



बिरसा मुंडा ट्रायबल युनिवर्सिटी Birsā Munda Tribal University

राजपिपला, जि. नर्मदा Rajpipla, Dist. Narmada

Established by Tribal Development Department, Govt. of Gujarat

School of Science B.Sc. (Zoology) Programme

Subject Code & Name: BS01MJZOO1: Non-Chordates-I

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	-	1	4	37.5 %	12.5 %	37.5 %	12.5 %

Programme Name	B.Sc. Zoology
Semester	I
Course Code	BS01MJZOO1
Course Title	Non – Chordates I
Course Content Type (Th./Pr.)	Theory + Practical
Course Credit	3 + 1
Sessions + Lab. Per Week	3 + 2
Total Teaching/Lab. Hours	45 Theory Hours + 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

- The student receives training and skills in the basics of zoology, understands the complex interactions of different living organisms.

Prerequisites (if any)

- Student must know about different strata and hierarchy of taxonomy.
- Student must aware about specific terms used for animal organ and organ systems.

Learning Outcomes

On the Completion of this course, students will able to:

- Students were able to learn about the taxonomy and diversity of different classes of animals.
- Students will learn about morphology and organ systems of primitive animal.





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School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	<p>Scheme of classification of phylum Protozoa to Nemathelminthes up to class with examples:</p> <ol style="list-style-type: none">1. Classification outline of phylum Protozoa (up to class).<ul style="list-style-type: none">• General characters Protozoa.• Brief introduction of Amoeba, Euglena, Paramecium and Vorticella.2. Classification outline of phylum Porifera (up to class).<ul style="list-style-type: none">• General characters Porifera.• Brief introduction of Leucosolenia, Grantia and Euspongia.3. Classification outline of phylum Coelenterata (up to class).<ul style="list-style-type: none">• General characters Coelenterata.• Brief introduction of Hydra, Physalia, Aurelia and Corals.4. Classification outline of phylum Platyhelminthes (up to class).<ul style="list-style-type: none">• General characters Platyhelminthes.• Brief introduction of Planaria, Liver fluke and Tape worm.5. Classification outline of phylum Nemathelminthes (up to class).<ul style="list-style-type: none">• General characters Nemathelminthes.• Brief introduction of Ascaris, Enterobius and Rhabditis.	15
II	<p>General Topics</p> <ol style="list-style-type: none">1. <i>Plasmodium vivax</i> :<ul style="list-style-type: none">• Early history,• Life cycle (Asexual and Sexual cycle).• Types of Malaria, Symptoms and Pathogenesis.2. Locomotion in Protozoa.3. Cell types in Porifera.4. Canal system in sponges.5. Asexual and Sexual reproduction in Sponges.6. Skelēton of sponges.7. Excretion in Platyhelminthes.	15





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B.Sc. (Zoology) Programme

III	General Morphology and Functional Anatomy: Hydra <ul style="list-style-type: none">• Habit & Habitat.• External Morphology and Body wall.• Nematocysts.• Locomotion methods.• Respiration.• Excretion and Osmoregulation.• Nervous system.• Reproduction and Regeneration.	15
Unit – IV Practical (s)		30 Hours
<ol style="list-style-type: none">1. To study the classification of phylum Protozoa and Porifera up to class with examples. - <i>Amoeba</i>, <i>Polystomella</i>, <i>Euglena</i>, <i>Paramoecium</i>, <i>Vorticella</i>, <i>Leucosolenia</i>, <i>Grantia</i> and <i>Euspongia</i>.2. To study the classification of phylum Coelenterata and Ctenophore up to class with examples. - <i>Hydra</i>, <i>Physalia</i>, <i>Aurelia</i>, <i>Corals</i>, <i>Sea anemone</i>, <i>Pleurobranchia</i>.3. To study the classification of phylum Platyhelminthes and Nematelminthes up to class with examples. - <i>Planaria</i>, <i>Liver fluke</i>, <i>Tape worm</i>, <i>Ascaris</i>, <i>Enterobius</i>, and <i>Rhabditis</i>.4. To study the life cycle of <i>Plasmodium vivax</i>.5. To study the canal system of sponges.6. To study the reproduction in sponges.7. To study the skeleton of sponges.8. To study the external morphology and body wall of Hydra.9. To study the nematocysts of Hydra.10. To study the locomotory mechanisms of Hydra.11. To study the reproduction in Hydra.		
Text Book(s)		
<ol style="list-style-type: none">1. Invertebrate Zoology by E. L. Jordan & P. S. Verma2. A modern textbook of Zoology – Invertebrate Zoology by R. L. Kotpal3. A textbook of Practical Zoology – Invertebrates by S. S. Lal4. A Manual of Practical Zoology – Invertebrates by P. S. Verma		





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Reference Books

1. Nirav College Zoology – 201 for B.Sc. Students by Mihir Suthar and Haresh Patel.
2. A Manual of Zoology- Vol. I & II by Ayyar and Ananthakrishnan.
3. Structure and Functions of Invertebrates by Barrington
4. Textbook of Invertebrates, 5th Ed. by Dhami and Dhami
5. Principles of Animal Taxonomy by Wallace, Dyson George and Gaylord Simpson.

Web Resources

1. [You Tube Invertebrate Animation Link](#)

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PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE:: Semester End Evaluation





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School of Science B.Sc. (Zoology) Programme

Subject Code & Name: BS01MJZOO2 Chordates-I

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	-	1	4	37.5 %	12.5 %	37.5 %	12.5 %

Programme Name	B.Sc. Zoology
Semester	I
Course Code	BS01MJZOO2
Course Title	Chordates – I
Course Content Type (Th./Pr.)	Theory + Practical
Course Credit	3 + 1
Sessions + Lab. Per Week	3 + 2
Total Teaching/Lab. Hours	45 Theory Hours + 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

- The student receives training and skills in the basics of zoology, understands the complex interactions of different living organisms.

Prerequisites (if any)

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Learning Outcomes

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Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	<p>Scheme of Classification of group Protochordata to class Cyclostomata.</p> <ol style="list-style-type: none">1. Comparison of Chordates with Non- Chordates.2. Classification outline of Subphylum: Cephalochordata.<ul style="list-style-type: none">• General characters of Cephalochordates.• Brief details of Amphioxus.• Affinities of Cephalochordata.3. Classification outline of Subphylum: Urochordata.<ul style="list-style-type: none">• General characters of Urochordata.• Brief details of Ascidian, Doliolum and Salpa.4. Classification outline of Class: Cyclostomata.<ul style="list-style-type: none">• General characters of Cyclostomes.• Brief details of Lamprey and Hagfish.	15
II	<p>Scheme of Classification of Super class Pisces to class Amphibia.</p> <ol style="list-style-type: none">1. Classification outline of Super class: Pisces.<ul style="list-style-type: none">• General characters of class Placodermi, Chondrichthyes and Osteichthyes.• Difference between Chondrichthyes and Osteichthyes.• Brief details of Sting ray fish, Electric ray fish, Catla, Rohu and Hippocampus.• Types of scales and fins in fishes.2. Classification outline of class: Amphibia.<ul style="list-style-type: none">• General characters of amphibians.• Brief details of Ichthyophis, Salamander and Hyla.• Hibernation and Aestivation.• Neoteny (Types and affecting factors).	15





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III	General Morphology and Functional Anatomy: <i>Amphioxus</i> (Lancelet) <ul style="list-style-type: none">• Habits and Habitat.• External features and Body wall.• Digestive system.• Respiratory system.• Blood vascular system.• Excretory system.• Reproductive system.	15
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Unit - IV Practical(s)

30 Hours

1. To study the classification of group Protochordata to class Cyclostomata with examples.
- *Ascidia, Doliolum, Salpa, Amphioxus, Lamprey and Hagfish.*
2. To study the classification of super class Pisces up to class with examples.
- *Sting ray, Electric ray, Rohu, Catla, Sea horse, Sucker fish and Eel.*
3. To study the classification of class Amphibia up to sub – class with examples.
- *Ichthyophis, Salamander and Hyla.*
4. To study the types of scales and fins of Fishes.
5. To study the external features and body wall of *Amphioxus*.
6. To study the digestive system of *Amphioxus*.
7. To study the blood vascular system of *Amphioxus*.
8. To study the reproductive system of *Amphioxus*.

Text Book(s)

1. Chordate Zoology by E. L. Jordan & P. S. Verma
2. Modern textbook of Zoology – Vertebrate Zoology by R. L. Kotpal
3. Practical Zoology – Vertebrates by S. S. Lal
4. A Manual of Practical Zoology – Chordates by P. S. Verma





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2. A Manual of Zoology- Vol. I & II by Ayyar and Ananthakrishnan.
3. Chordate Zoology by Dhami and Dhami.
4. A Textbook of Vertebrate Zoology by Prasad and Kashyap.
5. A Text Book of Chordates (Saras Publication) by Arumugam.

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School of Science

B.Sc. (Zoology) Programme

Subject Code & Name: - BS01MIZOO1 Basic Chemistry- I

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	-	1	4	37.5%	12.5%	37.5%	12.5%

Programme Name	B.Sc.(Zoology)
Semester	I
Course Code	BS01MIZOO1
Course Title	Basic Chemistry-I
Course Content Type (Th./Pr.)	Theory & Practical
Course Credit	3 + 1
Sessions+ Lab. Per Week	3+2
Total Teaching/Lab. Hours	45 Theory Hours + 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

1. To review the basics concepts of atomic structure that has direct relevance to the fundamental concepts of organic chemistry. This material is essential to the understanding of organic molecular structure and, later on, reaction mechanisms.
2. The study of chemists is always interested in identifying and knowing how the chemical transformation occurs. It plays an essential role in science and plays a central role in daily life activities.
3. Understand that elements are placed on the periodic table due to similar properties. Identify a period and a group on the periodic table.
4. Be able to recognize, classify, explain, and apply fundamental organic reactions.





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Learning Outcomes

On the Completion of this course, students will able to:

1. Understand the concepts of mole, molarity, mole fraction, molecular weight and so forth.
2. Calculate percentage ratios of weight average, volume average and limiting values of the reagents which are present in the reactions.
3. Students can understand electronic configuration of elements, shape of orbitals, nodes and model plane.
4. Students can write IUPAC nomenclature of organic compounds.
5. Recognize electronic displacements, reaction intermediate and its stability as well as different types of organic reactions.

Detailed Contents

UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Basic Organic Chemistry <ul style="list-style-type: none">➤ IUPAC Nomenclature of organic compounds (Acyclic, cyclic) and their application➤ Homolytic and heterolytic fission➤ Reaction Intermediates: basic introduction (1) Carbocation (2) Carbanion (3) Free radical➤ Electronic displacements in organic molecules: (1) Inductive effect (2) Electromeric effect (3) Mesomeric effect (4) Hyper conjugation➤ Introduction and generation of nucleophile and electrophiles➤ Types of organic reactions: general introduction (1) Substitution (2) Addition (3) Elimination (4) Rearrangement.	15



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II	Basic of Concepts of Chemistry <ul style="list-style-type: none">➤ Atomic Weight , Molecular Weight , Average Molecular Weight , Concept of Mole➤ Molarity, Normality, Molality, % W/W , % V/V , Mole Fraction, ppm➤ Limiting Reagent, Numerical➤ Determination of Molecular Formula Empirical formula, Numerical	15
III	Structure and properties of atoms <ul style="list-style-type: none">➤ Introduction to development of the structure of atom➤ Basic concept of Wave particle duality of electron, De-Broglie's equation, Heisenberg's uncertainty principle and its Numerical➤ Example based on de-Broglie's equation, Heisenberg's uncertainty principle➤ Shape of orbitals, nodes, nodal plane➤ Aufbau rule, Pauli's Principle, and Hund's rule for electronic configuration, stability of half-filled and completely filled orbitals	15

Unit - IV Practical(s)

30 Hours

Qualitative analysis of inorganic salts

(Minimum 06 salts-containing two radicals)

Inorganic salts containing anion (chloride, bromide iodide, nitrate, nitrite, sulphate, sulphite, sulphide, carbonate, phosphate (soluble & insoluble), oxide, chromate, and dichromate

Volumetric analysis-Acid Base Titration (Any three)

1. To prepare a solution by dissolving 'x' g NaHCO_3 in 100 ml solution and determine its concentration in terms of normality and molarity using 0.1N HCl solution.
2. To prepare a solution by dissolving 'x' g Na_2CO_3 in 100 ml solution and determine its concentration in terms of normality and molarity using 0.1N HCl solution.
3. To determine the normality, molarity and g/lit of NaOH using 0.1N Na_2CO_3 solution.
4. To determine the normality, molarity and g/lit of HCl using 0.1N Na_2CO_3 solution.
5. To determine the normality, molarity and g/lit of each component in a given mixture of NaHCO_3 using 0.1N CH_3COOH solution.
6. To determine the normality, molarity and g/lit of each component in a given mixture of Na_2CO_3 using 0.1N CH_3COOH solution.





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1. Inorganic Chemistry - J. N. Gurtu & H. C. Khera
2. Principles of Inorganic chemistry- B. R. Puri, L. R. Sharma and K. C. Kalia; Vallabh publications, Delhi.
3. Coordination chemistry-Ajai Kumar ; Aaryush Education, U.P.
4. Basic Inorganic Chemistry – Gurdeep & Chatwal.
5. Undergraduate Organic Chemistry, Vol-1, Jagdamba Singh, L. D.S. Yadav, Pragati Prakashan, 8th edition-2013
6. Organic Reaction Mechanism, including Reaction Intermediates, V. K. Ahluwalia
7. Organic Chemistry by Morrison and Boyd.
8. Essentials of Physical Chemistry, B. S. Bahl, G. D. Tuli and Arun Bahl, S. Chand & Co.
9. Elements of Physical Chemistry, B. R. Puri, L. R. Sharma and Madan Pathania, Vishal Publishing Co. Jalandhar.
10. Physical Chemistry, B. K. Sharma, Goel Publication House. Meerut.
11. Physical Chemistry, 7th edition P. C. Rakshit

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School of Science B.Sc. (Zoology) Programme

Subject Code & Name: - BS01MIZOO2 Basics of Electromagnetism

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	0	1	4	37.5%	12.5%	37.5%	12.5%

Programme Name	B.Sc. (Zoology)
Semester	I
Course Code	BS01MIZOO2
Course Title	Basics of Electromagnetism
Course Content Type (Th./Pr.)	Theory & Practical
Course Credit	3+1
Sessions+ Lab. Per Week	3+2
Total Teaching/Lab. Hours	45 Theory Hours+ 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

Students will able to study

1. Difference between vector and scalar quantity, scalar and vector product, Differential Calculus & Integral Calculus and its application.
2. The basic mathematical tools to solve the various electromagnetic problems also able to learn vector and scalar fields and various functions & operators.
3. To realize the importance of electricity and magnetism in real world.
4. Learn and revise the concept of electrostatics- Coulomb's law, Gauss's law and its application, Electric Potential and its relation with electric field etc.
5. Revise and study the basics of magnetostatics, Oersted's observation, magnetism and matter (Diamagnetism, Paramagnetism, Ferromagnetism), Ampere's law, Faraday's Law and its applications, Lenz law etc.

Prerequisites (if any)

12th Science passed with Physics subject.





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Learning Outcomes

On the Completion of this course, students will able to:

1. The Student will get the overview of core concepts in the field of electricity and magnetism.
2. Able to apply the theoretical knowledge of these fields to analyze and solve the problems of day to day life.
3. Learn the basic necessary mathematics tools to solve electromagnetism problems.

