

 <p>शिवाजी विद्यापीठ कोल्हापूर          Estd. 1962          "A<sup>++</sup>" Accredited by          NAAC(2021)          With CGPA 3.52</p>	<p><b>SHIVAJI UNIVERSITY, KOLHAPUR - 416004,          MAHARASHTRA</b>          PHONE : EPABX – 2609000,          www.unishivaji.ac.in, <a href="mailto:bos@unishivaji.ac.in">bos@unishivaji.ac.in</a>  <b>शिवाजी विद्यापीठ, कोल्हापूर - ४१६००४, महाराष्ट्र</b>          दूरध्वनी - ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दुरध्वनी विभाग २३१-२६०९०९३/९४</p>	
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SU/BOS/Science/

Date: **14 SEP 2022**  
**No 00235**

To,  
 The Principal,  
 All Affiliated Concerned Science Colleges/Institutions  
 Shivaji University, Kolhapur.

**Subject :- Regarding syllabi of M.Sc., & B. Sc. (NEP-2020) adegree programme under the Faculty of Science and Technology as per National Education Policy, 2020 .**

**Sir/Madam,**

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the syllabi and Nature of question paper of M.Sc., & B. Sc. (NEP-2020) System under the Faculty of Science and Technology as per National Education Policy, 2020 .

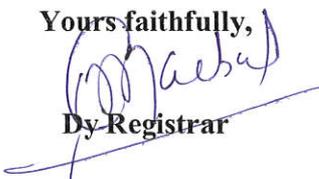
Sr. No.	Faculty of Science and Technology	Programme/ Course
1	Zoology	M. Sc. Part- I Zoology
		B. Sc. Part- I Zoology

This syllabi and nature of question paper shall be implemented from the Academic Year 2022-2023 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website [www.unishivaji.ac.in](http://www.unishivaji.ac.in) (students Online Syllabus)

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

  
 Dy Registrar

Copy to:

1	The Dean, Faculty of Science & Technology	7	Appointment Section
2	Director, Board of Examinations and Evaluation	8	P.G.Seminar Section
3	The Chairman, Respective Board of Studies	9	Computer Centre (I.T.)
4	B.Sc. Exam	10	Affiliation Section (U.G.)
5	Eligibility Section	11	Affiliation Section (P.G.)
6	O.E. I Section	12	P.G.Admission Section

# **SHIVAJI UNIVERSITY, KOLHAPUR.**



Accredited By NAAC with 'A++' Grade

**CHOICE BASED CREDIT SYSTEM**

Syllabus For

**B.Sc. Part - I  
ZOOLOGY**

**SEMESTER I AND II**

**(Syllabus to be implemented from June, 2022 onwards.)**

**Choice Based Credit System with Multiple Entry and Multiple Exit Options**

**To be implemented from the Academic Year 2022-23**

**First Year Bachelor of Science (Level-5) Programme Structure (NEP-2020 PATTERN)**

**Sub Zoology**

SEMESTER-I (Duration-6 Months)							
Technical scheme							
Theory					Practical		
CGPA Courses	Course code	Credits	Number of Lecture per week	Hours	Credits	Number of Lecture per week	Hours
	DSC-15A	02	05	04	02	04	3.2
	DSC-16A	02					
	AECC-A	02	04	3.2			
	Total-(A)	06	09		02	04	
Non CGPA Course	SEC-I	-	-	-	02	04	04
	VBC-I	-	-	-	01	02	02
SEMESTER-II (Duration-6 Months)							
CGPA Courses	DSC-15B	02	05	04	02	04	3.2
	DSC-16B	02					
	AECC-B	02	04	3.2			
	Total-(B)	06	09				
Non CGPA Course	SEC-I	-	-	-	02	04	04
	VBC-I	-	-	-	01	02	02
Total-(A+B)		12	18		04	08	6.4



**List of SEC Courses (A student can opt any SEC irrespective of his own faculty)**

- ❖ Apiculture
- ❖ Sericulture
- ❖ Vermiculture
- ❖ CMLT
- ❖ Aquarium Maintenance
- ❖ Bioinformatics

**Link for the pool of SEC courses from**

National Skills Qualification Framework (NSQF)

(You may add or delete any courses as per available facilities)

[https://drive.google.com/file/d/176Vwvx4SC2ONrt69XADruzI2qnfBPI\\_o/view?usp=sharing](https://drive.google.com/file/d/176Vwvx4SC2ONrt69XADruzI2qnfBPI_o/view?usp=sharing)

