



# Sh. L. N. Hindu College, Rohtak (Haryana)

## Course Plan

### Department of Botany

Program: B.Sc. Life Science

### SCHEME

PAPER-I DIVERSITY OF MICROBES

<b>Course Name</b>	<b>Discipline Specific Course (DSC A1)</b>	<b>Course Type</b>	<b>Theory</b>
<b>Course Code</b>	24BOTM401DS01	<b>Class</b>	BSc Life Science (Botany)I Sem.
<b>Instruction Delivery</b>	Per week Lectures: 2, Tutorial:0, Practical:4 Total No. Classes Per Sem: 76 (L), 28(T), - 48(P) Assessment in Weightage: Sessional (30%), End Term Exams (70%)		
<b>Course Coordinator</b>	Ms. Pratibha Saini	<b>Course Instructors</b>	Theory: Ms. Pratibha Saini Practical: Ms. Pratibha Saini

### COURSE OVERVIEW

The paper delves into the in-depth comprehensive understanding of the diversity, structure, function, and ecological significance of microorganisms, including bacteria, archaea, fungi, protists, and viruses and also to train the students for collection and preservation of microbes, algae and fungi. To explore microbial taxonomy and phylogeny, emphasizing evolutionary relationships etc.

### PREREQUISITE

#### Microbiology, Evolution

Cell Biology, Ecology,

Biochemistry- Structure and function of biomolecules

### COURSE OBJECTIVE

The objective of this course is to acquaint students with following things:-

- To provide an in-depth understanding of the vast diversity of microbial life, including bacteria, archaea, fungi, protists, and viruses, focusing on their unique structures, functions, and evolutionary relationships.
- To explore microbial classification, taxonomy, and phylogenetic methods, emphasizing the role of molecular techniques in identifying and studying microbes.



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### COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

	Course Outcomes
1	<ul style="list-style-type: none"><li>• General characters, ultrastructure, reproduction and economic importance of viruses and bacteria</li><li>• Students will apply molecular and morphological techniques to classify and study microbial diversity, understanding the methodologies for constructing phylogenetic trees and microbial identification</li></ul>
2	<ul style="list-style-type: none"><li>• General characters and life-cycle of cyanobacteria and algae.</li><li>• Students will analyze the ecological roles of microorganisms in various environments, including their contributions to nutrient cycling, symbiotic relationships, and the overall functioning of ecosystems.</li></ul>
3	<ul style="list-style-type: none"><li>• Identification, classification, reproduction and economic importance of various fungi and Lichens.</li></ul>
4	<ul style="list-style-type: none"><li>• General concepts regarding algal blooms, mycorrhiza, homothallism and heterothallism,</li><li>• heterokaryosis; parasexuality; alternation of generations</li></ul>
5	<ul style="list-style-type: none"><li>• Students will understand the role of microbes in human health and disease, including the microbiome, infectious diseases, and antimicrobial resistance.</li></ul>



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### COURSE CONTENT

Content
<p>Unit 1</p> <p>Viruses: Discovery, physiochemical and biological characteristics; classification (Baltimore), general structure with special reference to viroids and prions; replication (general account), DNA virus (T-phage), lytic and lysogenic cycle; RNA virus (TMV).</p> <p>Bacteria: Discovery, general characteristics; Types-archaebacteria, eubacteria, wall-less forms (mycoplasma and spheroplasts); Cell structure; Nutritional types; Reproduction-vegetative, asexual and recombination (conjugation, transformation and transduction). Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine).</p>
<p>Unit 2</p> <p>Cyanobacteria: General characters; thallus organization; cell structure; heterocyst and akinete development; reproduction; Life-cycle of Nostoc. Economic Importance of Cyanobacteria.</p> <p>Algae: General characteristics; Algae in diversified habitats (terrestrial, freshwater, marine); thallus organization; cell ultrastructure; reproduction (vegetative, asexual and sexual); Algal classification criteria- pigments, reserve food and flagella; Classification upto classes (Smith, 1955); algal blooms and red tides; algal biofertilizers.</p>
<p>Unit 3</p> <p>Morphology and life-cycle of Volvox, Oedogonium (Chlorophyceae), Vaucheria (Xanthophyceae), Ectocarpus (Phaeophyceae) and Polysiphonia (Rhodophyceae)</p> <p>Economic importance of algae</p>
<p>Unit 4</p> <p>Fungi: General characteristics; organization of thallus; nutrition and reproduction; Classification upto classes (Ainsworth, 1966); Morphology and life-cycles of Phytophthora (Mastigomycotina), Mucor (Zygomycotina), Penicillium (Ascomycotina), Puccinia, Agaricus (Basidiomycotina), Colletotrichum (Deuteromycotina); Economic importance of fungi</p> <p>Lichens: Classification, morphology, internal structure, reproduction and Economic importance.</p> <p>Mycorrhiza: Ectomycorrhiza and endomycorrhiza and their significance.</p>