Detailed Contents

UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Basic Vector Calculus: <ul style="list-style-type: none">➤ Types of Vectors, Vector addition, Vector subtraction, Unit vector, Dot or Scalar Products, Cross or Vector Products, Triple Product, reciprocal sets of vectors.➤ Partial differentiation of Vectors, Differentiability and Continuity➤ The vector differential operator ∇, the gradient, the divergence and curl, Formulae involving ∇. Invariance, Line integral, Surface integral, Volume Integral➤ The divergence theorem of Gauss, Stokes' theorem, Green's theorem, integral operator form ∇ (Theorem statements only) (Discussion on Related Problems)	15
II	Electrostatics: <ul style="list-style-type: none">➤ Coulomb's law, What is field, The Electric Field, Electric field of point charges, Electric Field of a point charges, Electric field due to continuous charge distributions, Electric field lines, A point charge in an electric field.➤ What is Gauss's law all about?, The flux of a vector field, The flux of electric field, Gauss law, Applications of Gauss law, Gauss law and conductors, Experimental tests of Gauss's law and Coulomb's Law➤ Potential energy, Electrical Potential energy, Electrical potential, Calculating potential from Field, Potential due to point charges, Equipotential Surfaces➤ Analysis of circuits, RC Circuits➤ Electric Field Strength, Electric Polarisation, Electric Displacement Vector, Three Electric Vectors D and P in terms of E, Concept of Capacitance (Discussion on Related Problems)	15





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III	Magnetism <ul style="list-style-type: none">➤ Lorentz force, Biot Savart Law, Magnetic field on the axis of a circular current loop, Ampere's Circuital law, The Solenoid, Magnetic Force between two current carrying conductors, Torque on current loop, magnetic dipole, circular loop as a magnetic dipole, moving coil galvanometer, conversion of galvanometer into ammeter and voltmeter➤ Analogy between Biot Savart's law and Coulomb's law, Magnetization and Magnetic intensity, Magnetic properties of matter (Diamagnetism, Paramagnetism, Ferromagnetism including Curie law and Hysteresis)➤ Orestead's Observation, Faraday's Experiments on electromagnetic induction, Faraday's Law of induction, Lenz Law (Discussion on Related Problems)	15
Unit-IV-Practical(s)		(30)
<ol style="list-style-type: none">1. Study the measurements and error analysis using Vernier Callipers and Micrometer Screw gauge.2. Study the various types of graph Plotting.3. Least square fitting using given linear data.4. Conversion of galvanometer into ammeter.5. Conversion of galvanometer into voltmeter.6. To determine the decay constant and time constant using RC circuit.7. Verification of Stefan's Fourth power law.8. Calibration of Spectrometer using Schuster's method.		
Text Book(s)		
<ol style="list-style-type: none">1. Unit 1: Vector analysis by Murray Spiegel, Schaum's Outline 2nd Edition.2. Unit 2: (i) Physics by Halliday, Resnick and Krane, Volume-2, 5th Edition, Willey Publication. (ii) Essentials of Electromagnetism by Matthew N. O. Sadiku, 7th Edition, Oxford Press.3. Unit 3: B.Sc. First Year -Electricity and Magnetism, BSCPH-102, Uttarakhand Open Uni.		
Reference Books		
<ol style="list-style-type: none">1. Electricity and Magnetism by D.C.Tayal, Himalaya Publishing House2. Introduction to Electromagnetism by David J. Griffiths, Pearson Publication3. Electricity and Magnetism by Satyaprakash, Meerut Publication4. Electricity and Magnetism by Sehgal, Chopra, S.Chand Publication, New Delhi		





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Web Resources

1. <https://phys.libretexts.org>
2. <https://www.youtube.com/watch?v=5JZjEmJqtus>
3. <https://www.youtube.com/watch?v=8zKTFwIzXhM>
4. <https://archive.nptel.ac.in/courses/115/104/115104088/>
5. <https://archive.nptel.ac.in/courses/115/101/115101005/>

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SEE:: Semester End Evaluation





बिरसा मुंडा ट्रायबल युनिवर्सिटी Birsā Munda Tribal University

राजपिपला, जि. नर्मदा Rajpipla, Dist. Narmada

Established by Tribal Development Department, Govt. of Gujarat

School of Science

B.Sc. (Zoology) Programme

Subject Code & Name: - BS01MIZOO3 Mathematics-I

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	0	1	4	37.5%	12.5%	37.5%	12.5%

Programme Name	B.Sc. (Zoology)
Semester	I
Course Code	BS01MIZOO3
Course Title	Mathematics-I
Course Content Type(Th./Pr.)	Theory & Practical
Course Credit	3 + 1
Sessions+ Lab. Per Week	3 + 2
Total Teaching/Lab. Hours	45 Theory Hours+ 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

Students will able to study

1. Understanding the concept of differentiation and its applications.
2. Developing the ability to find derivatives of various functions using differentiation rules.
3. Exploring higher-order derivatives and their interpretations.
4. Utilizing differentiation techniques such as the chain rule, product rule, and quotient rule.
5. Understanding the concept of integration and its applications.
6. Developing the ability to find anti - derivatives and definite integrals.
7. Exploring techniques of integration such as substitution, integration by parts, and partial fractions.
8. Eigen values represent scalar values associated with a matrix, and eigenvectors are corresponding vectors.
9. By understanding and applying basic matrix algebra, we can solve a wide range of mathematical Problems, analyze data, perform transformations, and model real-world phenomena.

Prerequisites (if any)

12th Science passed with Mathematics as a subject.





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School of Science B.Sc. (Zoology) Programme

Learning Outcomes

On the Completion of this course, students will able to:

1. Use Leibnitz's rule to evaluate derivatives of higher order, able to study the geometry of various types of functions, evaluate the area when studying Integration. The level of depth and complexity of these topics can vary depending on the educational level and the specific course being taken.
2. Perform Basic Matrix Operations, Multiply Matrices; Find the Inverse of a Matrix, Solve Systems of Linear Equations, Compute Determinants, Diagonalizable Matrices and Students will have a conceptual understanding of how matrices can represent transformations such as rotations, scaling, shearing, and reflections.

Detailed Contents

UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Revision of algebra of derivatives and its standard forms, Successive Derivatives, standard results for derivative, Leibniz's Theorem and examples based on it. Definition of limit of a sequence, Convergence and divergence of an infinite series, Comparison test, Ratio test, Root test, Radius and interval of convergence of power series.	15
II	Revision of algebra of integration and its standard forms, Reduction Formulae for $\int \sin^n x \, dx$, $\int \cos^n x \, dx$, $\int \sin^m x \cos^n x \, dx$ and $\int_0^{\pi/2} \sin^n x \, dx$, $\int_0^{\pi/2} \cos^n x \, dx$, $\int_0^{\pi/2} \sin^m x \cos^n x \, dx$ where $m, n \in \mathbb{N}$, with $m, n \geq 2$ Mean value theorems: Rolle's theorem, Lagrange's and Cauchy's theorem. and Taylor's theorem(without proof). Expansion in power series of $\sin x$, $\cos x$, $\log(1+x)$, e^x and $(1+x)^m$ in appropriate domain, L'Hospital's rule and it's numerical.	15





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III	<p>Matrices: matrix operations (Addition, Scalar Multiplication, Multiplication, Transpose, Adjoin and their properties); Special types of matrices: Null, Identity, Diagonal, Triangular, Symmetric, Skew-Symmetric, Hermitian, Skew-Hermitian, Orthogonal, Unitary, Normal, Idempotent, Nilpotent, Involuntary, Algebra of determinants and its properties, Solution of the matrix Equation $AX = B$; Row reduced Echelon form of matrix and Matrix inversion using it, Linear dependence and independence of rows and columns of a matrix. Row rank, column rank and rank of a matrix. Equivalence of row rank and column rank of matrix. Eigen values, eigenvectors and the characteristics equation of a matrix. Cayley- Hamilton theorem and its use in finding inverse of a matrix. Application of matrices to a system of a linear equation. Theorems on system of consistency of linear equations, solution of system of linear equation in three variables by Cramer's rule.</p>	15
Unit - IV Practical(s)		30 Hours
<ol style="list-style-type: none">1. Problems solving based on Limit using definition.2. Problems solving based on Derivative using first principle.3. Problems solving based on L-hospital rule first and second kind.4. Problems solving based on Extreme values of function using differentiation.5. Problems solving based on Integration by parts of definite integral.6. Problems solving based on $\int_0^{\pi/2} \sin^n x \, dx$, $\int_0^{\pi/2} \cos^n x \, dx$.7. Problems solving based on $\int_0^{\pi/2} \sin^m x \cos^n x \, dx$.8. Problems solving based on Properties of Inverse of matrix.9. Problems solving based on rank of a matrix.10. Problems solving based on Matrix represent as sum of Symmetric & Skew-Symmetric matrix11. Problems solving based on Find solution of system of linear equation using Cramer's rule.12. Problems solving based on Eigen values & Eigenvectors.		





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13. Problems solving based on verification of Cayley- Hamilton theorem.
14. Problems solving based on Inverse of matrix using Cayley- Hamilton theorem.

Text Book(s)

1. Calculus - Dr. Elliot Mendel son, Mc GrawHill Book co.
2. Calculus - Thomas and Finney, Pearson Education, Asian edition
3. Calculus and Analytic Geometry - G. B. Thomas and R. L. Finney. Pearson Education. Indian Reprint.
4. Mathematical Physics, - H.K. Dass, S. Chand.

Reference Books

1. Differential Calculus by Shanti Narayan & Differential Calculus by Gorakh Prasad
2. Higher Algebra by Barnard S. and Child J. M.
3. Higher Algebra by H. S. Hall and S. R. Knight H. M.
4. Integral Calculus by Shanti Narayan & Integral Calculus by Gorakh Prasad
5. Mathematical sciences (UGC CSIR) by Pawan Sharma, Neha Sharma and Suraj singh. (Arihant publication India)

Web Resources

1. <https://archive.nptel.ac.in/courses/111/105/111105121/>
2. <https://math.libretexts.org/>
3. <https://archive.nptel.ac.in/courses/111/108/111108157/>

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(CCE Theory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation, slip tests (announced/surprised), attendance etc. or any combination of these)

PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

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School of Science B.Sc. (Zoology) Programme

Subject Code& Name: - BS01MDZOO1 Ecosystem and Natural Resources

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	-	1	4	37.5%	12.5%	37.5%	12.5%

Programme Name	B.Sc. (Zoology)
Semester	I
Course Code	BS01MDZOO1
Course Title	Ecosystem and Natural Resources
Course Content Type (Th./Pr.)	Theory
Course Credit	3 + 1
Sessions+ Lab. Per Week	3 + 2
Total Teaching/Lab. Hours	45 Theory Hours + 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

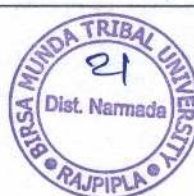
1. This is a unique undergraduate course designed to provide students with a fundamental understanding of ecological principles as applied to current natural resources and its management. This course arms students with the essential knowledge to tackle natural resources challenges in a changing world.

Prerequisites (if any)

Learning Outcomes

On the Completion of this course, students will be able to:

1. To understand the basic concepts of environmental studies and natural resources.
2. To learn about the various eco-systems of nature.
3. To gain knowledge about different types of environmental pollutions and their control measures.
4. To acquire the knowledge about the various social aspects related to the environment.





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School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Fundamentals Ecosystems: <ul style="list-style-type: none">• Introduction• Concept and types of ecosystem,• Structure and functioning of an Ecosystem.• Food chains, food webs and ecological pyramids• Energy flow in an ecosystem through Food Chain.• Primary Production and Secondary Production.• Ecosystem Regulation• Ecological Succession• Major Components of Ecosystems and Balance in Nature.• Terrestrial Ecosystems: Forests, Grasslands and Deserts.• Aquatic Ecosystem: Fresh Water, Coastal Water and Marine Water.	15
II	Natural Resources: <ul style="list-style-type: none">• Introduction.• Forest Resources (Narmada District).• Water Resources.• Energy Resources.• Land Resources.• Role of an Individual in Conservation of Natural Resources.• Equitable Use of Resources for Sustainable Lifestyles.• Environmental Implications of Non-conventional Sources of Energy.• Role of Government In conservation of natural Resources.	15





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III	Environmental Pollution: <ul style="list-style-type: none">• Introduction• Air Pollution, Sources of Air Pollution and Air Pollutants, Methods to Control Air Pollution.• Acid Rain.• Smog: Sulphur, Photochemical and Industrial.• Ozone layer depletion.• Water Pollution.• Soil Pollution and Soil Conservation.• Noise Pollution.• Thermal Pollution.• Marine Pollution.• Nuclear Hazards.• Solid Waste Management.	15
Unit – IV Practical(s)		30 Hours
<ol style="list-style-type: none">1. To study the detritus and grazing food chain.2. To study bottom-up and top-down control of community structure in through food web.3. To study energy, numbers and biomass ecological pyramids.4. To study the ecological succession and their types with examples.5. To study types of terrestrial ecosystem.6. To study types of aquatic ecosystem.7. To study the forest resources in context of Indian forests.8. To study hazardous pollutant in water and their adverse effects on health.9. To study the sewage treatment plants its mechanism.10. To study the eutrophic conditions in water bodies.		
Text Book(s)		
<ol style="list-style-type: none">1. Environmental Studies by Benny Joseph Tata McGraw Hill Publishing Co. Ltd.2. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha Hyderabad, Universities Press		





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Reference Books

1. Textbook of Environmental Sciences and Technology by Anji Reddy, Hyderabad.
2. Introduction to Environmental Sciences by Y. Anjaneyulu, BS Publications.
3. Fundamentals of Ecology by Odum E.P., Saunders, Philadelphia.
4. Ecology and Ecosystem Conservation by Schmitz O. J., Island Press, Washington, DC

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School of Science B.Sc. (Zoology) Programme

Subject Code & Name: - BS01MDZOO2: Physical Optics & Modern Physics

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	0	1	4	37.5%	12.5%	37.5%	12.5%

Programme Name	B.Sc. (Zoology)
Semester	I
Course Code	BS01MDZOO2
Course Title	Physical Optics & Modern Physics
Course Content Type(Th./Pr.)	Theory + Practical
Course Credit	3+1
Sessions+ Lab. Per Week	3+2
Total Teaching/Lab. Hours	45 Hours + 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

1. Students will be able to learn various phenomenon of light, focal length of thin lens, thin film interference, Newton's ring formation and wedge shape interference.
2. Learn about X-ray production, Bragg's formula, X-ray characteristics and X-ray uses in real world application, Compton effect and pair production.

Prerequisites (if any)

12th Science passed with Physics subject.

Learning Outcomes

On the Completion of this course, students will be able to:

1. The Student will get the overview of core concepts in the field of electricity and magnetism.
2. Able to apply the theoretical knowledge of these fields to analyze and solve the problems of day to day life.
3. Learn the basic necessary mathematics tools to solve electromagnetism problems.





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School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Light <ul style="list-style-type: none">➤ Huygen's Principle, Properties of Light, Refractive index, Optical Path, Fermat's Principle of least time,➤ Deviation by a thin lens, Power, Equivalent focal length of two lenses, Cardinal Points, Cardinal points of a coaxial system of two thin lenses –focal length of the system➤ Thick lens equation, Combination of two thick lenses – Extended object at infinity, Application of lens combination (Topics relevant problems)	15
II	Interference in Thin films <ul style="list-style-type: none">➤ Review of interference: introduction, Young's experiment, coherence, conditions for interference, Interference in thin films, interference due to reflected light (thin films), interference due to transmitted light(thin film), fringes produced by a wedge shaped thin film, Newton's rings, determination of wavelength of Sodium light using Newton's ring. (Topics relevant problems)	15
III	X-Rays <ul style="list-style-type: none">➤ Black body radiation, Photo electric effect, What is light, X-Rays, X-Ray production, X-Rays Characteristics, X-Ray Diffraction, Compton effect, Pair Production, photons and Gravity	15

Unit-IV-Practical(s)

(30)

1. η by dynamic method
2. M.I. of Disc using Torsional pendulum.
3. Prove the parallel axis theorem.
4. Prove the perpendicular axis theorem.
5. Determination of "g" using Bar Pendulum.
6. Newton's ring
7. Poisson's ratio of a rubber.
8. Cardinal Points of the lens system.





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School of Science B.Sc. (Zoology) Programme

Text Book(s)

1. Unit 1 & 2: A text book of Optics by Brijlal & Subramaniam, 23rd Edition, S. Chand Publication
2. Unit 3 : Concepts of Physics by Arthur Beiser, Willey Publication

Reference Books

1. Modern Physics by Kennth S. Krane, 3rd Edition, John Wiley & Sons, INC.
2. Modern Physics by Murugesan, 18th Edition, S.Chand.
3. Modern Physics by Paul A. Tipler, Ralph A. Llewellyn, W. H. Freeman and Company, New York.
4. Principle of Optics by B.K. Mathur, Gopal Printing
5. Optics by Ajoy Ghatak, Mc. Graw Hill
6. B.Sc. Practical Physics by Harnam Singh and Dr. P.S. Hemne, S. Chand & Co. Ltd., New Delhi (2000).
7. An Advanced Course in Practical Physics by D. Chatopdhyay, P.C. Rakshit, New Central Book Agency Pvt. Ltd (1990).
8. Advanced Practical Physics by M S Chauhan and S P Singh, Pragati Prakashan, Meerut (1984).

Web Resources

1. <https://phys.libretexts.org>
2. <https://archive.nptel.ac.in/courses/115/107/115107131/>
3. <https://www.youtube.com/watch?v=vxh0yiw4Z8I>
4. <https://www.youtube.com/watch?v=z-Z1FYbgjLo>
5. [https://eng.libretexts.org/Bookshelves/Materials_Science/Supplemental_Modules_\(Materials_Science\)/Electronic_Properties/Compton_Effect](https://eng.libretexts.org/Bookshelves/Materials_Science/Supplemental_Modules_(Materials_Science)/Electronic_Properties/Compton_Effect)

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School of Science

B.Sc. (Zoology) Programme

Subject Code & Name: - BS01MDZOO3 Climate change and Sustainable Development

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	-	1	4	37.5%	12.5%	37.5%	12.5%

Programme Name	B.Sc. (Zoology)
Semester	I
Course Code	BS01MDZOO3
Course Title	Climate change and Sustainable Development
Course Content Type (Th./Pr.)	Theory
Course Credit	3+1
Sessions+ Lab. Per Week	3+2
Total Teaching/Lab. Hours	60 Hours
* 2 Laboratory = 1 Session	

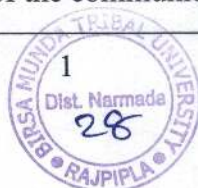
Learning Objectives

1. Students should be aware of pollution and different types of environmental pollution.
2. Impart knowledge of different type of disaster and its measures.
3. Students should be aware of water harvesting techniques
4. Students should learn changes of climate, its impact on human and other living being.

Learning Outcomes

On the Completion of this course, students will able to:

1. Students come to know various types of pollution and its effects. Students learn to check pollution and contribute to the society.
2. Identify new ways of curbing pollution. They also prepare themselves to curb with disastrous incidents like earthquakes, floods etc.
3. Demonstrate an awareness of the difficulties involved in the detection of any unusual global warming 'signal' above the 'background noise' of natural variability in the Earth's climate and of attributing (in whole or in part) any such signal to human activity.
4. Students also know the technology and health. They can contribute to ease the problems related population and health of the community.