**B. Sc. Part – I Semester –I**  
**ZOOLOGY**

DSC – 15A (ANIMAL DIVERSITY-I)  
Theory: 30 hrs. (37.5 lectures of 48 minutes)  
Marks -50 (Credits: 02)

**Unit 1:**

<b>Kingdom Protista</b>	<b>(3hrs.)</b>
General characters and classification up to classes; Locomotory organelles and locomotion in Protozoa	
<b>Phylum Porifera</b>	<b>(3hrs.)</b>
General characters and classification up to classes; Canal System in <i>Sycon</i>	
<b>Phylum Cnidaria</b>	<b>(3hrs.)</b>
General characters and classification up to classes; Polymorphism in Hydrozoa	
<b>Phylum Platyhelminthes</b>	<b>(3hrs.)</b>
General characters and classification up to classes; Life history of <i>Taenia solium</i> and its parasitic adaptations	
<b>Phylum Nematelminthes</b>	<b>(3hrs.)</b>
General characters and classification up to classes; Life history of <i>Ascaris lumbricoides</i> and its parasitic adaptations	

**Unit 2:**

<b>Phylum Annelida</b>	<b>(3hrs.)</b>
General characters and classification up to classes; Metamerism in Annelida	
<b>Phylum Arthropoda</b>	<b>(5hrs.)</b>
General characters and classification up to classes; Vision in Arthropoda, Metamorphosis in Insects	
<b>Phylum Mollusca</b>	<b>(3hrs.)</b>
General characters and classification up to classes; Torsion in gastropods	
<b>Phylum Echinodermata</b>	<b>(4hrs.)</b>
General characters and classification up to classes; Water-vascular system in Asteroidea	

**Total Periods – 30 hrs**

**B. Sc. Part – I Semester –I**  
**ZOOLOGY**  
**DSC – 16 A (Cell Biology and Evolutionary Biology)**  
Theory: 30 hrs. (37.5 lectures of 48 minutes)  
Marks-50 (Credits: 02)

**CELL BIOLOGY & EVOLUTIONARY BIOLOGY**

<b>Cell structure-</b>	<b>(2hrs.)</b>
Cell theory and diversity in cell size and shape	
<b>Structure of nucleus-</b>	<b>(2hrs.)</b>
Nucleus with reference to Nuclear membrane, Nucleoplasm, Chromatin and nucleolus.	
<b>Structure of Chromosome-</b>	<b>(3hrs.)</b>
With reference to Morphology and organization (Nucleosome), Polytene Chromosomes	
<b>Ultra structure and functions of the following</b>	<b>(8 hrs.)</b>
Plasma membrane (Fluid Mosaic Model)	
Mitochondria	
Endoplasmic reticulum	
Golgi complex	
Lysosome	
<b>Unit 2:</b>	
<b>History of Life</b>	<b>(2hrs.)</b>
Major Events in History of Life : Introduction to theories of origin of life, study of theory of chemical evolution.	
<b>Introduction to Evolutionary Theories</b>	<b>(5hrs.)</b>
Lamarckism, Darwinism, Neo-Darwinism	
<b>Direct Evidence of Evolution</b>	<b>(4hrs.)</b>
Types of fossils, formation of fossils, dating of fossils	
<b>Extinction</b>	<b>(4hrs.)</b>
Mass extinction (Causes, Names of five major extinctions, K-T extinction in detail), Role of extinction in evolution	

**Total Periods – 30 hrs**

- **Suggested Readings:**

- Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.
- Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science
- Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
- Pough H. *Vertebrate life*, VIII Edition, Pearson International.
- Hall B.K. and Hallgrímsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc.
- Tortora, G.J. and Derrickson, B.H. (2009). *Principles of Anatomy and Physiology*, XII Edition, John Wiley & Sons, Inc.
- DeRobertis EDP and DeRobertis EME – Cell and Molecular Biology
- C.B. Powar – Cell Biology, Himalaya Pub. House
- P. K. Gupta – Cell and Molecular Biology
- Cell Biology – Dr. N. Arumugam
- Ridley, M. (2004). *Evolution*. III Edition. Blackwell Publishing
- Barton, N.H., Briggs, D.E.G., Eisen, J.A., Goldstein, D.B. and Patel, N.H. (2007). *Evolution*. Cold Spring Harbour Laboratory Press.
- Hall, B.K. and Hallgrímsson, B. (2008). *Evolution*. IV Edition. Jones and Bartlett Publishers
- Campbell, N. A. and Reece J. B. (2011). *Biology*. IX Edition, Pearson, Benjamin, Cummings.
- Douglas, J. Futuyma (1997). *Evolutionary Biology*. Sinauer Associates.

