac.in
- www.ignou.ac.in
- www.egyankosh.ac.in
- www.iitm.ac.in
- www.eskillindia.org
- www.eshiksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- www.ndl.iitkgp.ac.in

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): 15 (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05 Total Marks - 15	

End Semester Exam (ESE): 35	Laboratory / Field Skill Performance: On spot Assessment	Managed by Course teacher as per lab. status
	A. Performed the Task based on lab. work - 20 Marks	
	B. Spotting based on tools & technology (written) – 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	

Name and Signature of Convener & Members of CBoS:

- ① R. Shree
- ② R. Shree
- ③ R. Shree
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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester - III	
		Session: 2024-25	
1	Course Code	MBSC-03 T	
2	Course Title	Cell Biology and Biochemistry	
3	Course Type	DSC	
4	Prerequisite (If Any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, the student will able to – <ul style="list-style-type: none"> ➤ illustrate the structural organization of eukaryotic and prokaryotic cells ➤ interpret cell division ➤ classify the biomolecules and compare their characteristics ➤ relate structure and functions of nucleic acids ➤ interpret the mechanism of enzyme action 	
6	Credit Value	03 Credits	Credit = 15 Hours - Learning & Observation
7	Total Marks	Max. Marks: 100	Minimum Passing marks: 40
PART – B: Content of the Course			
Total No. of Teaching-Learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	History of Cell Biology: Contribution of Indian Cell biologists and Biochemists: Ramakrishnan Nagaraj, Joyoti Basu, Veena Krishnaji Parnaik. Cell Structure: Prokaryotic and Eukaryotic cell, cellular organelles; Plasma membrane, Mitochondria, Golgi body, Nucleus, Ribosome, Lysosome, Endoplasmic reticulum. Cell division.		12
II	Carbohydrate: Structure, properties & classification of carbohydrates; Monosaccharides, Disaccharides and Polysaccharides. Proteins: Structure, properties & classification of amino acids. Structure & Classification of Protein- Primary, secondary; salient of α helix, β sheet, tertiary and quaternary.		11
III	Lipid: Structure, properties and classification of lipids. Nucleic acids: Structure of purine and pyrimidine bases, nucleoside and nucleotide; DNA structure and types: A, B, Z form; RNA - Structure, types and functions.		11
IV	Enzymes: Classification of enzymes, mechanisms of enzyme action; Lock and key hypothesis, induced fit hypothesis. Active site and activation energy, coenzyme, Isoenzyme, metal cofactors.; Allosteric enzymes. Enzyme inhibition; competitive, noncompetitive, uncompetitive.		11
Key Words	Cell structure, Carbohydrates, Protein, Lipids, Enzymes, DNA, RNA		

Name and Signature of Convener and Members of CBoS

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Cell and molecular biology; P. K. Gupta
2. Cell biology; C B Pawar
3. Biochemistry; U Satyanarayan and U Chakrapani
4. Fundamentals of Biochemistry; J L Jain, Sanjay Jain and Nitin Jain

Reference Books:

1. Lehninger's principles of Biochemistry; M.M. Cox, D. L. Nelson and W H Freeman.
2. Quick Review Biochemistry; Arun Kumar Singhal, AITBS Pub. India

Online Resources – e-Resources/ e-Books and e-learning portals

- <https://www.khanacademy.org/science/biology/structure-of-a-cell>
- <https://microbenotes-com.webpkgcache.com/doc/-/s/microbenotes.com/carbohydrates-classification-structure-functions/>
- <https://microbenotes.com/carbohydrates-structure-properties-classification-and-functions/>
- <https://www.onlinebiologynotes.com/classification-of-protein-on-the-basis-of-structure-composition-and-function/>

Part- D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz – (2): 20+20	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar – 10	
	Total Marks – 30	
End Semester Exam (ESE):	Two Section – A & B Section A: Q1. Objective 10 X 1 = 10 Mark; Q2. Short answer type – 5X4= 20 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10 = 40 Marks	