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School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	<ul style="list-style-type: none">• Pollution: Causes and Effects of Air Pollution, Water Pollution, Soil Pollution, Marine Pollution and Noise Pollution, Role of an individual in prevention of pollution,• Disaster management: Floods, Earthquakes, Cyclones and Landslides.	15
II	<ul style="list-style-type: none">• Social Issues: From unsustainable to sustainable development, Urban problems related to energy, Water conservation, Rainwater harvesting and Watershed management,• Resettlement and rehabilitation of people: It's Problems and concerns.	15
III	<ul style="list-style-type: none">• Climate Change and Global Warming: Climate change, Global warming, Acid rain, Ozone layer depletion, Issues involved in enforcement of environmental legislation.• Environment and Human Health: Role of information technology in environment and human health.	15
Reference Books		
<ol style="list-style-type: none">1. Environmental Studies- Dr. Suresh K. Dhameja. Published by SK Kataria & Sons, New Delhi-1100062. Introduction to Environmental Studies- Chandar K. Sharma, Vrinda Publications Pvt. Ltd. Delhi-1100913. Textbook of Environmental Studies for Undergraduate Courses – Erach Bharucha		
Web Resources		
<ol style="list-style-type: none">1. https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf		
Unit - IV Practical(s) (if any)		30 Hours
<ol style="list-style-type: none">1. Collection and preparation of soil samples for analysis.2. Estimation of pH of given soil sample.3. Estimation of electrical conductivity of given soil sample.4. Estimation of acidity of given water sample by volumetric method.5. Estimation of alkalinity of given water sample by volumetric method.6. Estimation of free CO₂ of given water sample by volumetric method.7. Estimation of chloride (Cl⁻) of given water sample by volumetric method.8. Study of different methods for water harvesting.		





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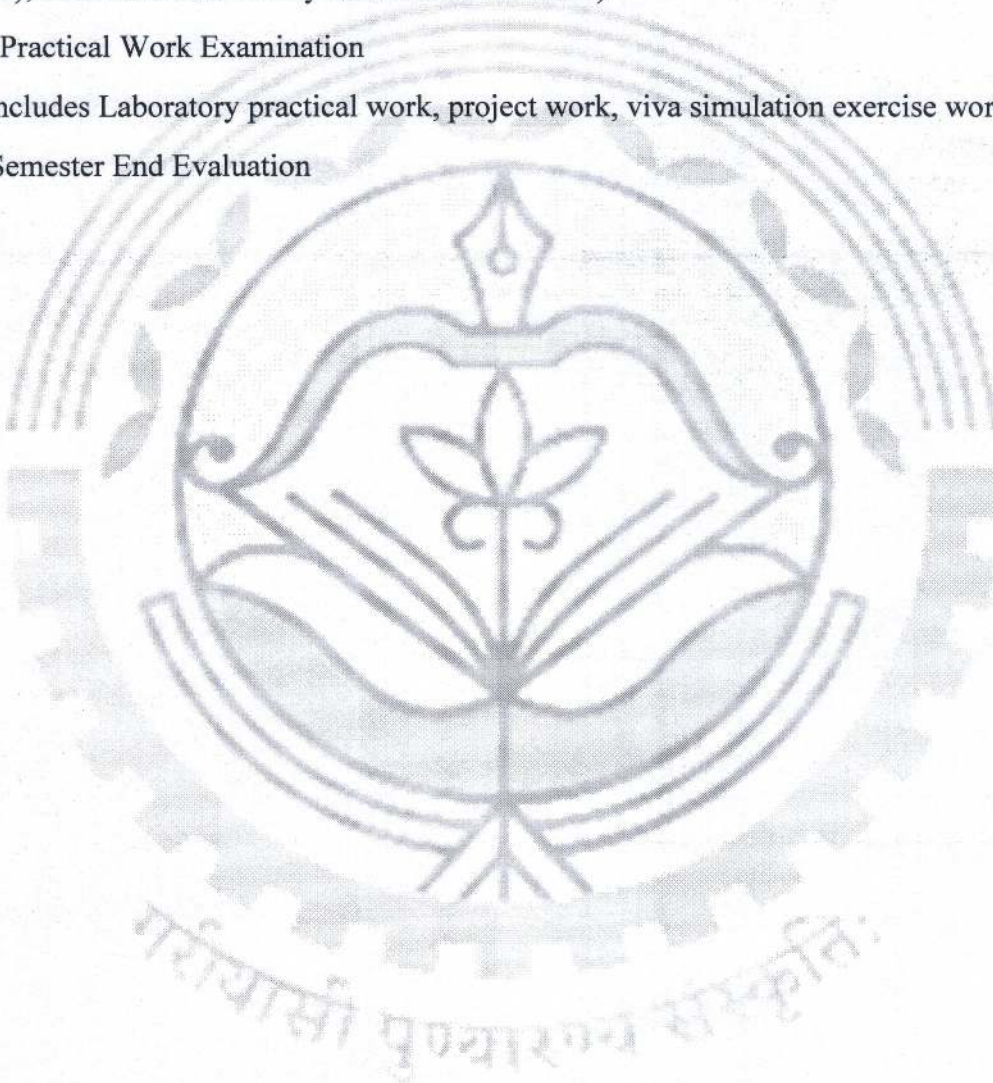
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School of Science B.Sc. (Zoology) Programme

Subject Code & Subject Name: BS01AEZOO1 English Language Skills-I

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
2	-	-	2	50%	00	50%	00

Programme Name	B.Sc. Zoology
Semester	I
Course Code	BS01AEZOO1
Course Title	English Language Skills-I
Course Content Type (Th./Pr.)	Theory
Course Credit	2
Sessions+ Lab. Per Week	2
Total Teaching/Lab. Hours	30 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

1. To develop a foundational understanding of English grammar and vocabulary.
2. To enhance reading comprehension skills.
3. To improve basic writing skills for effective communication.

Learning Outcomes

On the Completion of this course, students will able to:

1. Construct grammatically correct sentences.
2. Demonstrate the ability to understand and analyze written texts.
3. Produce clear and coherent written paragraphs.

Detailed Contents





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School of Science B.Sc. (Zoology) Programme

UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Basic Grammar and Vocabulary <ul style="list-style-type: none">• Introduction to Parts of Speech• Tenses, Articles, and Prepositions• Basic Vocabulary: Word Formation, Synonyms, and Antonyms	15
II	Reading and Writing Skills <ul style="list-style-type: none">• Reading Comprehension Techniques• Sentence Structure and Paragraph Writing• Basic Listening and Speaking Skills	15

Reference Books

- Murphy, Raymond. English Grammar in Use. Cambridge University Press.
- Redman, Stuart. English Vocabulary in Use. Cambridge University Press.
- Nuttall, Christine. Teaching Reading Skills in a Foreign Language. Macmillan Education.

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School of Science B.Sc. (Zoology) Programme

Subject Code & Subject Name: BS01AEZOO2 Fundamentals of Communication Skills

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
2	-	-	2	50%	00	50%	00

Programme Name	B.Sc. Zoology
Semester	I
Course Code	BS01AEZOO2
Course Title	Fundamentals of Communication Skills
Course Content Type (Th./Pr.)	Theory
Course Credit	2
Sessions+ Lab. Per Week	2
Total Teaching/Lab. Hours	30 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

- To introduce the fundamentals of communication.
- To develop effective speaking and listening skills.
- To enhance presentation and group discussion abilities.

Learning Outcomes

On the Completion of this course, students will able to:

- Understand the process and types of communication.
- Demonstrate effective verbal and non-verbal communication.
- Participate actively in group discussions and presentations.





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Established by Tribal Development Department, Govt. of Gujarat

School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Unit 1: Fundamentals of Communication <ul style="list-style-type: none">• Communication Process, Types, and Barriers• Importance of Effective Communication• Non-verbal Communication: Body Language, Facial Expressions, Proxemics, Chronemics, Vocalics	15
II	Unit 2: Effective Speaking and Listening <ul style="list-style-type: none">• Techniques for Effective Speaking: Clarity, Tone, and Body Language• Active Listening Skills• Introduction to Presentation Skills	15
Reference Books		
<ul style="list-style-type: none">• Adler, Ronald B., and Jeanne Marquardt Elmhorst. Communicating at Work: Principles and Practices for Business and the Professions. McGraw-Hill Education.• Lucas, Stephen. The Art of Public Speaking. McGraw-Hill Education.• Duck, Steve, and David T. McMahan. Communication in Everyday Life: The Basic Course Edition with Public Speaking. SAGE Publications.		

L:: Lecture, **T::** Tutorial, **P::** Practical

CCE:: Continuous and Comprehensive Evaluation

(CCE Theory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation, slip tests (announced/surprised), attendance etc. or any combination of these)

PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE:: Semester End Evaluation





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Established by Tribal Development Department, Govt. of Gujarat

School of Science B.Sc. (Zoology) Programme

Subject Code & Name: - BS01SEZOO1: Fundamentals of Computer and Office Automation
Packages-I

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
1	0	1	2	0.25	-	0.5	0.25

Programme Name	B.Sc. (Zoology)
Semester	I
Course Code	BS01SEZOO1
Course Title	Fundamentals of Computer and Office Automation Packages-I
Course Content Type (Th./Pr.)	Theory/Practical
Course Credit	2
Sessions+ Lab. Per Week	1+2*
Total Teaching/Lab. Hours	30 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

1. This course would make students acquainted with basics of computers.
2. Students can develop skills for effective use of Office Automation Tool.

Prerequisites (if any)

Basic Understanding and Operating of Computer System

Learning Outcomes

On the completion of this course, students will able to:

1. Explain the basic structure of computer and number system.
2. Summarize the Software and Operating System.
3. Apply and analyze various features into the documentation and presentation





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Established by Tribal Development Department, Govt. of Gujarat

School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Basic of Computers Computer, Data Processing, Characteristics of Computer, History of computer, Computer Generations, Basic Organization of Computer, Classification of computer (Analog, Digital, Hybrid, micro, mini, mainframe and super Computers), Number System (Decimal, Binary, Octal, Hexadecimal), Basic Binary Arithmetic, Introduction to Computer Code (ASCII, BCD, EBCDIC, UNICODE)	15
II	Software Types: Overview of System software and application software, Operating system, Utility software, drivers, compilers and interpreters. Virus, features, types of viruses, virus detection prevention and cure. Operating system: Windows: Desktop, Control Panel, Driver installation, create users, manipulate taskbar, power management, Install new peripheral etc. DOS: Basic Commands of DOS. Office Automation Fundamentals Introducing MS-Word, creating and formatting text documents, mail merge, page setup, creating table. Introducing MS-Power point, creating presentation, enhancing presentation using multimedia.	15
Text Book(s)		
--		
Reference Books		
1. Computer Fundamentals Concepts, System & Application By: P. K. Sinha Publisher: BPB 2. Microsoft Office 2019 for Dummies, Publisher: Wiley		
Web Resources		
1. https://edu.gcfglobal.org/en/topics/office/ 2. https://www.computer-pdf.com/tutorials-ms-office-basics 3. https://www.tutorialspoint.com/word/index.htm 4. https://www.tutorialspoint.com/powerpoint/index.htm		
Required Software(s) (if any)		
Windows OS and MS-Office		





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School of Science B.Sc. (Zoology) Programme

Practical(s) (if any)

List of Sample Practical

1. Create/Delete a directory and files using DOS commands.
2. Create/Delete a files and folder in Windows.
3. Prepare a Bio-data in MS-Word.
4. Prepare an invitation to invite your friends to your birthday party. Prepare at least five letters using Mail Merge.
5. Create and Design Admission/Enquiry Forms etc.
6. Design E-book cover pages / Magazine front/ books front/back page using cover page option in Insert Menu.
7. Create Business Cards using Shapes, text, and colours.
8. Make books content page or index page
9. Use smart art and create organization charts
10. Create a slide show presentation about BMTU.
11. Create slides with your own contents and decorate the text using Text Fill, Text Effect, Shape Outline, Shape Fill, and Shape Effect.
12. Create slides of your choice and give custom animation effects

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PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE:: Semester End Evaluation





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Established by Tribal Development Department, Govt. of Gujarat

School of Science

B.Sc. (Zoology) Programme

Subject Code & Name: - BS01SEZOO2 Green House Technology

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
2	-	-	2	50%	00	50%	00

Programme Name	B.Sc. (Zoology)
Semester	I
Course Code	BS01SEZOO2
Course Title	Green House Technology
Course Content Type (Th./Pr.)	Theory
Course Credit	2
Sessions+ Lab. Per Week	2
Total Teaching/Lab. Hours	30 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

1. To enable students for pursuing respectable career through self-employment.
2. To develop abilities in farming business.
3. To develop the skilled to manage protective cultivation technology and construction of polyhouse.
4. To trained future industry professionals.
5. To impart comprehensive knowledge with extra emphasis on practice.

Learning Outcomes

On the Completion of this course, students will able to:

1. Understand the concept and importance of greenhouse.
2. Learn operation and maintenance of greenhouse technology.
3. Gain the knowledge about different types of greenhouse.
4. Impart skill based knowledge, which will helpful for start-up.





बिरसा मुंडा ट्रायबल युनिवर्सिटी Birsā Mūṇḁā Trāyabala Yūnīvārsīṭī

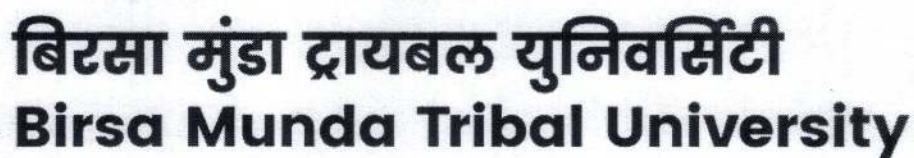
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School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	<ul style="list-style-type: none">• Introduction to Green House: Definition, concept, importance and scope.• Green House Technology: Operation, Maintenance and Management: light, temperature, humidity, pest and disease control, Advantages and applications in agriculture.• Types of Green House based on shape, utility, construction and covering material	15
II	<p>Structure and Construction of a Green House:</p> <ul style="list-style-type: none">• Location.• Frame work for various types of Green House.• Covering material.• Construction of typical Green House/poly house/ net house.• Construction of pipe framed Green House.• Construction of floors and Layout.• Design and development of low cost Green Houses structures.• Automated Green Houses, microcontrollers, waste water recycling.• Green House World Scenario.• Status in India.	15
Reference Books		
<ol style="list-style-type: none">1. Bose, T.K. and Som, T. K. 1986. Vegetable Crops in India. Naya Prakash, Kolkata.2. Bose, T.K. and Yadav, L.P. 1992. Commercial Flowers. Naya Prakash, Kolkata.3. Randhawa, G.S. and Mukhopadhyaya, A. 1994. Floriculture in India. Allied Publishers Pvt.Ltd. New Delhi.4. Shanmugavelu, K.G. 1985. Production Technology of Vegetable Crops. Oxford and IBM Publishing Co. Pvt. Ltd., New Delhi.5. Prasad S and Kumar U 2003. Commercial Floriculture. Agrobios.6. Prasad S and Kumar U 2003. Greenhouse management of horticultural crops. 2nd Edition. Agrobios.7. Principles of drip irrigation system, Dr. M.S. Mane, B.L.Ayare, Dr.S.S.Magar., Jain Bros., New Delhi8. Principles of sprinkler irrigation, Dr. M.S. Mane, Dr.B.L.Ayare. Jain Bros., New Delhi		





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PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE:: Semester End Evaluation





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Established by Tribal Development Department, Govt. of Gujarat

School of Science

B.Sc. (Zoology) Programme

Subject Code& Name: - BS01SEZOO3: Yoga in Practice

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
2	N/A	N/A	2	25	N/A	25	N/A

Programme Name	B.Sc. (Zoology)
Semester	1
Course Code	BS01SEZOO3
Course Title	Yoga in Practice
Course Content Type (Th./Pr.)	Th.
Course Credit	2
Sessions+ Lab. Per Week	2
Total Teaching/Lab. Hours	30 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

- Explain the concept of yoga in the contemporary context as well as for personal growth and development.
- Reflect on one's capabilities and ways to enhance them so as to utilize the same in a better way
- Develop physically, mentally, socially, emotionally and spiritually.

Prerequisites (if any)

N/A

Learning Outcomes

On the Completion of this course, students will able to:

- Understanding ways to harmonies the body and mind through Yoga.
- Disciplining the mind through practicing Yoga.
- Particularity about the Yoga Darshan through the selected topics of Yoga Philosophy based on Patanjala Yogasutra.





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School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	❖ Yoga: Asana, Pranayama and dhyana <ul style="list-style-type: none">➤ Yoga-Meaning and History➤ Understanding Asana and Pranayama➤ Asana: the basics➤ Significance of Asana➤ Surya Namaskara➤ Nadi shodhan Pranayama➤ Effect of Pranayama➤ Importance of Dhyana	15
II	❖ Pantanjali' Yogasutra and Chakra <ul style="list-style-type: none">➤ Introduction of Patanjali➤ The Eight-Fold Yoga (Astanga Yoga)<ul style="list-style-type: none">i) Yama ii) Niyama iii) Asana iv) Pranayama v) Pratyaharavi) Dharana vii) Dhyana viii) Samadhi➤ Pantanjali' Yogasutra: a summary➤ Chakras:- Muladhara, Swadhisthana, Manipura, Anahata, Vishuddha, Ajna, Sahasrara	15

Reference Books

1. Dasgupta, S. The Study of Patanjali. Calcutta: University of Calcutta Press, 1920.
2. Patanjali's Yog Pradeep- Swami Omanand Saraswati, Gita Press, Gorakhpur, 2013
3. Udayveer Shastri Granthavali 4, Patanjali- Yoga Darshanam, Udayveer Shastri, Govindram Hasanand, Delhi 6
4. Yog, Dr Puja Kotak, Bharti Print & Publishing House, Ahmedabad, 2014
5. Shree Patanjalyogdarshan with Rahsyadipika- Pujyamaharaj Nathu Publisher Shree harjivan Shah 1999.