**B. Sc. Part – I Semester –II**  
**ZOOLOGY**  
**DSC – 15 B (Animal Diversity and Insect Vector)**

Theory: 30 hrs. (37.5 lectures of 48 minutes)

Marks-50 (**Credits: 02**)

**Animal Diversity and Insect Vectors**

**Unit: I Animal Diversity**

**(16 hrs)**

**Type Study: Rat (*Rattus rattus*)** (Physiology is not expected)

- Systematic position, Habit and Habitat
- Morphological Characters
- Digestive System
- Respiratory System
- Circulatory System (Composition of Blood and Heart)
- Excretory System
- Reproductive System
- Brain for Rat

**Unit: II : Insect Vectors**

**1. Mosquito as an insect vector**

**(8hrs)**

Mosquito born diseases with respect to causal organism, life cycle and symptoms

- a. Malaria
- b. Dengue
- c. Chikungunya
- f. Control Measures of mosquitoes

**2. Housefly as an important mechanical vector**

**(2 hrs)**

Housefly born diseases with respect to Causal organism, life cycle, symptoms

- a. Myiasis
- b. Control Measure of housefly

**3. Flea as an insect vector**

**(4 hrs)**

Flea born diseases with respect to Causal organism, life cycle and symptoms

- a. Plague
- b. Typhus fever
- c. Control of fleas

**Total Periods – 30 hrs**

## **B. Sc. Part – I Semester –II**

### **ZOOLOGY**

#### **DSC – 16 B (Genetics)**

Theory: 30 hrs. (37.5 lectures of 48 minutes)

Marks-50 (**Credits: 02**)

### **Genetics**

#### **Unit: 1**

##### **Introduction to Genetics (3hrs.)**

Mendel's work on transmission of traits, Genetic Variations, Molecular basis of Genetic Information

##### **Mendelian and postMendelian Genetics (8hrs.)**

Principles of Inheritance, Incomplete dominance and co-dominance, gene interaction, Multiple alleles w.r.t. ABO, Rh blood groups and coat colour in rabbit, sex linked inheritance.

##### **Linkage, Crossing Over (4hrs.)**

Linkage and process of crossing over, Coupling and repulsion theory, Cytological evidence of crossing over.

#### **Unit 2:**

##### **Mutations (8hrs.)**

Chromosomal Mutations: Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy, induced gene mutation.

##### **Sex Determination (7hrs.)**

Chromosomal theory, Genic balance theory, Haploidy-Diploidy mechanism, Environmental Theory

**Total Periods – 30 hrs**

## Suggested Readings :

- P.S.Varma &V.K.Agarwal–CellBiology,Genetics,MolecularBiology, Evolution andEcology
- R. P. Meyyan, N, Arumugam – Genetics &Evolution
- Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). *Principles of Genetics*. VIII Edition. WileyIndia.
- Snustad, D.P., Simmons, M.J. (2009). *Principles of Genetics*. V Edition. John Wileyand SonsInc.
- Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). *Concepts of Genetics*. X Edition. Benjamin Verma P. S. and Agarwal V. K. – Genetics, S. Chand and Company
- Strickberger– Genetics. C Millian Publications
- Winchester – Genetics, Oxford Publication
- Genetics by P.P. Meyyan, Cummings.
- Russell, P. J. (2009). *Genetics- A Molecular Approach*. III Edition. Benjamin Cummings.
- Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. *Introduction to Genetic Analysis*. IX Edition. W. H. Freeman and Co.
- Imms, A.D. (1977). A General Text Book of Entomology. Chapman & Hall, U K Chapman, R.F. (1998). The Insects: Structure and Function. IV Edition, Cambridge University Press, U K Pedigo L.P. (2002). Entomology and Pest Management. Prentice Hall Publication Mathews, G. (2011). Integrated Vector Management: Controlling Vectors of Malaria Insect Vector Borne Diseases. Wiley-Blackwell Biology of Vertebrates Walter & Sayles; (McMillan). Chordate Zoology, P.S. Dhami & J. K. Dhami - R. Chand & Co., New Delhi. Modern Textbook of Zoology, R.L. Kotpal, Rastogi Publications, Meerut. The Life of Vertebrates, 3rd Edition, 1993, J. Z. Young E. L. B.S. Oxford. Chordate Zoology - E.L. Jordan, S. Chand & Co., New Delhi. The Phylum Chordata - 1987, H.H. Newman, Distributor Satish Book Enterprise, Agra. Comparative Anatomy of the Vertebrates G. C. Kent.