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## Course Plan

### LESSON PLAN (THEORY AND TUTORIAL CLASSES)

L. No	Topic to be Delivered	Tutorial Plan	Unit
1	Viruses	Theory test	1
2	Viruses		
3	<b>General characters of Bacteria &amp; Classification</b>		
4	Types of Bacteria , Cell structure		
5	Nutritional types & Reproduction	Theory test	1
6	Reproduction & Economic Importance of Bacteria		
7	<b>General characters of Cyanobacteria , Cell structure , Heterocyst &amp; N<sub>2</sub> Fixation</b>		
8	Reproduction & Economic Importance of BGA		
9	Nostoc		
10	General characters of algae-		
11	Reproduction in algae		
12	Classification upto classes (Smith, 1955) & Economic importance of algae		
13	Algal bloom, Red tide & Algal Biofertilizers	Theory Test	2
14	Morphology and life-cycle of Volvox(Chlorophyceae)		
15	Morphology and life-cycle of Volvox & Morphology and life-cycle of Oedogonium		
16	Morphology and life-cycle of Oedogonium & Morphology and life-cycle of Xanthophyceae- Vaucheria		
17	Morphology and life-cycle of Xanthophyceae- Vaucheria & Morphology and life-cycle of Phaeophyceae- Ectocarpus		
14	Morphology and life-cycle of Volvox(Chlorophyceae)	Theory Test	3
15	Morphology and life-cycle of Volvox & Morphology and life-cycle of Oedogonium		
16	Morphology and life-cycle of Oedogonium & Morphology and life-cycle of Xanthophyceae- Vaucheria		
17	Morphology and life-cycle of Xanthophyceae- Vaucheria & Morphology and life-cycle of Phaeophyceae- Ectocarpus		



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18	Morphology and life-cycle of Phaeophyceae- Ectocarpus & Morphology and life-cycle of Rhodophyceae- Polysiphonia		
19	Morphology and life-cycle of Rhodophyceae- Polysiphonia		3
20	Fungi: General characteristics		
21	Classification of Fungi upto classes (Ainsworth, 1966) & Economic importance of fungi		4
22	Morphology and life-cycles of Phytophthora (Mastigomycotina)		
23	Morphology and life-cycles of Phytophthora (Mastigomycotina) & Morphology and life-cycles of Mucor (Zygomycotina)		
24	Morphology and life-cycles of Mucor (Zygomycotina) & Morphology and life-cycles of Penicillium (Ascomycotina)		
25	Morphology and life-cycles of Penicillium (Ascomycotina) & Morphology and life-cycles of Puccinia ( Basidiomycotina)	Theory Test	4
26	Morphology and life-cycles of Puccinia ( Basidiomycotina) & Morphology and life-cycles of Agaricus ( Basidiomycotina)		
27	Morphology and life-cycles of Agaricus ( Basidiomycotina) & Morphology and life-cycles of Colletotrichum (Deuteromycotina)		
28	Lichens & Mycorrhiza		



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### Text Book

Modern's Botany ,

Pardeep's Botany vol. IV,

JBD New Concept in Botany.

### Reference Books

- Smith, G.M. 1971. Cryptogamic Botany. Vol. I. Algae & Fungi. Tata McGraw Hill Publishing Co., New Delhi.
- Sharma, P.D. 1991. The Fungi. Rastogi & Co., Meerut.
- Dube, H.C. 1990. An Introduction to Fungi, Vikas Publishing House Pvt.Ltd., Delhi.
- Clifton, A. 1958. Introduction to the Bacteria: McGraw Hill & Co., New York.
- Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.
- Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
- Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
- Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
- Willey, J.M., Sherwood, L., Woolverton, C.J, Prescott, L.M. and Willey, J.M. (2011). Prescott's Microbiology. New York, McGraw-Hill.