Name and Signature of Convener and Members of CBoS

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Sum.
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Rashmi
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Dr. Nelson

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Dr. Rachana Choudhary

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10/6/24

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester III	
		Session: 2024-25	
1	Course Code	MBSC - 03 P	
2	Course Title	Lab. Course – MBSC-03	
3	Course Type	Laboratory Course	
4	Prerequisite (If Any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, students will be able to – <ul style="list-style-type: none"> ➤ identify the various stages of cell division ➤ quantify the carbohydrates and protein in any sample ➤ determine the Vmax and Km value of enzymes ➤ analyse the effect of environmental factors on enzyme activity. 	
6	Credit Value	1 Credit	Credit = 30 Hours. Laboratory or Field learning/ Training
7	Total Marks	Max. Marks: 50	Min. Passing marks: 20

PART – B: Content of the Course

Total No. of learning-Training/ Performance Periods: 30 Periods (30 Hours)

Module	Topics (Course contents)	No. of Period
Lab./ Field Training/ Experiment contents of Course	1. Identification of different stages of mitosis in onion root tips. 2. Staining and visualisation of mitochondria by Janus green stain. 3. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars. 4. Qualitative tests for lipids and proteins. 5. Quantitative estimation of proteins by Folin Lawry method. 6. Study of protein secondary and tertiary structures with the help of models. 7. Study of enzyme kinetics – calculation of Vmax, Km values. 8. Study effect of temperature, pH and heavy metals on enzyme activity.	30

PART – C: Learning Resources

Text Books, Reference Books and Others

Books Recommended:

1. Practical microbiology: R C Dubey and D K Maheshwari.
2. An introduction to practical biochemistry: David T Plummer.
3. Basic concepts in clinical Biochemistry: A practical guide: Vijay Kumar, Kiran Dip Gill

Online Resources:

- <https://www.youtube.com/watch?v=hqbt7wtznrs>
- <https://www.youtube.com/watch?v=QacQmS3aaTI>

PART – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test/ Quiz – (2): 10 & 10 Assignment/ Seminar + Attendance: 05 Total Marks – 15	Better Marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Laboratory/ Field Skill Performance: On spot Assessment A. Performed the Task based on lab. work – 20 Marks B. Spotting based on tools & technology (written) - 10 Marks Viva-voce (based on principle/ technology) – 05 Marks	Managed by course teacher as per lab. status

Name and Signature of Convener and Members of CBoS

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester - III	
		Session: 2024-25	
1	Course Code	MBSE-01 T	
2	Course Title	Microbial Enzyme Technology	
3	Course Type	Discipline Specific Elective (DSE)	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – <ul style="list-style-type: none"> ➤ learn the fundamentals of enzymes, enzyme-action and metabolic reactions ➤ explain the mechanism of enzyme action ➤ relate enzyme modifications ➤ identify the applications of enzymes in various fields ➤ attain knowledge about various biochemical techniques 	
6	Credit Value	03 Credits	Credit = 15 Hours - Learning & Observation
7	Total Marks	Max. Marks: 100	Minimum Passing marks: 40

PART – B: Content of the Course

Total No. of Teaching-Learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	Basic concept of enzymes: Nomenclature, classification, methods for determination of enzyme activity. Enzyme kinetics: Michaelis-Menten equation, effect of pH, substrate concentration, temperature and inhibitors. Iso-enzymes and allosteric enzymes. Enzyme inhibition-competitive and non-competitive inhibition.	12
II	Mechanism of enzyme action: Action of ribonuclease, chymotrypsin and trypsin. Coenzyme catalysis. Mechanism of action of thiamine pyrophosphate enzyme. Control and regulation of enzyme activity and feedback mechanisms. Metabolic compartmentalization in relation to enzyme, enzymes and secondary metabolites.	11
III	Enzyme engineering & applications of microbial enzymes: Chemical modification and site-directed mutagenesis structure & function relationship of industrially important enzymes. Microbial enzymes in textile, leather, wood industries and detergents.	11
IV	Biochemical techniques: Determination of molecular weights, purity, General methods of extraction-salting out, use of organic solvents; Purification; analysis of proteins - mass determination- GC-MS; structure determination-X-ray diffraction.	11
Key Words	Enzyme, Enzyme action, Enzyme inhibition, Enzyme engineering, Biochemical techniques,	