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CCE:: Continuous and Comprehensive Evaluation

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School of Science B.Sc. (Zoology) Programme

Subject Code & Name: - BS01IKZOO1: श्रीमद् भगवद्गीता અને રામાયણનું જીવન સંગીત

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
2	N/A	N/A	2	25	N/A	25	N/A

Programme Name	B.Sc. (Zoology)
Semester	1
Course Code	BS01IKZOO1
Course Title	શ્રીમદ્ ભગવદ્ગીતા અને રામાયણનું જીવન સંગીત
Course Content Type (Th./Pr.)	Theory
Course Credit	2
Sessions+ Lab. Per Week	N/A
Total Teaching/Lab. Hours	30 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

1. વિદ્યાર્થીઓ ભારતીય જ્ઞાનના ભંડારરૂપ આર્ષ ગ્રંથોનો પરિચય મેળવે.
2. શ્રીમદ્ ભગવદ્ગીતા એ ભારતીય તત્ત્વજ્ઞાનની આધારશીલા છે તેના પ્રાથમિક જ્ઞાનથી પરિચિત થાય તેમજ વિશ્વબંધુત્વની ભાવના કેળવાય.
3. શ્રીમદ્ ભગવદ્ગીતાના સારરૂપ તત્ત્વનો બોધ પામે.
4. રામાયણમાં નિરૂપિત જીવનમૂલ્યોથી માહિતગાર થાય.
5. રામાયણકાલીન સંસ્કૃતિ તેમજ આદર્શ જીવનશૈલીથી પરિચિત થાય.





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Learning Outcomes

On the Completion of this course, students will able to:

1. श्रीमद् भगवद्गीता અને રામાયણમાં પ્રબોધિત માનવમૂલ્યોથી અવગત થશે.
2. સ્વસ્થ જીવન માટે સમસ્યાઓનું સમાધાન તેમજ સ્વનિયમનનું કૌશલ્ય પ્રાપ્ત કરશે.
3. આદર્શ રામરાજ્યની સંકલ્પના દ્વારા લોકશાહી તેમજ પ્રજાવત્સલ રાજાથી પરિચિત થશે.
4. રામાયણના કથાનકનો પરિચય મેળવશે.
5. રામાયણમાં નિરુપિત પાત્રોના આદર્શ જીવનથી પરિચિત થશે.

Detailed Contents

UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	<ul style="list-style-type: none">➤ શ્રીમદ્ ભગવદ્ગીતા વૈદિક ધર્મનો મૂલાધાર➤ શ્રીમદ્ ભગવદ્ગીતાનો સારાંશ➤ ગીતામાં જીવન જીવવાની કળા અથવા માનવજીવનમાં ઉપયોગીતા➤ શ્રીમદ્ ભગવદ્ગીતામાં સાંપ્રત વૈશ્વિક સમસ્યાનો ઉકેલ➤ શ્રીમદ્ ભગવદ્ગીતામાં ઇન્દ્રિયોને કાબુમાં રાખવાના ઉપાયો➤ શ્રીમદ્ ભગવદ્ગીતામાં શિક્ષણ અને કેળવણી➤ શ્રીમદ્ ભગવદ્ગીતામાં આંતર અને બાહ્ય સૌંદર્ય ખીલવવાનું શિક્ષણ	15





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II	<ul style="list-style-type: none">➤ रामायणनो संक्षिप्त कथासार➤ रामायणकालीन संस्कृति:-<ul style="list-style-type: none">▪ समाजव्यवस्था, शासनव्यवस्था, अर्थव्यवस्था, शिक्षणव्यवस्था, लोकजवन, वस्त्रो અને આભૂષણો, ખાનપાન, ઉત્સવો અને મોજશોખ, સંરક્ષણ વિચાર, પુરુષાર્થ વિચાર અને નૈતિક મૂલ્ય➤ રામાયણમાં પારિવારિક જીવન અને તેમાંથી પ્રતિબોધિત જીવનમૂલ્યો.➤ રામાયણના પાત્રો:<ul style="list-style-type: none">▪ રામ, લક્ષ્મણ, ભરત, દશરથ, સીતા, ઉર્મિલા, હનુમાન, રાવણ, જટાયુ, શબરી, ત્રિજટા, વિભીષણ, શ્રવણ, અંગદ	15
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Reference Books

1. શ્રીમદ્ ભગવદ્ગીતાનું જીવન સંગીત- સંપાદન ડૉ.દિનેશ પી.માછી, પ્રા.જીતેન્દ્ર આઈ.ટેલર, પ્રા. રાજેશ.આર.કગરાણા. પ્રકાશન- સંસ્કૃત વિભાગ, શ્રી મોહનસિંહ છોટુભાઈ રાઠવા આર્ટ્સ કોલેજ- પાવી.
2. શ્રીમદ્ ભગવદ્ગીતા(સંપૂર્ણ)- ડૉ.શાંતિકુમાર પંડ્યા, પાર્શ્વ પબ્લિકેશન, અમદાવાદ.
3. શ્રીમદ્ ભગવદ્ગીતા એક નૂતન અભિગમ- ડૉ.કુસુમબા જાડેજા, પાર્શ્વ પબ્લિકેશન, અમદાવાદ.
4. ગીતા અને આપણા પ્રશ્નો- સ્વામી સચ્ચિદાનંદ- ગૂર્જર પ્રકાશન, અમદાવાદ, ૧૯૮૯
5. નૈતિક શિક્ષણ અને શ્રીમદ્ ભગવદ્ગીતા- ડૉ.મુગટલાલ થાનકી, નવયુગ પ્રિન્ટીંગ પ્રેસ, અમદાવાદ.
6. શ્રીમદ્ ભગવદ્ગીતા- સાધક સંજીવની સહિત ગુજરાતી ટીકા, સ્વામી રામસુખદાસ, ગીતા પ્રેસ, ગોરખપુર.
7. વાલ્મીકિ રામાયણ ભાગ - ૧ ગુજરાતી અનુવાદ, સસ્તુ સાહિત્ય વર્ધક કાર્યાલય, અમદાવાદ.
8. રામાયણ, સમીક્ષિત વાચનાનો ગુજરાતી અનુવાદ, ડૉ. વિજય પંડ્યા, પાર્શ્વ પબ્લિકેશન, અમદાવાદ.
9. રામાયણ, સમીક્ષિત સંપાદન, ઓરિએન્ટલ ઇન્સ્ટીટ્યૂટ, વડોદરા.
10. આદિકવિ વાલ્મીકિ, ડૉ. રાધાવલ્લભ ત્રિપાઠી, સંસ્કૃત પરિષદ, સાગર.





બિરસા મુંડા ટ્રાયબલ યુનિવર્સિટી Birsā Munda Tribal University

રાજપિપલા, જિ. નર્મદા Rajpipla, Dist. Narmada

Established by Tribal Development Department, Govt. of Gujarat

School of Science B.Sc. (Zoology) Programme

Web Resources

1. રામાયણની ચરિત્રકથાઓ)sadhanaweekly.com)
2. <https://www.gitasupersite.iitk.ac.in/srimad>
3. <https://www.valmiki.iitk.ac.in/>

L:: Lecture, **T::** Tutorial , **P::**Practical

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(CCE Theory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation, slip tests (announced/surprised), attendance etc. or any combination of these)

PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE:: Semester End Evaluation





बिरसा मुंडा ट्रायबल युनिवर्सिटी Birsā Munda Tribal University

राजपिपला, जि० नर्मदा Rajpipla, Dist. Narmda

Established by Tribal Development Department, Govt. of Gujarat

School of Science B.Sc. (Zoology) Programme

Subject Code & Subject Name: BS01IKZOO2 Constitutional Values and Fundamental Rights

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
2	-	-	2	50%	00	50%	00

Programme Name	B.Sc. (Zoology)
Semester	I
Course Code	BS01IKZOO2
Course Title	Constitutional Values and Fundamental Rights
Course Content Type (Th./Pr.)	Theory
Course Credit	2
Sessions+ Lab. Per Week	N/A
Total Teaching/Lab. Hours	30 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

1. To enhance the students' understanding and significance of the Indian Constitution.
2. To evaluation of the preamble of the Constitution.
3. To cultivate knowledge regarding the basic values of the Indian Constitution.
4. To raise students' understanding of their fundamental rights.
5. To uphold democratic ideals based on the equality of all societal members and individual liberty.

Learning Outcomes

On the Completion of this course, students will able to:

1. The study of the process of constitution making in India as well as the growth of the constitution.
2. An analysis of the fundamental aspects of the Constitution of India.
3. An analysis of the principles that are outlined in the constitutional values of the Indian Constitution.
4. A goal is to instil a sense of safety and confidence in the country's minority groups.





बिरसा मुंडा ट्रायबल युनिवर्सिटी Birsā Mūṇḍā Drāyabala Yūnīvārsīṭī

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School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Constitution of India A. Introduction of Constitution of India B. Nature of Constitution of India C. Salient Features of the Constitution of India D. Preamble E. Rule of Law F. Separation of Powers Constitutional Values A. JUSTICE - social, economic and political B. LIBERTY - thought, expression, belief, faith and worship C. EQUALITY - status and of opportunity D. FRATERNITY – dignity, unity and integrity of the Nation	15
II	Fundamental Rights of the Indian Constitution A. Introduction B. Article 12 - State C. Article 13 – Judicial Review D. Article 14 to 18 – Right to Equality E. Article 19 – Right to Freedom F. Article 20 – Freedom in respect of conviction offences G. Article 21 – Right to life and Personal liberty H. Article 22 – Freedom and safeguard against arbitrary arrest and detention I. Article 23 – 24 – Right Against Exploitation J. Article 25 to 28 – Freedom of Religion K. Article 29 – 30 – Cultural and Educational Rights of Minorities L. Article 32 to 35 – Constitutional Remedies	15





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School of Science B.Sc. (Zoology) Programme

Reference Books

1. Jain, M. P. (2022). Constituonal Law. LexisNexis.
2. Joshi, D. K. (2019). Constituion of India. Allahabad: Central Law Publication.
3. Myneni, S. R. (2011). Constitutional Law - I . Hyderabad: Asia Law House.
4. Pandey, D. J. (2019). Constitutional Law of India. Allahabad: Central Law Publication.
5. Rao, M. (2013). Constitutional Law, Lucknow: Eastern Book Company.

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CCE:: Continuous and Comprehensive Evaluation

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PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE:: Semester End Evaluation





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School of Science B.Sc. (Zoology) Programme

Subject Code& Name: BS02MJZOO1 Non – Chordates II

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	-	1	4	37.5 %	12.5 %	37.5 %	12.5 %

Programme Name	B.Sc. Zoology
Semester	II
Course Code	BS02MJZOO1
Course Title	Non – Chordates II
Course Content Type (Th./Pr.)	Theory + Practical
Course Credit	3 + 1
Sessions+ Lab. Per Week	3 + 2
Total Teaching/Lab. Hours	45 Theory Hours + 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

- The student receives training and skills in the basics of zoology, understands the complex interactions of different living organisms.

Prerequisites (if any)

- Student must know about different strata and hierarchy of taxonomy.
- Student must aware about specific terms used for animal organ and organ systems.

Learning Outcomes

On the Completion of this course, students will able to:

- Students were able to learn about the taxonomy and diversity of different classes of animals.
- Students will learn about morphology and organ systems of primitive animal.





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School of Science

B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	<p>Scheme of classification of phylum Annelida to Mollusca up to class with examples:</p> <ol style="list-style-type: none">1. Classification outline of phylum Annelida (up to class).<ul style="list-style-type: none">• General characters Annelids.• Brief introduction of Nereis, Aphrodite, Leech and Amphitrite.• Types of Metamerism and its significance.2. Classification outline of phylum Arthropoda (up to class).<ul style="list-style-type: none">• General characters Arthropods.• Brief introduction of Apus, Prawn, Crab, Butterfly, Centipede and Scorpion.• Metamorphosis and types in Insects.• Mouthparts of Insects.3. Classification outline of phylum Mollusca (up to class).<ul style="list-style-type: none">• General characters Mollusca.• Brief introduction of Chiton, Dentalium, Pila, Unio and Octopus.• Economic Importance of Mollusca.	15
II	<p>Scheme of classification of phylum Echinodermata and Hemichordata up to class with examples:</p> <ol style="list-style-type: none">1. Classification outline of phylum Echinodermata (up to class).<ul style="list-style-type: none">• General characters Echinoderms.• Brief introduction of Brittle star, Sea urchin, Sea cucumber, Feather star and Starfish.• Autonomy and Regeneration in Echinoderm.• Water vascular system in Asteroidea.2. Classification outline of phylum Hemichordata (up to class).<ul style="list-style-type: none">• General characters Hemichordates.• Brief introduction of Balanoglossus.• Study of Balanoglossus as connecting link between non-chordates and chordates.	15





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School of Science B.Sc. (Zoology) Programme

III	General Morphology and Functional Anatomy: Earthworm (<i>Pheretima posthuma</i>) <ul style="list-style-type: none">• Habit & Habitat• External characters and Body wall• Digestive system• Respiratory system• Cardio vascular system (Heart, Arterial system and Venous system)• Excretory system• Nervous system• Reproductive system and Reproduction.	15
Unit – IV Practical(s)		30 Hours
<ol style="list-style-type: none">1. To study the classification of phylum Annelida and Arthropoda up to class with examples.<ul style="list-style-type: none">- <i>Nereis, Aphrodite, Amphitrite, Leech, Apus, Balanus, Prawn, Crab, Centipede, Butterfly and Scorpion.</i>2. To study the classification of phylum Mollusca, Echinodermata and Hemichordata up to class with examples.<ul style="list-style-type: none">- <i>Chiton, Dentalium, Pila, Unio, Octopus, Brittle star, Sea urchin, Sea cucumber, Feather star, Starfish and Balanoglossus. Physalia, Aurelia, Corals, Sea anemone, Pleurobranchia.</i>3. To study external characters and Body wall of Earthworm.4. To study Digestive system of Earthworm.5. To study Cardio vascular system (Heart, Arterial system and Venous system) of Earthworm.6. To study Nervous system of Earthworm.7. To study Reproductive system and Reproduction of Earthworm.8. To study mountings of Earthworm: Nephredia, Ovary and Blood gland.		
Text Book(s)		
<ol style="list-style-type: none">1. Invertebrate Zoology by E. L. Jordan & P. S. Verma2. A modern textbook of Zoology– Invertebrate Zoology by R. L. Kotpal3. A textbook of Practical Zoology – Invertebrates by S. S. Lal4. A Manual of Practical Zoology –Invertebrates by P. S. Verma		
Reference Books		





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School of Science B.Sc. (Zoology) Programme

1. Nirav College Zoology – 204 for B.Sc. Students by Mihir Suthar and Haresh Patel.
2. A Manual of Zoology- Vol. I & II by Ayyar and Ananthakrishnan.
3. Structure and Functions of Invertebrates by Barrington
4. Textbook of Invertebrates, 5th Ed. by Dhami and Dhami
5. Principles of Animal Taxonomy by Wallace, Dyson George and Gaylord Simpson.

Web Resources

1. [You Tube Invertebrate Animation Link](#)

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(CCE Theory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation; slip tests (announced/ surprised), attendance etc. or any combination of these)

PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.) **SEE:** Semester End Evaluation.





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School of Science

B.Sc. (Zoology) Programme

Subject Code & Name: BS02MJZOO2 Chordates – II

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	-	1	4	37.5 %	12.5 %	37.5 %	12.5 %

Programme Name	B.Sc. Zoology
Semester	II
Course Code	BS02MJZOO2
Course Title	Chordates – II
Course Content Type (Th./Pr.)	Theory + Practical
Course Credit	3 + 1
Sessions + Lab. Per Week	3 + 2
Total Teaching/Lab. Hours	45 Theory Hours + 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

- The student receives training and skills in the basics of zoology, understands the complex interactions of different living organisms.

Prerequisites (if any)

- Student must know about different strata and hierarchy of taxonomy.
- Student must aware about specific terms used for animal organ and organ systems.

Learning Outcomes

On the Completion of this course, students will able to:

- Students were able to learn about the taxonomy and diversity of different classes of animals.
- Students will learn about morphology and organ systems of primitive animal.





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School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	<p>Scheme of Classification of class Reptilia to class Aves.</p> <ol style="list-style-type: none">General character of Super class tetrapoda.Classification outline of class: Reptile.<ul style="list-style-type: none">General characters of Reptile.Brief details of Giant turtle, Tuatara, Common house lizard, Horned toad, Chameleon, Rat snake.Origin of ReptilesStudy of identification key for venomous and non-venomous snakes.Common venomous and non-venomous snakes of Gujarat.Classification outline of class: Aves.<ul style="list-style-type: none">General characters of class Aves.Brief details of Stork, Peacock, Kingfisher, Crow, Parakeet and Owl.Origin and affinities of Birds.Adaptation of beak and feet in Birds.	15
II	<p>Scheme of Classification of class Mammals and general topics.</p> <ol style="list-style-type: none">Classification outline of class: Mammals up to Infra class.<ul style="list-style-type: none">General characters of Mammals.Brief details of Hedgehog, Flying fox, Human, Dog, Blue whale, Dugong, Squirrel and Elephant.Origin of Mammals.Hibernation and Aestivation.Aquatic mammals and Adaptations.Dentition in mammals.	15





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School of Science B.Sc. (Zoology) Programme

III	<p>General Morphology and Functional Anatomy: Garden Lizard (<i>Calotes versicolor</i>)</p> <ul style="list-style-type: none">• External characters• Digestive System• Circulatory system (Heart, Arterial system and Venous)• Respiratory system• Nervous system (Brain and cranial nerves)• Sense organs (Refer <i>Uromastix</i>)• Urinogenital system	15
Unit – IV Practical(s)		30 Hours
<ol style="list-style-type: none">1. To study the classification of class Reptile up to subclass with examples. - Giant turtle, Tuatara, Common house lizard, Horned Toad, Chameleon, Rat snake and Sea snake.2. To study the classification of Aves up to subclass with examples. - Stork, Pelican, Goose, Kite, Peacock, Pigeon, Cuckoo, Parakeet, Owl, Swift, Kingfisher, Woodpecker, Crow, Crane, Red-wattled lapwing.3. To study the classification of class Mammals up to subclass with examples. - Hedge Hog, Flying fox, Human, Dog, Blue whale, Donkey, Blue bull, Elephant, Dugong, Squirrel, Indian Hare and Scaly anteater.4. To study of identification key for venomous and non-venomous snakes.5. To study the adaptation of beak and feet in Birds6. To study the external characters of <i>Calotes</i>.7. To study the digestive system of <i>Calotes</i>.8. To study the arterial system of <i>Calotes</i>.9. To study the dorsal and ventral view of brain of <i>Calotes</i>.10. To study the urinogenital system of male and female <i>Calotes</i>.		