### Web/Links for e-content

- <https://www.youtube.com/watch?v=b0rUeDgDV7g>
- <https://www.youtube.com/watch?v=5-275JxQKzc>  
[https://www.youtube.com/watch?v=oGiGMZtG\\_pw&list=PL1zxEeUFe9If\\_k7RHM6urumQIjDnGAwdg&index=6](https://www.youtube.com/watch?v=oGiGMZtG_pw&list=PL1zxEeUFe9If_k7RHM6urumQIjDnGAwdg&index=6)
- [https://www.youtube.com/watch?v=kVlyNRQZX50&list=PL1zxEeUFe9If\\_k7RHM6urumQIjDnGAwdg&index=10](https://www.youtube.com/watch?v=kVlyNRQZX50&list=PL1zxEeUFe9If_k7RHM6urumQIjDnGAwdg&index=10)



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### PRACTICE QUESTIONS (QUESTION BANK)

1. Describe the general structure of viruses.
2. Explain T phage in detail.
3. Describe TMV in detail.
4. State the physiochemical & biological characteristics of viruses.
5. Give a brief account of lytic cycle.
6. Give a brief account of Lysogenic cycle.
7. Describe general characteristics of bacteria.
8. Explain bacterial cell structure with well Labelled diagram.
9. Explain various nutrition types in bacteria.
10. Describe all major types or classes of bacteria.
11. Give a brief account of reproduction in bacteria.
12. Describe conjugation in detail.
13 Explain Transformation in bacteria.
14 Explain Transduction in bacteria.
15. State Economic Importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine).
16. Give thallus organization in Cyanobacteria.
17. Write short note on heterocyst.
18. Explain general characters of algae.
19. Write short note on algal bloom & algal fertilizers.
20. Give morphology & life cycle of Oedogonium.
21. Give morphology & life cycle of Polysiphonia.
22. State Economic importance of algae.
23. Describe general characters of fungi.
24. Morphology and life-cycles of Phytophthora (Mastigomycotina)
25. Morphology and life-cycles of Puccinia (Basidiomycotina)
26. Explain morphology & internal structure of Lichens.
27. Describe Ectomycorrhiza and endomycorrhiza and their significance.
28. Give economic importance of Lichens.
29. Morphology and life-cycles of Colletotrichum.
30. Morphology and life-cycles of Ectocarpus.



# Sh. L. N. Hindu College, Rohtak (Haryana)

## Course Plan

Department of Chemistry

Program: BSc I Major

Chemistry

### SCHEME

<b>Course Name</b>	<b>Discipline Specific Course</b>	<b>Course Type</b>	<b>Theory</b>
<b>Course Code</b>	<b>UMLS4 or UMPS4</b>	<b>Class</b>	<b>BSc I Sem.</b>
<b>Instruction Delivery</b>	<b>Per week Lectures: 2, Tutorial:1, Practical: - Total No. Classes Per Sem: 32(L), (T), -(P) Assessment in Weightage: Sessional (20%), End Term Exams (80%)</b>		
<b>Course Coordinator</b>	<b>Dr Manish Kumar</b>	<b>Course Instructors</b>	<b>Theory: Dr Manish Kumar Practical: -- Dr Manish Kumar</b>

### COURSE OVERVIEW

Chemistry is the study of macroscopic and microscopic phenomena in chemical systems in terms of the principles, practices, and concepts of physics such as motion, energy, force, time, thermodynamics, quantum chemistry, inorganic chemistry, organic chemistry, statistical mechanics, Electrochemistry, analytical dynamics and chemical equilibria.

### PREREQUISITE

Gaseous state, Chemical bonding, Stereochemistry and p-block elements

### COURSE OBJECTIVE

The objective of this course is to study the different type of chemical bonds and theory of compounds. This Course also reflects the gaseous state of the molecules and various factors on which energy of molecules depend. It also explains the bonding, different type of chemical properties of p-block elements. It gives idea about general organic chemistry and stereochemistry of organic compounds.

### COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

<b>CO No.</b>	<b>Course Outcomes</b>
1	Remember the basic concept of chemical bond formation, resonance and H-bonding.
2	Remember the basic properties and compounds of p-block elements and different acids and bases..
3	Understand the phenomenon gaseous state and critical state
4	Understand the electronic displacement effects and stereochemistry of molecules in 3-D





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### COURSE CONTENT

#### Content

##### **Chemical Bonding and Molecular Structure**

Ionic bond, lattice energy, Born-Haber cycle and its applications, Fajan's rules, hydration energy, bond moment, dipole moment and percentage ionic character. Resonance and resonance energy: study of some inorganic and organic compounds. Molecular Orbital Approach: LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combination of atomic orbitals, non-bonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of s-p mixing) and heteronuclear diatomic molecules such as O<sub>2</sub><sup>-</sup>, O<sub>2</sub><sup>2-</sup>, N<sub>2</sub><sup>-</sup>, CO, NO<sup>+</sup>, CN<sup>-</sup>. Comparison of VB and MO approaches.

##### **p-Block Elements**

Oxides – structures of oxides of N, P. Oxyacids – structure and relative acid strengths of oxyacids of nitrogen and phosphorus. Structure of white, yellow and red phosphorus. Oxyacids of sulphur – structures and acidic strength, H<sub>2</sub>O<sub>2</sub> – structure, properties and uses. Basic properties of halogen, interhalogen compounds – types and properties, halogen-acids and oxyacids of chlorine – structure and comparison of acidic strength.

##### **Acids and Bases**

Brönsted–Lowry concept, conjugate acids and bases, relative strengths of acids and bases, effects of substituent and solvent, differentiating and levelling solvents. Lewis acid-base concept, classification of Lewis acids and bases, Lux-Flood concept.

##### **Gaseous States**

Maxwell's distribution of velocities and energies (derivation excluded), calculation of root mean square velocity, average velocity and most probable velocity. Collision diameter, collision number, collision frequency and mean free path, deviation of real gases from ideal behaviour, derivation of Van der Waals Equation of state and its applications in the calculation of Boyle's temperature (compression factor), explanation of behavior of real gases using Van der Waals equation.

##### **Critical Phenomenon**

Critical temperature, critical pressure, critical volume and their determination. PV isotherms of real gases, continuity of states, isotherms of Van der Waals equation, relationship between critical constants and Van der Waals constants, compressibility factor. Law of corresponding states.

##### **Basics of Organic Chemistry and Stereochemistry**

Electronic displacements and its applications, reaction intermediates and concept of aromaticity. Concept of isomerism, types of isomerism, optical isomerism, optical activity, elements of symmetry, molecular chirality, enantiomers, stereogenic centre, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization, relative and absolute configuration, sequence rules, R & S system of nomenclature.



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### LESSON PLAN (THEORY AND TUTORIAL CLASSES)

L. No	Topic to be Delivered	Tutorial Plan	Unit
1	Ionic bond, lattice energy, Born-Haber cycle and its applications, Fajan's rules, hydration energy	Practice Questions on factors effecting ionic bond.	1
2	bond moment, dipole moment and percentage ionic character		
3	Resonance and resonance energy: study of some inorganic and organic compounds.		
4	Molecular Orbital Approach: LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combination of atomic orbitals,	Practice Questions on Resonance with drawing of different resonating structures of molecules.	
5	MO treatment of homonuclear diatomic molecules of 1st and 2nd periods		
6	heteronuclear diatomic molecules such as $O^{2-}$ , $O_2^{2-}$ , $N^{2-}$ , CO, $NO^+$ , $CN^-$ .	Practice Questions on MO theory with bond order and magnetic character	1
7	Comparison of VB and MO approaches		
8	Questions on MO theory and resonance		
9	Oxides – structures of oxides of N, P. Oxy-acids – structure and relative acid strengths of oxy-acids of nitrogen and phosphorus	Practice questions on acidic strength of oxyacids.	2
10	. Structure of white, yellow and red phosphorus. Oxyacids of sulphur – structures and acidic strength		
11	H <sub>2</sub> O <sub>2</sub> –structure, properties and uses. Basic properties of halogen, interhalogen compounds-types and properties		
12	halogen-acids and oxyacids of chlorine – structure and comparison of acidic strength.		
13	Acids and Bases: Brönsted–Lowry concept, conjugate acids		