Name and Signature of Convener and Members of CBoS

Jan
10.6.24

Rashmi
10.6.24

Dh
10.6.24

Shree

Dr. K. K. Patil

Paul
10.6.24

Prasad
10/6/24

Sadhana
10.06.24

Dr. Nelson Xeb

Pradip
10/6/24

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. A Text Book of Microbiology: R. C. Dubey & D. K. Maheshwari
2. A text book of Industrial Microbiology. 2nd edition. Panima Publishing Company, New Delhi.
3. Industrial Microbiology: Patel A H. (1996).1st edition. MacMillan India Limited Publishing Company Ltd. New Delhi, India.
4. Fundamentals of Biochemistry; Dr. J.L. Jain, Dr. Sanjay Jain, Nitin Jain, S. Chand Publication

Reference Books:

1. Principles of Biochemistry and molecular biology: Wilson & Walker
2. Lehninger Principles of Biochemistry, 8th Edition, David L. Nelson, Micheal M. Cox
3. Biotechnology: Crueger Wand Crueger A. (2000).

Online Resources – e-Resources/ e-Books and e- learning portals

- <https://www.britannica.com/science/enzyme>
- https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SBB2204.pdf
- <https://www.khanacademy.org/science/ap-biology/cellular-energetics/environmental-impacts-on-enzyme-function/a/basics-of-enzyme-kinetics-graphs>
- <https://microbeonline.com/maldi-tof-ms-principle-applications-microbiology/>
- <https://www.technologynetworks.com/analysis/articles/gc-ms-principle-instrument-and-analyses-and-gc-msms-362513>

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz – (2): 20+20	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar – 10	
	Total Marks – 30	

End Semester Exam (ESE):	Two Section – A & B Section A: Q1. Objective 10 X 1 = 10 Mark; Q2. Short answer type – 5X4= 20 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10 = 40 Marks
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Name and Signature of Convener and Members of CBoS

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10.6.24

[Signature]
Dr. Nelson

[Signature]
10/6/24
Dr. Rachana Choudhary

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF MICROBIOLOGY

COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester - III	Session: 2024-25
1	Course Code	MBSE-01 P	
2	Course Title	Lab. Course - MBSE-01	
3	Course Type	Laboratory Course	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – <ul style="list-style-type: none"> ➤ show the enzyme production by microorganisms ➤ demonstrate the actions of different enzymes ➤ determine various parameters of enzyme action ➤ examine various biochemical techniques used for enzyme technology 	
6	Credit Value	1 Credit	<i>Credit = 30 Hours. Laboratory or Field learning/ Training</i>
7	Total Marks	Max. Marks: 50	Min. Passing marks: 20
PART – B: Content of the Course			
Total No. of learning-Training/ Performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./ Field Training/ Experiment contents of Course	1. Screening of amylase producing microorganisms. 2. Demonstrations of enzyme activity: Phosphatase and Catalase 3. Determination of kinetic constant of enzyme: Amylase activity, Vmax. Km. 4. Effect of pH and temperature on amylase activity. 5. Effect of inhibitors on amylase activity. 6. Effect of UV absorption on proteins.		30
Key Words	Enzyme, Enzyme activity, Enzyme inhibition, Biochemical techniques		
PART – C: Learning Resources			
Text Books, Reference Books and Others			
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.			
Online Resources:			
<ul style="list-style-type: none"> • https://books.google.co.in/books?id=Wh9OTbjcsfUC&printsec=age&q&f=false • https://books.google.co.in/books/about/Practical_Microbiology.html?id=Wh9OTbjcsfUC&redir_esc=y 			
PART – D: Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Maximum Marks:		50 Marks	
Continuous Internal Assessment (CIA):		15 Marks	
End Semester Exam (ESE):		35 Marks	
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test/ Quiz – (2):	10 & 10	Better Marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/ Seminar + Attendance:	05	
	Total Marks:	15	
End Semester Exam (ESE):	Laboratory/ Field Skill Performance: On spot Assessment		Managed by course teacher as per lab. status
	A. Performed the Task based on lab. work –		
	20 Marks		
	B. Spotting based on tools & technology (written) -		
	10 Marks		
	C. Viva-voce (based on principle/ technology) –		
	05 Marks		