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School of Science B.Sc. (Zoology) Programme

Text Book(s)

1. Chordate Zoology by E. L. Jordan & P. S. Verma
2. Modern textbook of Zoology –Vertebrate Zoology by R. L. Kotpal
3. Practical Zoology –Vertebrates by S. S. Lal
4. A Manual of Practical Zoology – Chordates by P. S. Verma

Reference Books

1. Nirav College Zoology – 202 for B.Sc. Students by Mihir Suthar, Haresh Patel and Kamlesh Shah.
2. A Manual of Zoology- Vol. I & II by Ayyar and Ananthakrishnan.
3. Chordate Zoology by Dhami and Dhami.
4. A Textbook of Vertebrate Zoology by Prasad and Kashyap.
5. A Text Book of Chordates (Saras Publication) by Arumugam.

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PWE::Practical Work Examination

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SEE::Semester End Evaluation





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School of Science

B.Sc. (Zoology) Programme

Subject Code & Name: - BS02MIZOO1 Basic Chemistry-II

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	-	1	4	37.5 %	12.5 %	37.5 %	12.5 %

Programme Name	B.Sc. (Zoology)
Semester	II
Course Code	BS02MIZOO1
Course Title	Basic Chemistry-II
Course Content Type (Th./Pr.)	Theory & Practical
Course Credit	3+1
Sessions+ Lab. Per Week	3+2
Total Teaching/Lab. Hours	45 Theory Hours + 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

1. Understand how the adsorption mechanism takes place on the surface of solids and what the factors effects on adsorption.
2. To understand physical trends of elements and their chemical properties.
3. To get information about oxidation states and anomalous properties of elements.
4. To understand concept of hybridization, MO theory and its applications.

Learning Outcomes

On the Completion of this course, students will able to:

1. Understand different reaction isotherms and their applications and limitations.
2. Understand catalyst and their uses in different organic reactions.
3. Students can calculate electronegativity, oxidation state and metallic radii.
4. Understand how enzyme works as a catalyst and its applications in different chemical reactions.
5. Understand behavior of Langmuir and Freundlich isotherms.





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School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Periodicity <ul style="list-style-type: none">➤ Study of modern periodic table, electronic configuration in periodic table, Periodicity in atomic properties and its causes, Magic number➤ Explanation of general trends of periodic properties<ul style="list-style-type: none">(1) Atomic radii (covalent, metallic and van der Waals radii)(2) Calculation of Ionic radii by Pauling method(3) Ionization potential(4) Electron gain enthalpy(5) Electronegativity➤ Calculation of Electronegativity by Mulliken and Pauling method.➤ Periodic Trends in Chemical Properties,<ul style="list-style-type: none">(a) Periodicity of Valence or Oxidation States(b) Anomalous Properties of Second Period Elements, Periodic Trends and Chemical Reactivity	15
II	Chemical bonding <ul style="list-style-type: none">➤ Basics of Covalent bond, Ionic bond, Coordinate covalent bond and H-bonding➤ Octet rule and its limitation➤ Lewis Structure, Bond Length, Bond order, Bond Angle Geometry and its shapes of Molecule➤ Valence bond theory and its limitations➤ Sidgwick Powell rule and VSEPR theory,➤ Concept of hybridization: sp, sp^2, sp^3, sp^3d & sp^3d^2➤ MO theory and its application➤ Energy level diagrams of B_2, C_2, N_2, O_2, F_2, CO, and NO calculation of bond order and magnetic properties.	15



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III	Adsorption and Catalysis <ul style="list-style-type: none">➤ Introduction➤ Characteristics and factors affecting on adsorption➤ Mechanism of Adsorption➤ Types of Adsorptions (physical and chemical)➤ Adsorption isotherm and Freundlich equation with limitations,➤ Langmuir theory of adsorption: assumptions, derivation, modification in equation at very low and high pressure.➤ Applications of adsorption.➤ Introduction of catalysis➤ Types of catalysis (homogeneous and heterogeneous)➤ Active centers, Enzyme catalysis and its characteristics.➤ Basic concept of acid-base theory : Arrhenius, Lowry-Bronsted and Lewis	15
Unit – IV Practical(s) 30 Hours		
Organic qualitative analysis <p>Identification of Aromatic Hydrocarbons or Compounds containing a functional group (other than multiple bond) using Physical and Chemical tests. (Minimum 06 compounds covering all the chemical nature must be given)</p> <p>Examples: Carboxylic acids: Aliphatic acids like oxalic and succinic acid, Aromatic acids: Benzoic acid, cinnamic acid and phthalic acid Phenols: α-naphthol, β-naphthol, Resorcinol Bases: Aniline, methylaniline, dimethylamine Neutral: Acetone, Ethyl methyl ketone, Ethyl acetate, naphthalene, anthracene, nitrobenzene, benzamide, urea, thiourea, chloroform, acetanilide, benzanilide, carbon tetra chloride, chloroform, chlorobenzene, bromobenzene.</p> Volumetric Titration (any three) <ol style="list-style-type: none">1. To determine the strength of NaOH and Na_2CO_3 present in the solution mixture of NaOH and Na_2CO_3 and to find out their percentage composition.2. To determine the strength of NaHCO_3 and Na_2CO_3 present in the solution mixture of NaHCO_3 and Na_2CO_3 and to find out their percentage composition.3. To determine the Normality, g/liter and Molarity of $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ and H_2SO_4 present in the solution mixture of $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ and H_2SO_4 by using XN NaOH and YN KMnO_4 Solution.		





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4. To determine the Normality, g/liter and Molarity of $\text{H}_2\text{C}_2\text{O}_4$, $2\text{H}_2\text{O}$ and $\text{K}_2\text{C}_2\text{O}_4$ present in the solution mixture $\text{H}_2\text{C}_2\text{O}_4$, $2\text{H}_2\text{O}$ and $\text{K}_2\text{C}_2\text{O}_4$ by using XN NaOH and YN KMnO_4 Solution.
5. To determine the amount of Ca^{+2} and Mg^{+2} ion by EDTA solution from the mixture solution of CaCl_2 and MgCl_2 .

Reference Books

1. Basic Inorganic Chemistry – Gurdeep & Chatwal.
2. Inorganic Chemistry - J. N. Gurtu & H. C. Khera
3. Principles of Inorganic chemistry- B. R. Puri, L. R. Sharma and K. C. Kalia; Vallabh publications, Delhi.
4. Coordination chemistry-Ajai Kumar; Aaryush Education, U.P.
5. Organic Reaction Mechanism, including Reaction Intermediates, V. K. Ahluwalia
6. Organic Chemistry, Vol-1, Jagdamba Singh, L. D.S. Yadav, Pragati Prakashan, 8th edition-2013
7. Organic Chemistry by Morrison and Boyd.
8. Essentials of Physical Chemistry, B. S. Bahl, G. D. Tuli and Arun Bahl, S. Chand & Co.
9. Physical Chemistry, 7th edition P. C. Rakshit
10. Elements of Physical Chemistry, B. R. Puri, L. R. Sharma and Madan Pathania, Vishal Publishing Co. Jalandhar.
11. Organic Chemistry- Nimai Tewari Volume I & II

L: Lecture, **T:** Tutorial, **P:** Practical

CCE: Continuous and Comprehensive Evaluation

(CCE Theory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation; slip tests (announced/surprised), attendance etc. or any combination of these)

PWE: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE: Semester End Evaluation





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School of Science

B.Sc. (Zoology) Programme

Subject Code & Name: - BS02MIZOO2 Fundamentals of Mechanics & Optics

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	0	1	4	37.5 %	12.5 %	37.5 %	12.5 %

Programme Name	B.Sc. (Zoology)
Semester	II
Course Code	BS02MIZOO2
Course Title	Fundamentals of Mechanics & Optics
Course Content Type(Th./Pr.)	Theory & Practical
Course Credit	3+1
Sessions+ Lab. Per Week	3+2
Total Teaching/Lab. Hours	45 Theory Hours + 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

Students will able to study

1. To understand the basic concepts of types of waves with special reference to Ultrasonic waves and its applications. The unit also introduces understanding of oscillations with special emphasis on properties of simple harmonic motion observed in case studies of different types of pendulums.
2. To understand the theoretical concepts of material behaviour with particular emphasis on their elastic property.
3. To provide exposure to various properties of Laser, production techniques of Laser and its applications.

Prerequisites (if any)

12th Science passed with Physics subject.





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Learning Outcomes

On the Completion of this course, students will able to:

1. The Student will get the overview of core concepts in the field of mechanics and basic optics.
2. Able to understand elastic nature of material, types of elastic modulus and different methods to determine elastic modulus.
3. Learn the structure and properties of lasers, their performance and applications in engineering and medical fields.
4. Learn the basic necessary mathematics tools to solve mechanics problems.

Detailed Contents

UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Elasticity Introduction, Definitions of Load, Stress and Strain, Hooke's Law & Stress-strain diagram, Three types of elasticity:(i) Young's modulus (ii) Bulk Modulus and (iii) Modulus of Rigidity, Work done per unit volume in elongation strain, Deformation of a cube- (Bulk modulus, Modulus of rigidity, Young modulus), Relation connecting the elastic constants, Poisson's ratio, Relation for K and η in terms of Poisson's ratio, Limiting values of σ , Determination of Poisson's ratio for rubber, Twisting couple on a cylinder (or wire), Torsional pendulum, Determination of η -Statical method (Horizontal twisting apparatus for a rod), Bending of beams, Bending moment, The cantilever-when the weight of beam is ineffective, Depression of a beam supported at the ends when the beam is loaded at the centre, Related Numerical	15
II	Fiber optics and Ultrasonic waves Introduction, Fiber- Optic System, The Primary advantages of Fiber-Optic Communication compared to metallic cable (Electrical) communication, Fiber cable construction, Basic Principle- Total internal reflection, Acceptance angle and Numerical Aperture, Propagation of light through optical fiber, index Profile, Fiber configurations, Difference between various configurations, Related Numerical	15





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II	Introduction to Ultrasonic waves, Production of ultrasonic waves (1) Magnetostriction method (2) Piezo-electric method, Detection of Ultrasonic, Properties of Ultrasonic, Wavelength of Ultrasonic waves, Applications of ultrasonic waves, Related Numerical	15
III	LASER Introduction, Properties of LASER, Stimulated absorption, Spontaneous emission and Stimulated emission, Relation between Einstein's A and B coefficients, Population Inversion, Pumping, Main component of LASER, ND: YAG LASER, CO ₂ LASER, Application of LASER in material processing, Holography and Other application of Laser, Related Numerical	15

Unit-IV-Practical(s)

(30)

1. Wattage of the bulb.
2. Y by Cantilever
3. η by static method
4. Depression of a beam when loaded at middle.
5. Determine the Moment of Inertia of different bodies using bifiller suspension method.
6. To measure the angle of prism and calibration of spectrometer.
7. Determine resolving power of prism.
8. Measure elastic constants using Searl's method.

Text Book(s)

1. Unit 1: Mechanics by D. S. Mathur, S. Chand Publication
2. Unit 2: (i) Engineering Physics by R K Gaur and S L Gupta, Dhanpatrai Publication
(ii) Engineering Physics by G. Vijayakumari, Vikas Publishing house,
3. Unit 3: LASER by K. Rajgopal, PHI Learning, New Delhi

Reference Books

1. Mechanics by Prof. D.S.Mathur, Revised by Dr. P.S. Hemne, Revised Edition, S.Chand Publication.
2. Basics of LASER Physics by Karl. F.Rank, 2nd Edition, Springer Publication.
3. A Textbook of Optics, D. N. Vasudeva, Atma Ram & Sons, Delhi (20th Edition).
4. Practical Physics by Gupta, Kumar Pragati Prakashan
5. B.Sc. Practical Physics by C.L. Arora, S.Chand Publication





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Web Resources

1. <https://phys.libretexts.org>
2. <https://www.youtube.com/watch?v=ssv9vDWKQDk>
3. <https://archive.nptel.ac.in/courses/115/102/115102124/>
4. <https://youtu.be/i1EI503LhFQ?si=wpJLHKrjVFT-GQDN>
5. <https://archive.nptel.ac.in/courses/104/104/104104085/>
6. <https://nptel.ac.in/courses/115106119>

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PWE: Practical Work Examination

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SEE: Semester End Evaluation





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School of Science

B.Sc. (Zoology) Programme

Subject Code & Name: - BS02MIZOO3 Mathematics-II

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	0	1	4	37.5 %	12.5 %	37.5 %	12.5 %

Programme Name	B.Sc.
Semester	II
Course Code	BS02MIZOO3
Course Title	Mathematics – II
Course Content Type(Th./Pr.)	Theory & Practical
Course Credit	3 + 1
Sessions+ Lab. Per Week	3+2
Total Teaching/Lab. Hours	45 Theory Hours + 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

Students will able to study

1. Understanding the concept of differentiation and its applications.
2. Developing the ability to find derivatives of various functions using differentiation rules.
3. Exploring differential equations and their real world applications.

Prerequisites (if any)

12th Science passed with Mathematics as a subject.

Learning Outcomes

On the Completion of this course, students will able to:

1. Apply the knowledge of differential equation and its application.
2. Recall and understand limit and continuity of functions of several variables.
3. Recall Young's and Schwartz's theorem without proof.
4. Understand partial differentiation.
5. Solve problems related to partial differentiation.





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Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Revision of Ordinary differential equation , Order and degree of differential equation, Variable separable equation, Homogeneous differential equation and Non- homogeneous differential equations. Differential Equations of First Order and First Degree: Definition and method of solving of Linear differential equations of first order and first degree. Definition and method of solving of Bernoulli's differential equation and Definition and methods of solving of Exact differential equation. Differential equations of first order and higher degree: Differential equations of first order and first degree solvable for x, solvable for y, solvable for p.	15
II	Clairaut's form of differential equation and Lagrange's form of differential equations. Linear differential equations of higher order Linear differential equations of higher order with constant coefficients. Operator D, Meaning of auxiliary equation, Roots of auxiliary equation and solution of auxiliary equation $f(D)y = 0$ for real roots and complex roots, Operator $1/D$. Solution of differential equations of the type $f(D)y = X$. Meaning of complimentary function (C.F.) and Particular integral (P.I.). Methods to obtain Particular integral(P.I.) when $X = e^{ax}$, $X = \sin mx$, $X = \cos mx$, $X = \sin (ax+b)$, $X = \cos(ax+b)$, $X = x^m$, $X = e^{ax} V$, V is the function of x.	15





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III	Limit and continuity of function of several variables. Partial derivatives, Partial derivatives of higher order, Partial differentiation of composite function, Homogeneous function, Euler's theorem on homogeneous function of two and three variables, Total differential and chain rule, Change of variables, Partial differentiation of implicit function, Total differential Young's and Schwartz's theorem (without proof). Errors and approximate values, Jacobians, Taylor's theorem of function of two variables, Maxima, Minima, Saddle points of function of several variables, Lagrange's method of undetermined multipliers.	15
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Unit – IV Practical(s) 30 Hours

1. Practical problem based on homogeneous differential equation.
2. Practical problem based on non-homogeneous differential equation.
3. Practical problem based on linear differential equations of first order and first degree.
4. Practical problem based on method of solving of Bernoulli's differential equation.
5. Practical problem based on method of solving Exact differential equation.
6. Practical problem based on method of solving Lagrange's differential equations.
7. Practical problem based on method of solving differential equations of the type $f(D)y = e^{ax}$.
8. Practical problem based on method of solving differential equations of the type $f(D)y = \sin(ax+b)$.
9. Practical problem based on method of solving differential equations of the type $f(D)y = \cos(ax+b)$.
10. Practical problem based on method of solving differential equations of the type $f(D)y = x^n$.
11. Practical problem based on method of solving differential equations of the type $f(D)y = e^{ax} x^n$.
12. Practical problem based on method of solving differential equations of the type $f(D)y = \sin(ax + b)$.
13. Practical problem based on method of solving differential equations of the type $f(D)y = \cos(ax + b)$.
14. Practical problem based on method of solving Linear differential equations with variable coefficient





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Text Books

Unit 1 & 2: Mathematical Physics, - H.K.Dass, S.Chand.

Unit 3 : Differential Calculus by Shanti Narayan. 15th Edition (2004).