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	and bases, relative strengths of acids and bases, effects of substituent		
14	differentiating and levelling solvents. Lewis acid-base concept, classification of Lewis acids and bases, Lux-Flood concept.		
15	Revision of halogen acids, oxyacids of P,S,Cl.		
16	calculation of root mean square velocity, average velocity and most probable velocity.	Practice questions on Conductance and their formulae	3
17	Collision diameter, collision number, collision frequency and mean free path, deviation of real gases from ideal behaviour		
18	derivation of Van der Waals Equation of state and its applications in the calculation of Boyle's temperature		
19	explanation of behavior of real gases using Van der Waals equation		
20	Critical temperature, critical pressure, critical volume and their determination. PV isotherms of real gases,		
21	continuity of states, isotherms of Van der Waals equation, relationship between critical constants and Van der Waals constants	Practice questions on different type of velocities and their relations	4
22	compressibility factor. Law of corresponding states.	Practice questions collision phenomenon of molecules	
23	Questions on different velocities and critical phenomenon		
24	Questions on collision diameter, frequency and real gas equation.		
25	Revise some pyq based on this chapter		
26	Electronic displacement: inductive effect,	Practice questions on electronic displacements	
27	reaction intermediates and concept of aromaticity		
38	isomerism, types of isomerism		



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29	elements of symmetry, molecular chirality, enantiomers, stereogenic centre	Practice questions on Aromaticity  Practice questions on enantiomers and diastereomers.  Practice questions on R & S configuration	
30	two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization		
31	relative and absolute configuration, sequence rules, R & S system of nomenclature.		
32			

### Text Book

A text book of Physical Chemistry, K.L.Kapoor, VOL I  
Concise Inorganic Chemistry by J. D. Lee  
Organic Chemistry by R. T. Morrison and R. N. Boyd.  
Stereochemistry of Organic Compounds by E. L. Eliel and S. H. Wilen.

### Reference Books

Principles of Physical Chemistry by Puri Sharma Pathania  
Physical Chemistry by Atkins  
Basic Organic Chemistry by R. Chandra, S. Singh and A. Singh.

### Web/Links for e-content

<https://youtu.be/esNMFQgJ9QY?si=7MT7mpZl5CqJX9LH>

<https://youtu.be/UXJkYgfKdQI?si=bxHgOHfstwuWUXo3>

[https://youtube.com/playlist?list=PLqUcmwsbGS\\_G4EV0KMBt0vQCfy04USNay&si=ki9V-3TcdeLca4SU](https://youtube.com/playlist?list=PLqUcmwsbGS_G4EV0KMBt0vQCfy04USNay&si=ki9V-3TcdeLca4SU)

[https://youtube.com/playlist?list=PLqUcmwsbGS\\_FcmcVHfvwM3K14oX59S9DG&si=tfaqMKVcmQTwd9dO](https://youtube.com/playlist?list=PLqUcmwsbGS_FcmcVHfvwM3K14oX59S9DG&si=tfaqMKVcmQTwd9dO)

### PRACTICE QUESTIONS (QUESTION BANK)

S No	Problem
1	Draw MO diagram of $N_2^+$ and explain why they have less bond order than $N_2$ .
2	Draw MO diagram of CO and find its bond order.
3	Explain Born-Haber cycle of $CaCl_2$ .
4	Explain Fajan rule with example



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5	Discuss Resonating structures of $O_3$ molecule.
6	Why NaCl is soluble in water whereas AgCl is insoluble in water?
7	What is meant by H-bonding? Discuss its types with suitable examples.
8	Why dipole moment of p-dichlorobenzene is greater than o-dichlorobenzene?
9	Write the structure and properties of $H_2O_2$ .
10	Compare the acidic strength of $HClO_4$ , $HClO_3$ , $HClO_2$ , $HClO$
11	Discuss the structures of various oxy-acids of Phosphorus.
12	Discuss the structures of various oxy-acids of Sulphur.
13	What are interhalogen compounds? Give their properties and structures.
14	What are bronsted acid and bases?
15	Explain the hydrides of various group elements
16	What is Lux-Flood concept of acid and bases.
17	What are different velocities and their relations?
18	Define Collision number, diameter and frequency.
19	Derive an expression for Vander Waal equation for real gases.
20	Differentiate between real and ideal gases.
21	What are the Vander Waal constants? Give their units.
22	What is $T_c$ , $P_c$ and $V_c$ ?