Name and Signature of Convener and Members of CBoS

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF MICROBIOLOGY

COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Diploma/Degree)		Semester - III/IV	
Session: 2024-25			
1	Course Code	MBVAC-01	
2	Course Title	Microbes and Human Health	
3	Course Type	Value Added Course (VAC)	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – <ul style="list-style-type: none"> ➤ define the basic concept of Infection and disease ➤ explain various serological tests ➤ illustrate the basic knowledge of Immune status of human body ➤ identify various infectious diseases 	
6	Credit Value	02 Credits	Credit = 15 Hours - Learning & Observation
7	Total Marks	Max. Marks: 50	Minimum Pass marks: 20
PART – B: Content of the Course			
Total No. of Teaching-Learning Periods: (01 Hr. per Period) - 30 Periods (30 Hours)			
Unit	Topics (Course contents)		No. of Periods
I	Infection & Disease: Difference between infection and disease, Important terminologies along with suitable examples; primary infection, secondary infection, contagious infection, nosocomial infections, clinical infection, subclinical infection, zoonoses, vector borne infection. Epidemic, endemic and pandemic diseases.		08
II	Routes of entry and transmission of disease: Portal of entry, Portal of exit, Reservoir, susceptible host. Direct contact, indirect contact, Airborne, vector borne, blood borne, non-contact vehicle transmission. Exposure, risk and standard precautions, expanded precautions. Control of routes of transmission.		08
III	Serological reactions: Basic concept of serological reactions, blood cell counting, Agglutination, precipitation. Blood group determination, Widal test, VDRL test. Total RBC count, Total leucocyte count, Platelet count, Differential count, Estimation of haemoglobin.		07
IV	Viral and Bacterial infection: Common water borne infections, air borne infections; their causes, sign & symptoms, pathogenesis, diagnosis, treatment and prevention.		07
Key Words	Infection, Disease, Virulence, Pathogenesis		

Name and Signature of Convener and Members of CBoS

Danu 10/6/24 P. S. Nagal 10/6/24 S. S. Nagal 10.6.24 Rashmi 10.6.24 [Signature] 10.6.24 [Signature] [Signature] DR. K. K. P. Ch. [Signature] Dr. Nelbar Xess

PART – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. A Text Book of Microbiology; Dubey & Maheshwari.
2. General Microbiology; Vol I & II, Powar C.B. and Dagainawala H.I., Himalayn Pub. House, Bombay.
3. Text book of Microbiology; Ananthanarayan R. and Paniker C.K.J. (2009). 8th edition, University Press Publication
4. A Text Book of Microbiology; P. Chakraborty, 3rd Edn, New Central book Agency (P) Ltd, Kolkata, India 2005.

Reference Books:

1. Preventive and Social Medicine, Park and Park

- https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SBMA1302.pdf
- <https://www.news-medical.net/health/Modes-of-Transmission.aspx>
- <https://courses.lumenlearning.com/suny-microbiology/chapter/how-pathogens-cause-disease/>

PART – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test/ Quiz – (2): 10 & 10 Assignment/ Seminar + Attendance: 05 Total Marks: 15	Better Marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 15 Marks
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End Semester Exam (ESE):	Two Section – A & B Section A: Q1. Objective 05 X 1 = 05 Mark; Q2. Short answer type – 5X2 = 10 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X05 = 20 Marks
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Name and Signature of Convener and Members of CBoS