Reference Books

1. Differential Calculus by Shanti Narayan

2. Differential Calculus by Gorakh Prasad

3. Differential Equations by D. A. Murray

4. A Text book of Calculus, S. C. Arora and Ramesh Kumar, Pitamber Publishing, New Delhi

Web Resources

1. <https://math.libretexts.org/>

2. <https://archive.nptel.ac.in/courses/111/104/111104144/>

3. <https://archive.nptel.ac.in/courses/111/106/111106146/>

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School of Science

B.Sc. (Zoology) Programme

Subject Code & Name: - BS02MDCHE1: Agricultural Chemistry

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	-	1	4	37.5 %	12.5 %	37.5 %	12.5 %

Programme Name	B.Sc. (Zoology)
Semester	II
Course Code	BS02MDCHE1
Course Title	Agricultural Chemistry
Course Content Type (Th./Pr.)	Theory & Practical
Course Credit	3+1
Sessions+ Lab. Per Week	3+2
Total Teaching/Lab. Hours	45 Theory Hours + 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

1. Agricultural chemistry often aims at preserving or increasing the fertility of soil with the goals of maintaining or improving the agricultural yield and improving the quality of the crop
2. As a form of applied sciences, some main aims of agricultural chemistry are: Increase yield of crops and livestock. Improving the quality of products. Reducing the cost of products.
3. To convert natural resources into viable business enterprises through scientific, technical, public private partnership and marketing support.





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Learning Outcomes

On the Completion of this course, students will able to:

1. Demonstrate the ability to apply appropriate theoretical knowledge, access relevant information, understand the principles of project and experimental design
2. Utilize practical skills, technology and computational systems when addressing problems and challenges related to agriculture.
3. Students will understand and analyze the current events and issues that are occurring in agriculture and how they affect your future in agriculture.
4. Students will be able to recognize and examine the relationships between inputs and outputs in their agricultural field to make effective and profitable decisions.
5. Acquire the ability to engage in independent and life-long learning in the ever-changing agricultural production system/enterprises.

Detailed Contents

UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Introduction of Soil Science Soil-pedagogical and edaphological concepts, origin of the earth, rocks and minerals, weathering, soil profile, retention of water by soil, movement of soil water, layer silicate clays-genesis and classification, cation and anion exchange, humus-fraction of organic matter, carbon cycle, soil colloids, soil organic matter	15
II	Soil Chemistry, Soil Fertility & Nutrient Managements Soil chemistry, soil pH and buffer pH, soil as a source of plant nutrient, all about nitrogen, phosphorous, potassium, secondary nutrients, micro nutrients, nutrient deficiency and toxicity, soil fertility evolution	15
III	Manures, Fertilizers & Agrochemicals Manures-types, composition and values, green manures, composition of organic waste, classification of fertilizers-N,P and K, Nitrogenous fertilizers, potassium fertilizers, secondary and micronutrients fertilizers, complex fertilizers, mixed fertilizers, organophosphates, impacts of fertilizers on the environment Insecticides, herbicides, pesticides	15





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Unit – IV Practical(s)	30 Hours
Basic techniques & Calculations (Any five)	
<ol style="list-style-type: none">1. Determination of EC and pH of soil2. Determination of cation exchange capacity of soil3. Estimation of organic carbon content in soil4. Determination of densities of soil5. Determination of moisture content from soil and plant6. Determination of maximum water holding capacity (MWHC) of soil.7. Determination of hydraulic conductivity of soil	
Text Book(s)	
<ol style="list-style-type: none">1. Introductory soil science, D.K. Das, Kalyani publishers	
Reference Books	
<ol style="list-style-type: none">1. A handbook of soil. Fertilizer and manure, P.K. Gupta, Agribios2. Soil fertility and fertilizer, samual L. Tisdale and Nelson, PHI Learning publishers3. Fundamentals of soil science, V.N. Sahai, Kalyani publishers	
Web Resources	
www.agrigyan.in	

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(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE:: Semester End Evaluation





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B.Sc. (Zoology) Programme

Subject Code & Name: - BS02MDZOO2 - Biochemistry

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	-	1	4	37.5 %	12.5 %	37.5 %	12.5 %

Programme Name	B.Sc. (Zoology)
Semester	II
Course Code	BS02MDZOO2
Course Title	Bio-chemistry
Course Content Type (Th./Pr.)	Theory & Practical
Course Credit	3 + 1
Sessions+ Lab. Per Week	3 + 2
Total Teaching/Lab. Hours	45 Theory Hours + 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

The course aims to provide student with an understanding of biomolecules such as proteins and carbohydrates focusing on their structural underpinning, unique properties, biological roles and functions and interrelations.

Prerequisites (if any)

Learning Outcomes

On the Completion of this course, students will able to:

1. Acquainted with chemical a molecular foundations of life and appreciate the role of water in biological system.
2. Able to comprehend the structure, function and acid-base properties of amino acids.
3. Explain the hierarchical structure of structure proteins and their biological significance.
4. Explain the structures and properties of carbohydrates.





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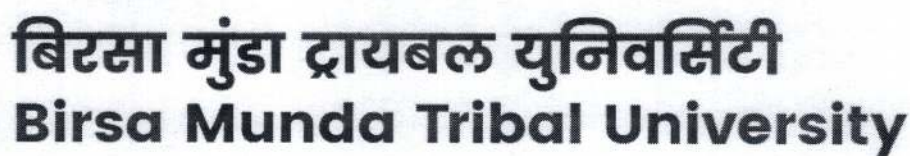
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Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Foundation of Biochemistry <ul style="list-style-type: none">• Properties and structure of water molecule.• pH, pH scale and Buffers (Phosphate and Citrate buffer). Introduction and Classification of Carbohydrates: <ul style="list-style-type: none">• Sources and nutritive values of Carbohydrates.• Monosaccharides: Aldoses and ketoses, trioses, tetroses, pentoses and hexoses.• Stereoisomerism of Monosaccharides.• Disaccharides: Maltose, Lactose and Sucrose.• Polysaccharides: Starch and Glycogen.• Structural polysaccharides: Cellulose and chitin.	15
II	Introduction and Classification of Proteins: <ul style="list-style-type: none">• Sources and nutritive values of Proteins.• Properties of proteins.• Classification of proteins: Simple proteins, Compound proteins and Derived proteins.• Biological functions of proteins.• Configuration of Proteins with their examples: Primary, Secondary, Tertiary and Quaternary.• Properties and structure of Amino acids.• Classification of Amino acids.	15





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III	Introduction and Classification of Lipids: <ul style="list-style-type: none"> • Sources and nutritive values of Lipids. • Properties of Lipids. • Classification of Lipids: Simple Lipids, Compound Lipids and Derived Lipids. • Structure and classification of fatty acids. • Biological functions of Lipids. 	15
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Unit - IV Practical(s)	30 Hours
<ol style="list-style-type: none">1. Preparation of buffers, phosphate and acetate buffers.2. Determination of pKa of acetic acid.3. Qualitative tests for carbohydrates.4. Qualitative tests for amino acids.5. Estimation of amino acid by Ninhydrin method.6. Separation of amino acid mixture by thin layer chromatography/paper chromatography.7. Estimation of vitamin C from lemon fruits.	
Text Book(s)	
<ol style="list-style-type: none">1. Elementary Biochemistry by Jain and Jain.2. Biochemistry by U. Satyanarayana and U. Chakrapani.	
Reference Books	
<ol style="list-style-type: none">1. Lehninger: Principles of Biochemistry by D.L Nelson, Lehninger A.L. and Cox M.M.2. Biochemistry by Berg J. M. Tymoczko J. L. and L. Stryer.3. Biochemistry by Voet & Voet.	

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B.Sc. (Zoology) Programme

Subject Code & Name: - BS02MDZOO3 Basic Electronics

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	0	1	4	37.5 %	12.5 %	37.5 %	12.5 %

Programme Name	B.Sc. (Zoology)
Semester	II
Course Code	BS02MDZOO3
Course Title	Basic Electronics
Course Content Type(Th./Pr.)	Theory + Practical
Course Credit	3+1
Sessions+ Lab. Per Week	3+2
Total Teaching/Lab. Hours	45 Theory Hours + 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

1. Learn about basic electronic components like semiconductor diode and transistor.
2. They will learn about types of special purpose diode, rectifier their types and its real world applications.
3. They will learn about characteristics of transistors, Boolean expression of different gates and various number systems.

Learning Outcomes

On the Completion of this course, students will able to:

1. The Student will get the overview of core concepts in the field of electronics.
2. Able to apply the theoretical knowledge of these fields to analyze and solve the problems of day to day life.
3. Learn the basic necessary analog and digital electronics.





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Established by Tribal Development Department, Govt. of Gujarat

School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Semiconductor Diode: <ul style="list-style-type: none">➤ Semiconductor Diode, Semiconductor diode as a rectifier, Rectifiers, Half wave rectifier, Output frequency of Half wave rectifier, Efficiency of Half wave rectifier, Full wave rectifier, Center tap full wave rectifier, Full wave Bridge Rectifier, Output frequency of full wave rectifier, Efficiency of full wave rectifier, Faults in center tap full wave rectifier, Nature of Rectifier output, Ripple factor, Filter circuits, Types of Filter circuits,➤ Zener Diode, Reverse breakdown of diodes, Equivalent circuit of Zener Diode, Zener Diode as a voltage stabilizer, Solving Zener diode circuits, Application of Diodes and related problems	15
II	Transistor: <ul style="list-style-type: none">➤ Transistor Action, Transistor biasing, Transistor symbol, Transistor circuit as an amplifier, Transistor connections, Common base connection, Characteristics of common Base Connection, Common emitter connection, characteristics of common emitter connection, Measurement of leakage current, Characteristics of common Emitter connection, Common Collector connection, Transistor load line analysis, Operating point, Performance of transistor amplifier, Cut off and saturation points	15
III	Digital Electronics: <ul style="list-style-type: none">➤ Number Systems, The Decimal Numbers system, Binary system, Binary to Decimal Conversion, binary fraction, Decimal to binary conversion, Octal system octal to decimal conversion, decimal to octal conversion, octal to binary conversion, binary to octal conversion, advantages of octal number system, Hexadecimal number system, Count beyond F in Hexadecimal system, Binary to Hexadecimal conversion, Hexadecimal to binary conversion,➤ Positive and Negative Logic, The OR gate, Diode OR gate, Transistor OR gate, Three input OR gate, Exclusive OR gate, The AND gate, Diode OR gate, NOT gate, Equivalent circuit for a NOT gate, The NOT operation, Bubbled gates, The NOR gates, NAND gates, NOR and NAND gates as a universal gates, The XOR gates related problems.	15





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School of Science B.Sc. (Zoology) Programme

Unit-IV-Practical(s)	(30)
<ol style="list-style-type: none">1. To study V-I characteristics of P-N Diode.2. To study V-I characteristics of Zener Diode.3. Zener Diode as a voltage regulator.4. Half wave Rectifier.5. Full wave Rectifier.6. Full wave Bridge Rectifier.7. Logic gates.8. V-I characteristics of Common Emitter Transistor.	
Text Book(s)	
<ol style="list-style-type: none">1. Unit 1 & 2: Principles of Electronics by V. K. Mehta, Rohit Mehta, 12th edition, S. Chand.2. Unit 3: Basic Electronics, Solid State, B. L. Theraja, S.Chand	
Reference Books for Practical	
<ol style="list-style-type: none">1. B.Sc. Practical Physics by Harnam Singh and Dr. P.S. Hemne, S. Chand & Co. Ltd., New Delhi (2000).2. An Advanced Course in Practical Physics by D. Chatopdhyay, P.C. Rakshit, New Central Book Agency Pvt. Ltd (1990).3. Advanced Practical Physics by M S Chauhan and S P Singh, Pragati Prakashan, Meerut (1984).	
Web Resources	
<ol style="list-style-type: none">1. https://phys.libretexts.org2. https://drait.edu.in/assets/departments/ECE/materials/18EC24_Basic_Electronics_Notes.pdf	

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CCE: Continuous and Comprehensive Evaluation

(CCE Theory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation, slip tests (announced/surprised), attendance etc. or any combination of these)

PWE: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE: Semester End Evaluation





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Established by Tribal Development Department, Govt. of Gujarat

School of Science

B.Sc. (Zoology) Programme

Subject Code & Subject Name: BS02AEZOO1 English Language Skills-II

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
2	-	-	2	25	00	25	00

Programme Name	B.Sc. Zoology
Semester	II
Course Code	BS02AEZOO1
Course Title	English Language Skills-II
Course Content Type (Th./Pr.)	Theory
Course Credit	2
Sessions+ Lab. Per Week	2
Total Teaching/Lab. Hours	30 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

- To advance understanding of complex grammatical structures.
- To expand students' vocabulary with idioms and phrasal verbs.
- To improve analytical reading and higher-level writing skills.

Prerequisites (if any)

Learning Outcomes

On the Completion of this course, students will able to:

- Use advanced grammar accurately in writing and speaking.
- Comprehend and utilize a broader range of vocabulary.
- Write essays and reports with a clear structure and argumentation.





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School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Unit 1: Advanced Grammar and Vocabulary <ul style="list-style-type: none">Conditional Sentences, Modals, and Passive VoiceIdioms, Phrasal Verbs, and CollocationsReading and Interpretation Techniques	15
II	Unit 2: Writing Skills <ul style="list-style-type: none">Essay Writing: Structure, Argumentation, and CoherenceReport Writing: Purpose, Format, and StyleListening and Speaking: Participating in Discussions and Debates	15
Reference Books		
<ul style="list-style-type: none">Swan, Michael. Practical English Usage. Oxford University Press.McCarthy, Michael, and Felicity O'Dell. English Phrasal Verbs in Use. Cambridge University Press.Nunan, David. Second Language Teaching & Learning. Heinle & Heinle Publishers.		
Web Resources		

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PWE::Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE::Semester End Evaluation





बिरसा मुंडा ट्रायबल युनिवर्सिटी Birsā Mūṇḍā Drāyabala Yūnīvārsīṭī

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Established by Tribal Development Department, Govt. of Gujarat

School of Science

B.Sc. (Zoology) Programme

Subject Code & Subject Name: BS02AEZOO2 Scientific Communication Skills

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
2	-	-	2	25	00	25	00

Programme Name	B.Sc. Zoology
Semester	II
Course Code	BS02AEZOO2
Course Title	Scientific Communication Skills
Course Content Type (Th./Pr.)	Theory
Course Credit	2
Sessions+ Lab. Per Week	2
Total Teaching/Lab. Hours	30 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

- To develop effective communication skills tailored for scientific contexts
- To enhance presentation and public speaking skills for scientific topics
- To improve collaborative communication skills for scientific research and projects

Prerequisites (if any)

Learning Outcomes

On the Completion of this course, students will able to:

- Communicate scientific ideas both verbally and in writing
- Deliver clear and engaging presentations on scientific topics
- Collaborate effectively in group discussions and research projects





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School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Unit 1: Scientific Communication <ul style="list-style-type: none">Fundamentals of Scientific Communication: Clarity, Precision, and ObjectivityCommunicating Scientific Data: Graphs, Tables, and FiguresWriting Abstracts, Summaries, and Scientific Reports	15
II	Unit 2: Presentation and Public Speaking <ul style="list-style-type: none">Techniques for Effective Scientific PresentationsUse of Visual Aids in PresentationsPublic Speaking Skills: Clarity, Engagement, and Confidence	15
Reference Books		
<ul style="list-style-type: none">Alley, Michael. The Craft of Scientific Writing. Springer.Peat, Jennifer, et al. Scientific Writing: Easy When You Know How. BMJ Books.Day, Robert A., and Barbara Gastel. How to Write and Publish a Scientific Paper. Cambridge University Press.		

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PWE::Practical Work Examination

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SEE::Semester End Evaluation





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School of Science B.Sc. (Zoology) Programme

Subject Code & Name:- BS02SEZOO1: Fundamentals of Computer and Office

Automation Packages-II

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
1	0	1	2	0.25	-	0.5	0.25

Programme Name	B.Sc. (Zoology)
Semester	II
Course Code	BS02SEZOO1
Course Title	Fundamentals of Computer and Office Automation Packages-II
Course Content Type (Th./Pr.)	Theory/Practical
Course Credit	2
Sessions+ Lab. Per Week	1+2*
Total Teaching/Lab. Hours	30 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

1. To aware students about basic structure of computer and basic of Information technology.
2. Students can develop skills for effective use of Office Automation Tool.

Prerequisites (if any)

Basic Understanding and Operating of Computer System

Learning Outcomes

On the completion of this course, students will able to:

1. Infer organization of input/output, memory and processing devices.
2. Summarize the Information technology
3. Apply and analyze various features into the spreadsheet and database.