# **B. Sc. Part – I**

## **ZOOLOGY PRACTICALS**

Marks -50 (Credits: 02)

(DSC– 15A,B and 16 A,B:  
LAB)

### **1. Study of the following specimens:**

- i Study of *Amoeba*, *Euglena*, *Plasmodium*, *Paramecium*, w.r.t. classification and locomotion
- ii Study of *Sycon*, *Hyalonema*, and *Euplectella*, *Obelia*, *Physalia*, *Aurelia*, *Tubipora*, *Metridium*, *Taenia solium*, Male and female *Ascaris lumbricoides*, *Aphrodite*, *Nereis*, *Pheretima*, *Hirudinaria*, *Palaemon*, *Cancer*, *Limulus*, *Palaemnaeus*, *Scolopendra*, *Julus*, *Periplaneta*, *Apis*, *Chiton*, *Dentalium*, *Pila*, *Unio*, *Loligo*, *Sepia*, *Octopus*, *Pentaceros*, *Ophiura*, *Echinus*, *Cucumaria* and *Antedon*, w.r.t. classification and morphological peculiarities.

### **2. Study of the following:**

- i T.S. or L.S. of *Sycon*,
- ii Life history *Taenia* and *Ascaris* and their parasitic adaptations.

### **3. Preparation of haemincrystals**

### **4. Study Tour: Visit to any suitable place to study animal diversity or any place related to theory syllabus and submission of report.**

### **5. Preparation of blood smear and identification of ABO and Rh blood groups**

### **6. Cytological Preparations:**

Mitochondria – Stained preparation of mitochondria from onion peeling / Hydrilla leaf / Oral mucosa by using Janus Green -B.

Polytene Chromosomes – Stained preparation of polytene chromosome in Chironomous larva/Drosophila larva.

### **7. Study of fossil evidences from plaster cast models and pictures.**

### **8. Demonstration of Rat to study,**

- Digestive system, Lungs, Heart, Kidney, Testis, Ovary and Brain of Rat

### **9. Study of Mendelian Inheritance and gene interactions (Non-Mendelian Inheritance) using suitable examples. Minimum 10 Examples on: Monohybrid & Dihybrid ratio, Incomplete dominance, Co-dominance, Multiple alleles, Sex linked inheritance, Linkage, Crossing over and Gene interaction.**

### **10. Study of following insect vectors through permanent slides or photographs**

1. Mosquito born diseases (Causal organism, symptoms and control measures)
  - a. Malaria
  - b. Dengue
  - c. Chikungunya
2. Housefly born diseases (Causal organism, symptoms and control measures)
  - a. Myiasis
3. Flea born diseases (Causal organism, symptoms and control measures)
  - a. Plague
  - b. Typhus fever

## SUGGESTED READINGS

- Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.
- Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science
- Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
- Pough H. *Vertebrate life*, VIII Edition, Pearson International.
- Hall B.K. and Hallgrimsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc.
- Practical Zoology by Kotpal.
- Practical Zoology by Verma and Agarwal. Physiology by C.C. Chattarji. Vol. I & II.
- Lehane, M. J. (1991). *Biology of blood sucking insects*. Harper Collins Academic, London.
- Service M. W. (1986). *Blood sucking insects : Vectors of disease, studies in biology*. No. 167, Arnold, London.

## SCHEME OF MARKING (THEORY)

SEM	Core Course	Evaluation	Marks	Total Marks	Answer Books	Standard of passing( Min)
I	DSC - 15A	Semester wise	50	100	As per Instructions	35
	DSC - 16A	Semester wise	50			
II	DSC - 15B	Semester wise	50	100	As per Instructions	35
	DSC - 16B	Semester wise	50			

## SCHEME OF MARKING (PRACTICAL)

**Practical examination is annul**

SEM	Course	Marks	Evaluation	Sections	Standard of passing
I and II	DSC – A( DSC 15A and DSC 16A) Lab and DSC - B ( DSC 15B and DSC 16B) Lab	50	Annual	As per Instructions	35%

## Nature of Theory Question Paper

### B.Sc. I Zoology

Q.1 Ten multiple choice question (one mark each)	10
Q. 2 Attempt any two (Ten marks each)	20
i.	
ii.	
iii.	
Q.3 Attempt any four (five marks each)	20
i.	
ii.	
iii.	
iv.	
v.	
vi.	