P. S. Reddy
10/6/24

Suma
10.6.24

Roshmi
10.6.24

Dr. Nelson Xers
10.6.24

Dr. Swetha Nagar
10/6/24

Dr. V. Shanthi
10/6/24

Sadhana
10-6-24

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor <i>(Certificate / Diploma / Degree)</i>		Semester – I/III/V	Session: 2024-2025
1	Course Code	ZOVAC-01	
2	Course Title	Public Health and Hygiene	
3	Course Type	Value Added Course	
4	Pre-requisite (if, any)	<i>As per Program</i>	
5	Course Learning Outcomes (CLO)	<ul style="list-style-type: none"> ➤ Understand the importance of hygiene. ➤ Identify current national and global public health problems. ➤ Aware about the issues of food safety, water safety, vaccination, and obesity. ➤ Create general medical awareness in daily life. ➤ Analyze the measures to live a healthy life. 	
6	Credit Value	2 Credits	<i>Credit = 15 Hours -learning & Observation</i>
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 30 Periods (30 Hours)			
Unit	Topics (Course Contents)		No. of Period
I	Maintenance of personal hygiene: Introduction to public health and hygiene: determinants and factors. Pollution and health hazards: Water and air borne diseases. Radiation hazards: Network Towers and electronic gadgets (recommended levels, effects and precaution). Personal hygiene: Oral hygiene, Menstrual Hygiene, Ideal hand washing methods, Ideal food keeping methods.		07
II	Nutrition and Health: Classification of food into micro and macro nutrients. Balanced diet. Importance of dietary fibres. Significance of breast feeding. Malnutrition anomalies: Anaemia (Iron and B12 deficiency), Kwashiorkar, Marasmus, Rickets, Goiter (cause, symptoms, precaution and cure).		07
III	Communicable/Contagious and Non-Communicable Diseases: Communicable viral diseases: measles, chicken pox, swine flu (their causal agents, symptoms and prevention). Communicable bacterial diseases: tuberculosis, typhoid, cholera (their causal agents, symptoms and prevention). Sexually transmitted diseases: AIDS, Syphilis (their causal agents, symptoms and prevention). Non-communicable diseases: hypertension, arthritis, Diabetes, peptic ulcer, obesity, depression and anxiety (their causal agents, symptoms and prevention).		09
IV	Public Health Management & General Medical Awareness: Vaccination, Benefits of institutional deliveries, Deworming drive: Use of Albendazole. First Aid: Electrocutation, Road Accident, Burn, Lightning Strike, Envenomation. Importance of Cardiopulmonary resuscitation (CPR). Blood Donation: Eligibility, Health Screening. Road Safety: Good Samaritan, General safety precautions on Road and Motion Sickness. Fire Safety: Fire Control and Fire Extinguisher Categories.		07
Keywords	<i>Health, Hygiene, Nutrition, Disorders, Vaccination, Safety, Fire, Blood, Medication.</i>		
Signature of Convener & Members (CBoS):			

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Mary Jane Schneider (2011) Introduction to Public Health.
- Muthu, V.K. (2014) A Short Book of Public Health.

Reference Books Recommended

- Detels, R. (2017) Oxford Textbook of Public Health (6th edition).
- Gibney, M.J. (2013) Public Health Nutrition.
- Wong, K.V. (2017) Nutrition, Health and Disease.

Online Resources–

- <https://www.fda.gov/drugs/investigational-new-drug-ind-application/general-drug-categories>
- <https://www.nfpa.org/news-blogs-and-articles/blogs/2023/08/01/fire-extinguisher-types>
- <https://www.redcross.org/take-a-class/cpr/performing-cpr/what-is-cpr#:~:text=What%20Is%20the%20Purpose%20of,healthcare%20workers%20and%20emergency%20responders.>
- <https://unesdoc.unesco.org/ark:/48223/pf0000226792>

Online Resources–

- https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S001827/P001833/M029447/ET/15245666876.21Q1.pdf
- https://www.nhm.gov.in/images/pdf/programmes/mhs/Training_Materials/PDF_English/reading_material.pdf