Detailed Contents





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UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Basic I/O Devices, Memory, Data Storage & Processor Type of input and output devices, Types of Memory (RAM→SRAM, DRAM, DDR etc., ROM→ROM, PROM, EPROM, EEPROM etc.), Types of magnetic devices (floppy disk, hard disk, magnetic tape etc.), storage mechanism for magnetic storage devices like tracks, sectors, clusters etc., other storage devices (USB Flash Drive, CD, DVD, blu ray disk etc.), Cloud storage like google drive, OneDrive etc., Types of processor (Dual core, Core 2 duo, i3, i5, i7 etc.)	15
II	Information Technology: Understanding the need of Information, Data, Knowledge, Difference between Data, Information and Knowledge Office Automation Fundamentals Introducing MS-Excel, formatting workbook, conditional formatting, Autofill and custom list, sorting data, filtering data, creating charts, summarize data using pivot table, working with basic functions and formulae, protecting data. Introducing MS-Access, creating database, working with tables, queries, forms and reports	15
Text Book(s)		
Reference Books		
1. Computer Fundamentals Concepts, System & Application By: P. K. Sinha Publisher: BPB 2. Introduction to Information Technology By: Turban, Rainer Publisher: Wiley 3. Fundamentals of Information Technology By: Mathew Anoop, S. Kavitha Murugesan Publisher: Narosa Publishing House 4. Microsoft Office 2019 for Dummies, Publisher: Wiley		
Web Resources		
1. https://edu.gcfglobal.org/en/topics/office/ 2. https://www.computer-pdf.com/tutorials-ms-office-basics 3. https://www.tutorialspoint.com/excel/index.htm 4. https://www.tutorialspoint.com/ms_access/index.htm		
Required Software(s) (if any)		
MS-Office		





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Practical(s) (if any)

List of Sample Practical

1. Prepare a mark sheet using appropriate formulae.
2. Insert car sales data into sheets and compare sales for men and women, using various different chart types.
3. Use the formatting tools to make your data look more professional and presentable.
4. Creates Range names and uses them in formulae.
5. Use a custom number format to change the appearance of dates/numbers.
6. Calculate parking fees using an IF function.
7. Use the inbuilt functions to calculate basic statistics from a list of data.
8. Create two different tables with country information now Create a query showing the countries in one table not in the other, and vice versa.
9. Use Make Table queries to separate a large table of data into several smaller ones.
10. Create Access queries that prompt the user for criteria.
11. Delete records from a database using Delete queries.
12. Use Make Table queries to create a backup of important data, and to quickly make copies of specific records.
13. Use the Auto form wizard to create a quick form for entering and viewing data
14. Create forms based on the one-to-many relationships in database.
15. Use the report wizard to quickly create detailed summary reports based on your data.
16. Design a report to list courses by Various Schools of BMTU.

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PWE:: Practical Work Examination

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SEE:: Semester End Evaluation





બિરસા મુંડા ટ્રાયબલ યુનિવર્સિટી Birsā Munda Tribal University

રાજપિપલા, જિ. નર્મદા Rajpipla, Dist. Narmda

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School of Science

B.Sc. (Zoology) Programme

Subject Code & Name: - BS02SEZOO2 Personality Development & Leadership Skill

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
2	-	-	2	25	-	25	-

Programmed Name	B.Sc. (Zoology)
Semester	II
Course Code	BS02SEZOO2
Course Title	Personality Development & Leadership Skill
Course Content Type (Th./Pr.)	Theory
Course Credit	2
Sessions+ Lab. Per Week	2
Total Teaching/Lab. Hours	30Hours
* 2 Laboratory = 1 Session	-

Learning Objectives

1. વિદ્યાર્થીઓ વ્યક્તિત્વનો અર્થ સમજે.
2. વ્યક્તિત્વ વિકાસ વિશે પરિચય મેળવી સમજણ કેળવે.
3. વિદ્યાર્થીઓ વ્યક્તિત્વ વિકાસને સમજી જીવનમાં ઉતારી સ્વ-વ્યક્તિત્વનો વિકાસ કરે.
4. વિદ્યાર્થીઓને નેતૃત્વ વિશેનો ખ્યાલ અને મહત્વ સમજે.
5. વિદ્યાર્થીઓ નેતાના પ્રકારો અને નેતાના લક્ષણોથી અવગત થશે.
6. વિદ્યાર્થીઓ નેતા બનવા માટેની સમજ કેળવે.

Learning Outcomes

1. વિદ્યાર્થીઓમાં વ્યક્તિત્વનો વિકાસ થાય અને સ્વ-વ્યક્તિત્વને ઓળખી શકે.
2. વ્યક્તિત્વ વિકાસની પાયાની બાબતોની સમજ મેળવી તેના જીવનમાં ઉતારશે.
3. નેતૃત્વનું મહત્વ સમજી નેતા બનવા માટેના ગુણો વિકસાવી શકે.
4. નેતાના પ્રકારો અને લક્ષણો વિશે સમજ મેળવી પોતાના જીવનમાં નેતા તરીકેની સમજ મેળવે.





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School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	<ul style="list-style-type: none">➤ વ્યક્તિત્વનો અર્થ➤ વ્યક્તિ અને વ્યક્તિત્વ➤ વ્યક્તિત્વની મુખ્ય બાબતો➤ વ્યક્તિત્વને અસર કરતા પરિબળો➤ વ્યક્તિત્વ વિકાસની પાયાની બાબતો	15
II	<ul style="list-style-type: none">➤ નેતૃત્વનો અર્થ અને વ્યાખ્યા➤ નેતૃત્વનું મહત્વ➤ નેતૃત્વનાં પ્રકારો➤ શૈલીઓ અને તેના ફાયદાઓ/ગેરફાયદા➤ સારા નેતાના લક્ષણો	15
Reference Books		
<ol style="list-style-type: none">1. વ્યક્તિત્વ વિકાસ-પ્રો. નેહા ડી. રાવલ, ડૉ. ધર્મિષ્ઠા ગોહિલ2. Leadership and management By A Chandramohan, Himalaya Publishing House.3. વાણિજ્ય વ્યવસ્થા અને સંચાલન-ટી. જે. રાણા, બી. એસ. શાહ પ્રકાશન		
Web Resources		
https://baou.edu.in/assets/pdf/BCPDA210_slm.pdf		

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CCE: Continuous and Comprehensive Evaluation

(CCE Theory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation, slip tests (announced/surprised), attendance etc. or any combination of these)

PWE: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE: Semester End Evaluation





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School of Science

B.Sc. (Zoology) Programme

Subject Code & Name: - BS02SEZO03 Honeybee Farming

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
2	-	-	2	50%	00	50%	00

Programme Name	B.Sc. Zoology
Semester	II
Course Code	BS02SEZO03
Course Title	Honeybee Farming
Course Content Type (Th./Pr.)	Theory
Course Credit	2
Sessions+ Lab. Per Week	2
Total Teaching/Lab. Hours	30 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

This course is designed to acquaint the student with the broad field of beekeeping, Honeybee biology, and division of labour in bees and construction of bee hives.

Prerequisites (if any)

Learning Outcomes

On the Completion of this course, students will able to:

1. Understand the morphology, anatomy and life cycle of Honey Bee species.
2. Learn its social organization and social or solitary behavior.
3. Acquire knowledge about beekeeping tools and equipment.
4. Apply, practical and theoretical concept to identify species and casts of bees.
5. Get acquaint about properties and applications of Honey and its by-products.





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School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	1. Introduction to Apiculture - scope, importance : <ul style="list-style-type: none">History of beekeeping: Definition, Beekeeping worldwide and In India.Traditional beekeeping and Modern beekeeping. 2. Honey Bee morphology, Anatomy and Life cycle : <ul style="list-style-type: none">Basic concepts of morphology of Honey beesTypes of honey bees- indigenous, exotic, Species of honey bees. Origin, systematics and distribution of honey bees.Social organization in honey bees: Colony life and social organization – Queen, drone, worker.Study of Social behavior of honey bee: Attack, Bee DanceBee enemies – Enemy: Mites, Wax Moths, Ants, Bee Eaters, Garden Lizards, Bears.	15
II	1. Beekeeping: Tools and Equipment: <ul style="list-style-type: none">Basic requirements for beekeeping start upBIS standard Tools used in apiculture.Introduction to types of bee boxes and Their Parts 2. Honey Processing and Bee Hive Products : <ul style="list-style-type: none">Honey - its properties and application in various fieldsHoney extraction & handling - Quality control standards, Processing of honey.Other valuable by-products of honey bees – Wax, Bee venom & Royal jelly extraction.	15
Text Book(s)		
1. Economic Zoology, G.S. Shukla, 2009 Rastogi Publications		
Reference Books		





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School of Science B.Sc. (Zoology) Programme

1. Anatomy of Honey bee by R.E. Snodgrass.
2. Bees and Bee keeping in India by D.P. Abrol, Kaluani Publications.
3. The hive & the Honey Bee, Dadant Publication, America.
4. Beekeeping in India, 1962, 82, by Sardar singh, ICAR, New Delhi.
5. Beekeeping by E.F. Phillips. Agrobios (India) Publication.
6. Handbook of Beekeeping by Dharamsingh, Devendra Pratap Singh, Agrobios.

Web Resources

1. Vocational : Bee keeping :: <https://www.classcentral.com/course/swayam-vocational-bee-keeping17839/course/swayam-vocational-bee-keeping-17839> (Swayam Course)
2. Beekeeping parts, tools, & equipment: <https://www.classcentral.com/course/youtube-beekeeping-parts-toolsequipment-59050/course/youtube-beekeeping-parts-tools-equipment-59050> (Swayam Course).

L:: Lecture, **T::** Tutorial , **P::** Practical

CCE:: Continuous and Comprehensive Evaluation

(CCE Theory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation, slip tests (announced/ surprised), attendance etc. or any combination of these)

PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE:: Semester End Evaluation





बिरसा मुंडा ट्रायबल युनिवर्सिटी Birsā Munda Tribal University

राजपिपला, जि० नर्मदा Rajpipla, Dist. Narmda

Established by Tribal Development Department, Govt. of Gujarat

School of Science

B.Sc. (Zoology) Programme

Subject Code & Name: - BS02VAZOO1 Introduction to National Service Scheme

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
2	-	-	2	25	-	25	-

Programme Name	B.Sc. (Zoology)
Semester	II
Course Code	BS02VAZOO1
Course Title	Introduction to National Service Scheme
Course Content Type (Th./Pr.)	Theory
Course Credit	2
Sessions+ Lab. Per Week	2
Total Teaching/Lab. Hours	30 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

1. To know the basic concept, Philosophy, Objectives and various advisory Committees of NSS.
2. To understand the basic programmes and activities of NSS.
3. Understand themselves in relation to their community.
4. Identify the needs and problems of the community and involve them in problem solving process
5. To develop capacity to meet emergencies and natural disasters and to practice national integration and social harmony.



बिरसा मुंडा ट्रायबल युनिवर्सिटी Birsā Mūṇḁā ḁāyabala Yūnīvārsīṁṁī

राजपिपला, जि० नर्मदा Rajpipla, Dist. Narmda

Established by Tribal Development Department, Govt. of Gujarat

School of Science B.Sc. (Zoology) Programme

Learning Outcomes

On the Completion of this course, students will able to:

1. To know about History & Concept of NSS
2. Understand the community in which they work.
3. Understand themselves in relation to their community.
4. It has provided diversified opportunities to students in schools/colleges and universities to develop their personality through community service.

Detailed Contents

UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Introduction of national service scheme: Introduction of National Service Scheme, • History & Concept of NSS, Objectives, Symbol, NSS Badge, Motto, NSS Songs, NSS Day, NSS Advisory Committees at various levels NSS programmes and activities: Basic concepts and components, NSS programmes and activities	15
II	Special camping programme: Contributions of special camping programme, Planning and preparation of special camping programme, Financial pattern of expenditure for special camping programme Administrative structure: at national level, at state level, at university level & at +2 level NSS advisory committees	15

Reference Books

1. NATIONAL SERVICE SCHEME MANUAL (Revised)

Web Resources

1. <https://nss.gov.in/>

L:: Lecture, **T::** Tutorial, **P::** Practical

CCE:: Continuous and Comprehensive Evaluation

(CCE Theory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation, slip tests (announced/surprised), attendance etc. or any combination of these)

PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE:: Semester End Evaluation





बिरसा मुंडा ट्रायबल युनिवर्सिटी Birsa Munda Tribal University

राजपिपला, जि. नर्मदा Rajpipla, Dist. Narmada

Established by Tribal Development Department, Govt. of Gujarat

School of Science

B.Sc. (Zoology) Programme

Subject Code& Name: - BS02VAZOO2 Tribal Culture and Communication

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
2	-	-	2	25	-	25	-

Programme Name	B.Sc. (Zoology)
Semester	II
Course Code	BS02VAZOO2
Course Title	Tribal Culture and Communication
Course Content Type (Th./Pr.)	Theory
Course Credit	2
Sessions+ Lab. Per Week	2
Total Teaching/Lab. Hours	30 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

- 1 આદિવાસી સંસ્કૃતિનો પરિચય મેળવે
- 2 આ એકમનો અભ્યાસ કર્યા બાદ વિદ્યાર્થી આદિવાસી સંસ્કૃતિના વિષયને સળતાથી સમજી શકશે
- 3 આદિવાસી ઇતિહાસ અને વિકાસ તેમજ આદિવાસી જાતિ વગેરેની વિગતવાર માહિતી જાણી શકશે .
- 4 ગુજરાતની આદિવાસી બોલીઓ અને વારસા વિશે જાણી શકશે .

Learning Outcomes

1. આદિવાસી સંસ્કૃતિનો પરિચય મેળવે .
2. આ એકમનો અભ્યાસ કર્યા બાદ વિદ્યાર્થી આદિવાસી સંસ્કૃતિનાં વિષયને સળતાથી સમજશે .
3. આદિવાસી ઇતિહાસ, વિકાસ તેમજ આદિવાસી જાતિ વગેરેની વિગતવાર માહિતી જાણશે.
4. ગુજરાતની આદિવાસી બોલીઓ અને વારસા વિશે જાણી શકશે.





बिरसा मुंडा ट्रायबल युनिवर्सिटी Birsa Munda Tribal University

राजपिपला, जि. नर्मदा Rajpipla, Dist. Narmada
Established by Tribal Development Department, Govt. of Gujarat

School of Science B.Sc. (Zoology) Programme

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	<p>ગુજરાત રાજ્યમાં આદિવાસી સંસ્કૃતિ અને વિકાસની સક્ષિપ્ત ઝાંકી</p> <ul style="list-style-type: none">➤ આદિજાતિનો અર્થ અને વ્યાખ્યા➤ આદિવાસી જાતિઓનો ઇતિહાસ➤ આદિવાસી વિકાસ - ઇતિહાસ➤ રોજિંદા જીવન સાથે વણાયેલી આદિવાસી કળા➤ સગાઈ રીત રિવાજો➤ આદિવાસી વ્રશ્ય સંસ્કૃતિ➤ સામાજિક ઉત્સવો સંલગ્ન નૃત્યો અને વાદ્યો	15



બિરસા મુંડા ટ્રાયબલ યુનિવર્સિટી Birsā Munda Tribal University

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School of Science B.Sc. (Zoology) Programme

II	<p>ગુજરાતનાં આદિવાસી લોકસમુદાયનો પરિચય</p> <ul style="list-style-type: none">➤ પરિચયાત્મક➤ આદિવાસી લોકબોલી➤ ખેતી, જંગલ, સામાજિક,➤ જાત માહિતી➤ સગાં સંબંધી➤ ખોરાક, પોશાક, ઘરેણાં તથા ગામ વિશેની સામાન્ય માહિતી. <p>આદિવાસી જાતિનો પરિચય</p> <ul style="list-style-type: none">➤ પાડવી➤ રાઠવા➤ ચૌધરી➤ ગામીત➤ ભીલ➤ વળવી➤ વસાવા➤ કથોડિયા➤ નાયકા	15
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Text Book(s)

1. આદિવાસી લોકમેળા : શંકરભાઈ તડવી, આદિવાસી સંગ્રહાલય, છોટાઉદેપુર.
2. ગુજરાતનાં લોકમેળા અને ઉત્સવ : મૃદુલા મહેતા, યુનિ ગ્રંથ નિર્માણ બોર્ડ, અમદાવાદ.
3. ગુજરાતનાં લોકમેળા જોરાવરસિંહ જાદવ, ઈમેજ પ્રકાશન, અમદાવાદ.
4. ગુજરાતની આદિવાસી લોકસંસ્કૃતિ: ડૉ. અરૂણ વાઘેલા.





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Established by Tribal Development Department, Govt. of Gujarat

School of Science B.Sc. (Zoology) Programme

Reference Books

1. ગુજરાતની લોક સંસ્કૃતિ : હસુમતિબેન સેડાણી , યુનિ ગ્રંથનિર્માણ બોર્ડ , અમદાવાદ .
2. આદિવાસી લોકમેળા : શંકરભાઈ તડવી , આદિવાસી સંગ્રહાલય, છોટાઉદેપુર.
3. ગુજરાતનાં લોકમેળા અને ઉત્સવ : મૃદુલા મહેતા , યુનિ ગ્રંથનિર્માણ બોર્ડ , અમદાવાદ.
4. ગુજરાતનાં લોકમેળા જોરાવરસિંહ જાદવ , ઈમેજ પ્રકાશન , અમદાવાદ.
5. ગુજરાતની આદિવાસી લોકસંસ્કૃતિ: ડૉ . અરૂણ વાઘેલા
6. ભીલી સાહિત્ય : એક અધ્યયન - હસુ યાજ્ઞિક, ગુર્જરી ટ્રાયબલ ફાઉન્ડેશન, અંબાજી

Web Resources

1. <http://www.kamat.com/databashe/content/adivasis/>

L:: Lecture, **T::** Tutorial , **P::** Practical

CCE:: Continuous and Comprehensive Evaluation

(CCETheory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation, slip tests (announced/ surprised), attendance etc. or any combination of these)

PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE:: Semester End Evaluation





CURRICULUM AND CREDIT FRAMEWORK

For

**B.Sc. Honours/ Honours with Research in
Zoology**

As per NEP 2020

(To be Effective from June, 2024)



ORDINANCES AND REGULATIONS:

Ordinances & Regulations for the Degree of Bachelor of Science (As Per NEP 2020) are as under:

Ordinances:

Ord. – 1:

Candidate for admission to the Bachelor of Science must have passed standard 12th or equivalent examination in respective stream from Gujarat Higher Secondary Board or any other board.

Ord – 2: Candidate who have passed an equivalent examination from any other board or examining body and is seeking admission to the B.Sc. will be required to provide necessary eligibility certificate.