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23	What is continuity of state? Explain relation between critical pressure, volume and temperature?
24	Explain Law of corresponding states.
25	What is inductive effect? Explain its applications
26	What is Resonance effect? Explain its applications
27	Write a short note on structure, stability and reactivity of carbocations.
28	What is optical activity? How it is related with chirality of compounds?
29	What are enantiomers and Diastereomers?
30	Explain racemic mixture and meso compounds in details.
31	What is R & S configuration. Calculate the R & S configuration of some organic compounds.
32	What are chiral and achiral molecules with 2 stereo genic centers.



# Sh. L. N. Hindu College, Rohtak (Haryana)

## Course Plan

Department of Zoology

Program: B.Sc Medical

**Animal Diversity of**

**Non-Chordates**

### SCHEME

<b>Course Name</b>	<b>Animal Diversity of Non- Chordates</b>	<b>Course Type</b>	<b>Theory</b>
<b>Course Code</b>	<b>24ZOOM401DS02</b>	<b>Class</b>	B.Sc,Medical (Zoology) Ist Sem.
<b>Instruction</b>	<b>Per week Lectures: 6, Tutorial:0, Practical:4</b>		
<b>Delivery</b>	<b>Total No. Classes Per Sem: 70(L), 28(T), 42-(P)</b> <b>Assessment in Weightage: Sessional (30%), End Term Exams (70%)</b>		
<b>Course Coordinator</b>	<b>Manisha Yadav</b>	<b>Course Instructors</b>	Theory: Manisha Yadav Practical: Manisha Yadav

### COURSE OVERVIEW

Non-chordates are a group of animals that lack a notochord, a rod-like structure in their bodies. They include a wide variety of animals, such as marine species and members of the phyla Porifera, Hemichordata, Echinodermata, Mollusca, Arthropoda, Annelida, Aschelminthes, Platyhelminthes, Ctenophora, and Coelenterata.

### PREREQUISITE

General Characters, classification and type study of Protozoa (Plasmodium Vivax type study)

General Characters, classification and type study of Porifera (Sycon type study)

General Characters, classification and type study of Coelenterata (Obelia) and Platyhelminthes (Fasciola Hepatica)

General Characters, classification and type study of Annelida (Earthworm), Arthropoda (Cockroach), Mollusca (Apple snail), Hemichordata (Sea star)

### COURSE OBJECTIVE

The course is designed to develop an understanding of the basic insect biology as well as natural history and evolutionary reflationary of non-chordates orders and family. Student can be conversant with scientific literature especially the literature related to non-chordate biology. This course provides the core knowledge of the potential impact of different non-chordate species. The students can have a visual and hand on experience with biological research materials and methods. By fostering an in-depth



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engagement with zoological sciences, it empowers students to contribute meaningfully to the exploration of non-chordates diversity.

### COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO No.	Course Outcomes
1	Student will be able to describe unique characters and recognize life forms of Lower phylum Protozoa to Helminthes
2	Student will be able to describe unique characters and recognize life forms of higher phylum Annelida to Echinodermata
3	Student will be able to describe unique characters and recognize life forms of lower chordates phylum

### COURSE CONTENT

Content
<b>Unit I</b> Phylum Protozoa : General Characters and Classification Protozoa: <i>Plasmodium vivax</i> (Malarial Parasite) Phylum Porifera : General Characters and Classification Phylum Porifera: <i>Scypha</i> (Sycon)
<b>Unit II</b> Phylum Coelentrata : General Characters and Classification Phylum Coelentrata : <i>Obelia</i> (Sea Fur) Phylum Platyhelminths : General Characters and Classification Phylum Platyhelminths: <i>Fasciola hepatica</i> (Sheep Liver Fluke) Phylum Aschehelminths: General Characters and Classification
<b>Unit III</b> Phylum Annelida : General Characters and Classification Phylum Annelida : <i>Pheretima posthuma</i> (Earthworm) Phylum Arthropoda : General Characters and Classification Phylum Arthropoda: <i>Periplaneta americana</i> (Cockroach)
<b>Unit IV</b> Phylum Mollusca : General Characters and Classification