PART-D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

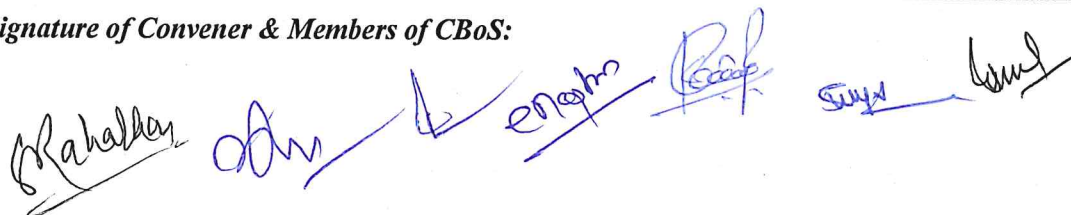
Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar + Attendance- 05 Total Marks -15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 05 x 1 = 05 Mark; Q2. Short answer type- 5 x 2 = 10 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit- 4 x 05 = 20 Marks	

Name and Signature of Convener & Members of CBoS:



PART-C: Learning Resources

Text Books, Reference Books, and Others

Text Books Recommended –

1. Ecology and Environment, 8th Edition, P.D.Sharma, Rastogi Publication, Meerut.
2. Environmental Biology, 2nd Edition, P.D.Sharma, Rastogi Publication, Meerut.
3. Environmental Biology and Toxicology, 2nd Edition, P.D.Sharma, Rastogi Publication, Meerut.
4. Environmental Studies, 1st Edition, S.V.S.Rana, Rastogi Publication, Meerut.
5. Environmental Biotechnology, 1st Edition, S. V. S. Rana, Rastogi Publication, Meerut.

Online Resources–

- e-Resources / e-books and e-learning portals

Online Resources–

- e-Resources / e-books and e-learning portals

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

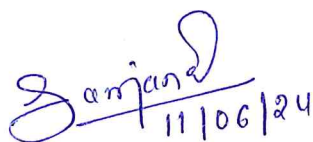
Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

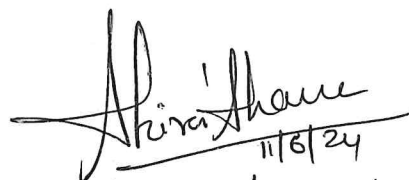
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2):	10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance -	05	
	Total Marks -	15	

End Semester Exam (ESE):	Two sections – A & B Section A: Q1. Objective – 05 x1= 05 Mark; Q2. Short answer type- 5x2 =10 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit- 4x05 =20 Marks
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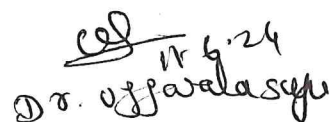
Name and Signature of Convener & Members of CBoS:


11/06/24

(Dr. Sanjani Bhagat)

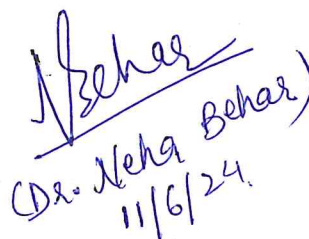

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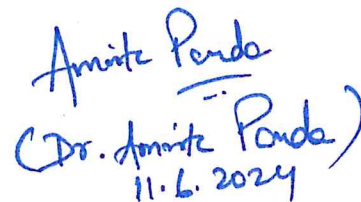
(Dr. Shivani Sharma)



11/6/24
Dr. Ujjwal Singh

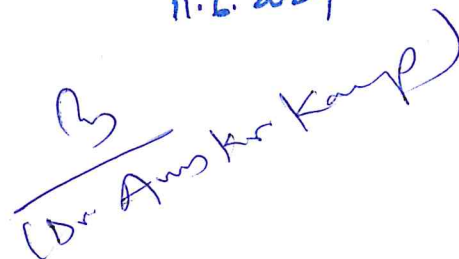

11/06/24

(Dr. Shubha Diwan)


11/6/24
Dr. Neha Behar


11.6.2024
Dr. Amite Pande


Dr. Pramod Kumar Mahesh


Dr. Anurag Kaur