Ord. – 3:

Definitions of Keywords:

1. Academic Year:

An Academic Year is divided into two semesters and a semester of minimum 15 weeks comprises 90 working days.

2. Programme: An educational programme leading to award of the Certificate, Diploma, Bachelor, Bachelor (Honours) or Bachelor (Honours with Research).

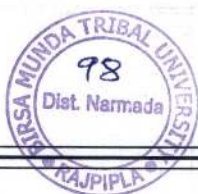
3. Course: Usually referred to, as 'paper/subject' is a component of a program. The courses should define learning activities, objectives and learning outcomes. Types of courses / activities constitute the programs of study comprise lectures outreach activities / Practical / Case Study / Group Discussion / Quiz / Project work/ Viva / Seminars / Assignment / Internship / Presentations / Research Project etc. or a combination of some of these.

4. Major & Minor Discipline Course: Major discipline is grouping of courses of main focus and the degree will be awarded in that discipline. Students should secure the prescribed number of credits (about 50% of total credits) through core courses in the major discipline. Minor discipline helps a student to gain a broader understanding beyond the major discipline

5. Multidisciplinary Courses: These courses are intended to broaden the intellectual experience and form part of other disciplines.

6. Ability Enhancement Courses: The courses aim at enabling the students to acquire and demonstrate the core linguistic skills, including critical reading and expository and academic writing skills, that help students articulate their arguments and present their thinking clearly and coherently and recognize the importance of language as a mediator of knowledge and identity.

7. Skills Enhancement Courses: These courses are aimed at imparting practical skills, hands-on training, soft skills, etc., to enhance the employability of students.



8. Value-Added Courses / Indian Knowledge System: The course aims at enabling the students to acquire and demonstrate the knowledge and understanding of contemporary India with its historical perspective, the basic framework of the goals and policies of national development, and the constitutional obligations with special emphasis on constitutional values and fundamental rights, ethics and duties.

9. Summer Internship/ Apprenticeship: Students will have to undergo Internships / Apprenticeships in a firm, industry, or organization or Training in labs with faculty and researchers in their own or other HEIs/research institutions during the summer term. Students will be provided with opportunities for internships with local industry, business organizations, health and allied areas, local governments (such as panchayats, municipalities). Parliament or elected representatives, media organizations, artists, crafts persons, and a wide variety of organizations so that students may actively engage with the practical side of their learning and, as a by-product, further improve their employability.

10. Vocational Courses: Vocational Education and Training will form an integral part of the undergraduate programme to impart skills along with theory and practical.

11. Research Dissertation: Students choosing a 4-Year Bachelor's degree (Honours with Research) are required to take up research dissertation under the guidance of a faculty member. The students are expected to complete the Research Dissertation in the eighth semester.

12. Credit: It determines the number of hours of instruction required per week over the duration of a semester. One credit is equivalent to one hour of teaching per week, One credit for tutorial work means one hour of engagement per week, A one-credit course in practical or lab work, community engagement and services, and fieldwork in a semester mean two-hour engagement per week, A one-credit of Seminar or Internship or Studio activities or Field practice/projects or Community engagement and service means two-hour engagements per week.

13. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters O, A+, A, B+, B, C, P, F and Ab.

14. Credit Point: It is the product of grade point and number of credits for a course.

15. Semester Grade Point Average (SGPA): It is a measure of performance or work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.

16. Cumulative Grade Point Average (CGPA): it is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.



Ord. – 4 : B.Sc. Degree programme is of three/four academic year's duration consisting of six/eight semesters, which will be required to be completed within **7 years** from the date of his/her first admission in the First Semester. Students are permitted to take a break or exit with a UG certificate / UG Diploma / UG Degree are permitted to re-enter within three years and complete the degree programme. But total duration for completing the programme shall not exceed 7 years.

Ord. – 5: B.Sc. Three years (six semesters)/ Four years (eight semesters) Degree programme is a regular fulltime programme. A student can pursue two full time academic programmes in physical mode provided that in such cases, class timing for one programme do not overlap the class timings of the other programme. Students can pursue two academic programmes, one in full time and physical mode and another in Open and Distance Learning (ODL)/ Online mode; or up to two ODL/Online programmes simultaneously.

Ord. – 6: No candidate will be admitted to any semester end examination unless it is certified by the principal that he/she has attended the course of study to the satisfaction of the principal of the school.

Ord. – 7: Candidate desirous of appearing at any semester end examination of the said programme must forward their application in the prescribed form to the University through the principal on or before the date prescribed for the purpose under the relevant ordinances.

Ord. – 8: No candidate will be permitted to reappear at any semester end examination, which he/she has already passed. The marks of successfully completed course will be carrying forwarded for the award of class.

Ord. – 9: Medium of instruction is English/Gujarati.

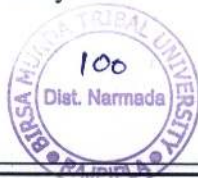
Ord. – 10: B.Sc. Programme of the University as per NEP 2020 is implemented along with the Continuous and Comprehensive Evaluation (CCE) and minimum attendance is at least 75% attendance.

Ord. – 11:

The main aim of the NEP-2020 is to facilitate Multiple Entry and Exit options with UG certificate/ UG diploma/ or degree, depending upon the number of credits secured. The Entry and Exit options for students, who enter in the B.Sc. programme, are as follows:

1ST YEAR:

Entry 1: The entry requirement for Level 4.5 is Higher Secondary School Leaving Certificate obtained after the successful completion of Grade 12 and should meet the entrance requirements, availability of seats, admission regulations of the BMTU. A programme of study leading to entry into the first year of the Bachelor's degree is open to those who have met the eligibility requirements, including specified levels of attainment at the higher secondary level of education specified in the programme admission regulations. Admission to the Bachelor degree programme of study is based on the evaluation of documentary evidence



(including the academic record) of the applicant's ability to undertake and complete a Bachelor's degree programme.

Exit 1: UG Certificate: A UG certificate shall be awarded if a student exit at the end of year one (two semesters) after successfully securing 44 credits. The student also needs to secure 4 additional credits in summer internship/Apprenticeship in the major discipline or multidiscipline offered course. These students are allowed to re-enter the degree programme within three years and complete the degree programme within the stipulated maximum period of seven years.

2ND YEAR:

Entry 2. The entry requirement for Level 5.0 is a Certificate in Science obtained from any University after completing the first year (two semesters) of the undergraduate programme and meet the entrance requirements, availability of seats and admission regulations of the BMTU.

Exit 2: UG Diploma: A UG diploma shall be awarded if a student exit after two years (four semesters) after successfully securing 88 credits from level 4.5 to 5.0, with 44 credits at level 5.0. The student also needs to secure 4 additional credits in summer internship/Apprenticeship in major discipline or multidiscipline offered course. These students are allowed to re-enter within a period of three years and complete the degree programme within the maximum period of seven years.

3RD YEAR:

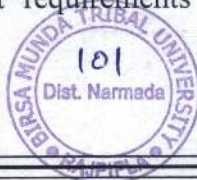
Entry 3. The entry requirement for Level 5.5 is a UG Diploma obtained from any institution after completing two years (four semesters) of the undergraduate and meet the entrance requirements, availability of seats and admission regulations of the BMTU.

Exit 3: On successful completion of three years, the relevant Bachelor of Science Degree shall be awarded (Level 5.5). A Bachelor's degree requires minimum 132 credits from levels 4.5 to 5.5, with minimum 44 credits at level 4.5, minimum 44 credits at level 5.0, and minimum 44 credits at level 5.5.

4TH YEAR:

Entry 4. A student seeking admission to a 4-year Bachelor of Science degree (Honours/Honours with Research) (Level 6.0) in a specified field of learning, must have completed all requirements of the relevant three-year Bachelor of Science degree (Level 5.5) and meet the entrance requirements, availability of seats and admission regulations of the BMTU. After completing the requirements of a three-year Bachelor's degree programme, candidates shall be allowed to continue studies in the fourth year of the undergraduate programme to pursue and complete the Bachelor's degree in Honours /Bachelor's degree in Honours with Research.

Exit 4: 4-year UG Degree (Honours): A four-year UG Honours degree in the major discipline will be awarded to those who complete a four-year degree programme with 176 credits and have satisfied the credit requirements including 12 credits from O-J-T or equivalent courses.



4-year UG Degree (Honours with Research): They should do a research dissertation under the guidance of a faculty member of the University. The research dissertation will be in the major discipline. The students, who secure 176 credits, including 12 credits from a research dissertation, are awarded UG Degree (Honours with Research).

Summary of Multiple Exit System:

1	UG Certificate	UG Certificate will be awarded when a student exits after completion of semester 1 and semester 2 with 44 credits along with successfully completion of work based vocational course of 4 credits Online/Offline or internship/Apprenticeship
2	UG Diploma	UG Diploma will be awarded when a student exits after completion of semester 1 to semester 4 with 88 credits along with successfully completion of work based vocational course of 4 credits Online/Offline or internship /Apprenticeship
3	UG Degree	Bachelor's degree will be awarded when a student exits after completion of semester 1 to semester 6 with 132 credits.
4	UG Degree Honours	Bachelor's degree (Honours) will be awarded when a student exits after completion of semester 1 to semester 8 with 176 credits, including 12 credits from O-J-T (On the Job Training) or equivalent courses
5	UG Degree Honours with Research	Bachelor's degree (Honours with Research) will be awarded when a student exits after completion of semester 1 to semester 8 with 176 credits including 12 credits from a research dissertation

Ord. – 12:

A regular candidate having obtained minimum marks for passing in **CCE (i.e. 9 out of 25 & 18 out of 50)** and **SEE (i.e. 9 out of 25 & 18 out of 50)** or more but fails to obtain minimum **40%** aggregate marks will be required to re-appear in both the component viz CCE and SEE. In such a case candidate will not be required to keep term for the respective semester. The marks of the examination in which the student has passed will be carried forward.

No.	CCE (Continuous & Comprehensive Evaluation)	SEE (Semester End Evaluation)	Result	Require to Appear in Exam
1	Pass	Pass	Pass	N. A.
2	Pass	Fail	Fail	SEE Only
3	Fail	Pass	Fail	CCE Only
4	Fail	Fail	Fail	Both (CCE & SEE)



Regulations:

R.1

The new curriculum as per NEP 2020 is not only student centric in the teaching-learning processes but also in their evaluation process. The evaluation consists of the following two components: The component consists of Continuous and Comprehensive Evaluation (CCE) and the second component consists of the Semester end examination. The division of marks between the two shall be 50:50 in the NEP 2020; the evaluation process shall follow the norm that the faculty, who teaches the course, shall conduct the Continuous and Comprehensive Evaluation (CCE). **The concerned faculty shall be accountable for transparency and reliability of entire evaluation of the student in the concerned Course**

In each course, every credit carries 25 marks, of which 50% marks is assigned for CCE and rest 50% marks for SEE.

Sr. No.	Evaluation	4 credit subjects (Marks)	2 credit subjects (Marks)
1	CCE (50%)	Final marks 50	25
2	SEE (50%)	Final marks 50	25
	Total	100	50

Note:- Total Theory(CCE+SEE) 150 Marks converted for **75 Marks** and Total Practical (CCE+SEE) 50 marks converted for **25 marks**

R-2

Continuous and Comprehensive Evaluation (CCE): Subject-wise CCE will be undertaken by the concerned faculty member. The mode of evaluation will be decided by the faculty member concerned with the subject.

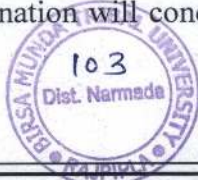
Normally CCE Theory includes Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation, tutorials, slip tests (announced/ surprised), attendance etc. or any combination of these. The students are expected to submit their answer scripts/ reports of internal evaluation within the stipulated time. Failure to do so may result in the script not being valued.

CCE PWE includes Laboratory practical work, project work, viva simulation exercise work etc

Another part of CCE consists of Mid Semester Examination, which is compulsory for all students. It can be done in a scheduled manner. **The duration of the mid-term evaluation shall be one hour.**

R-3

Semester End Evaluation (SEE): The SEE carries 50% of the marks assigned to a course. **SEE shall be of 2½ hours for 4 credit course (75 Marks) and 1½ hours in case of 2 credit courses.** The controller of the examination will conduct this examination. Paper setting and



evaluation will be done by the internal and external examiners. This examination shall be conducted as per a schedule which shall be notified in advance.

The backlog exam will be conducted twice a year just after the result declared of the semester evaluation. Students shall have a second chance to clear their backlog and avoid the burden to carry forward the backlog with the next semester exam.

Appearance in all the evaluations is mandatory and no exemption can be granted except in the following case:

1. In case of inability to attend the exam due to reasons considered genuine by the controller of examination in consultation with the Registrar/VC.
2. In case of medical emergency, a certificate from the registered medical practitioner must be produced before the commencement of exams. The authority will then take final decision on the recommendation for exemption.

R-4

Eligibility Criteria to appear in SEE: To be able to appear for the SEE, a student must comply with the following conditions:

1. Should have at least 75% of attendance in all the courses put together
2. Should have at least 70% of attendance in each course/subject
3. Should not have any disciplinary proceedings pending against him/her
4. Should have no pending due

R-5

Practical Examination: Practical examination (wherever applicable) shall be conducted at the end of every semester. The examination shall be conducted as per norms decided by the concerned authority of the University

R-6

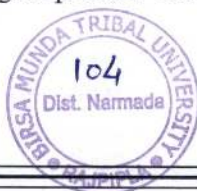
Research Dissertation work: The research dissertation work and the Supervisor shall be assigned to the student by the concerned school well in advance. Evaluation of dissertation will be done by the subject experts appointed by the university. Maximum marks of the dissertation will be 200.

R-7

Letter Grades and Grade Points

The Semester Grade Point Average (SGPA) is computed from the grades as a measure of the student's performance in a given semester. The SGPA is based on the grades of the current term, while the Cumulative Grade Point Average (CGPA) is based on the grades in all courses taken after joining the programme of study.

The relative grading system provides the relative performance of a student to a group/class wherein the student is ranked in a group/class based on relative level of achievements.



BMTU may also mention the marks obtained by the students in each course and a weightage average of marks on the Grade sheet for the benefits of the students.

Sr. No.	Letter Grade	Grade Point	Marks (In %)
1	O (outstanding)	10	96.0-100
2	A+ (Excellent)	9	86.0-95.9
3	A (Very Good)	8	76.0-85.9
4	B+ (Good)	7	66.0-75.9
5	B (Above Average)	6	56.0-65.9
6	C (Average)	5	46.0-55.9
7	P (Pass)	4	36.0-45.9
8	F (Fail)	0	Below 36.0
9	Ab (Absent)	0	Absent

Minimum passing marks for each pattern of evaluation (formative and summative):

Maximum Marks	Minimum Passing Marks
25	9
50	18
100	36

R-8

Computation of SGPA and CGPA

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

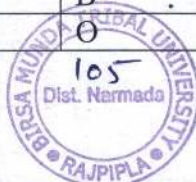
1. The SGPA is the ratio of the sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$\text{SGPA (Si)} = \Sigma(C_i \times G_i) / \Sigma C_i$$

Where S_i is the SGPA for i^{th} course, C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

Example for Computation of SGPA

Sem	Course	Credit	Letter Grade	Grade point	Credit Point (Credit x Grade)
I	Major Course 1	4	A	8	4 X 8 = 32
I	Major Course 2	4	B+	7	4 X 7 = 28
I	Minor Course 3	4	B	6	4 X 6 = 24
I	MDC 4	4	O	10	4 X 10 = 40



I	AEC 5	2	C	5	2 X 5 = 10
I	SEC 6	2	B	6	2 X 6 = 12
I	IKS 7	2	A+	9	2 X 9 = 18
		22			164
SGPA :-					164/22 = 7.45

2. The Cumulative Grade Point Average (CGPA) is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$$\text{CGPA} = \Sigma(C_i \times S_i) / \Sigma C_i$$

Where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

Example for Computation of CGPA

Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6
Credit: 22 SGPA: 6.82	Credit: 22 SGPA: 7.8	Credit: 22 SGPA: 5.6	Credit: 22 SGPA: 6.0	Credit: 22 SGPA: 6.3	Credit: 22 SGPA: 8.0
$\text{CGPA} = (22 \times 6.82) + (22 \times 7.8) + (22 \times 5.6) + (22 \times 6.0) + (22 \times 6.3) + (22 \times 8.0) / 132$ $\text{CGPA} = 149.6 + 171.6 + 123.2 + 132 + 138.6 + 176 / 132$ $\text{CGPA} = 891 / 132$ $\text{CGPA} = 6.75$					

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the grade sheet. The grade sheet may issue for each semester based on SGPA and CGPA and consolidated grade sheet indicating the performance in each semester.

R-9

Percentage Calculation

The percentage calculation will be on the basis as below

$$\text{Percentage} = \frac{\text{Total Marks Obtained in all the semesters} \times 100}{\text{Grand Total of Maximum Marks of all the semesters.}}$$

R-10

Award of Class:

A candidate who become eligible for the award of Bachelor of Science Honours / Honours with Research Degree shall be placed in one of the following classes based on Marks.

Sr. No.	Range of Marks	Description/Class
1	$\geq 70\%$ and $\leq 100\%$	Distinction
2	$\geq 60\%$ and $< 70\%$	First Class
3	$\geq 48\%$ and $< 60\%$	Second Class
4	$\geq 36\%$ and $< 48\%$	Pass Class
5	$< 36\%$	FAIL



R-11

If candidates who have failed in all the courses/papers of the semester are eligible to enter in next semester till the last semester. The result of the last semester shall not be declared (kept withheld) unless and until the candidate clears all the courses/papers of a programme.