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Phylum Mollusca : *Pila globosa* (An apple snail)

Phylum Echinodermata : General Characters and Classification

Phylum Echinodermata : *Asterias* (Sea Star)

Phylum Hemichordata: General Characters with examples



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### LESSON PLAN (THEORY AND TUTORIAL CLASSES)

L. No	Topic to be Delivered	Tutorial Plan		Unit
1	Introduction to phylum Protozoa.	MCQ test on Characters, classification and type of Protozoa & Porifera	Diagram test	1
2	Type study <i>Plasmodium vivax</i> .			
3	Type study <i>Scypha</i>			
4	General characters and classification of Coelentrata	MCQ test of Coelentrata to Aschelminths	Diagram test	2
5	Phylum Coelentrata : <i>Obelia</i> (Sea Fur)			
6	Phylum Platyhelminths : General Characters and Classification			
7	Phylum Platyhelminths: <i>Fasciola hepatica</i> (Sheep Liver Fluke)	MCQ test		
8	Phylum Aschehelminths: General Characters and Classification			
11	Phylum Annelida : General Characters and Classification Phylum Annelida : <i>Pheretima posthuma</i> (Earthworm) Phylum Arthropoda : General Characters and Classification Phylum Arthropoda: <i>Periplaneta americana</i> (Cockroach)	Diagram test on type study of Mollusca to Echinodermata		3&4
12	Phylum Mollusca : General Characters and Classification			



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	Phylum Mollusca : <i>Pila globosa</i> (An apple snail)		
13	Phylum Echinodermata : General Characters and Classification Phylum Echinodermata : <i>Asterias</i> (Sea Star)		
14	Phylum Hemichordata: General Characters with examples		



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### Text Book

Sabharwal A. Modern text book of Zoology B. Sc. Part-I, Semester-I: Animal Diversity of Non-Chordates

### Reference Books

1. Barnes, R.D. Invertebrate Zoology (1982) VI Edition. Holt Saunders International Edition.
2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. & J.I., Spicer (2002) The Invertebrates: A New Synthesis. III Edition. Blackwell Science.
3. Barrington, E.J.W. (1979) Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson.
4. Boradale, L.A. and Potts, E.A. (1961) Invertebrates: A Manual for the use of Students. Asia Publishing Home.
5. Bushbaum, R. (1964) Animals without Backbones. University of Chicago Press.

### Web/Links for e-content

<https://www.youtube.com/watch?v=uTaTcKjQoq8&t=98s>  
<https://www.youtube.com/watch?v=WmbMYr2pLh4>  
<https://www.youtube.com/watch?v=aL5EIVX8Y6g&t=221s>  
<https://www.youtube.com/watch?v=7jilMde4zfY>  
<https://www.youtube.com/watch?v=-hsPTu3TcUE>



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### PRACTICE QUESTIONS (QUESTION BANK)

S No	Problem
1	List peculiar characters of phylum Porifera?
2	Differentiate between three classes of Porifera?
3	Classify the phylum Porifera upto class level giving the characters and examples of each group?
4	Differentiate between Polyp and Medusa with diagrams ?
5	Give an account of Habitat, Habits, and external characters of Obelia?
6	Give detail account on life history of Fasciola Hepatica?
7	Describe life cycle of Plasmodium vivax?
8	Give an account of reproductive system of Fasciola with diagrams?
9	What is tube within tube body plan?
10	List peculiar characters of Aschelminthes?
11	List peculiar characters of Annelida?
12	Decribe circulatory system of <i>Pheretima</i> ?
13	Give an account of nervous system of earthworm?
14	Describe digestive system of <i>Pheretima</i> ?
15	Give an account on general characters of phylum Arthropoda?
16	Describe mouth parts of cockroach?
17	Give an account on digestive system of cockroach?
18	Write about circulatory system of cockroach.
19	Give an account on general characters of Mollusca and Echinodermata?
20	Describe respiration in <i>Pila</i> .
21	Write about nervous system of <i>Pila</i> .
22	Describe water vascular system of Asterias.
23	Give an account on life history of Asterias?