



SU/BOS/Science/403

Date: 18/07/2024.

To,

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

Subject: Regarding Minor Change syllabi of B.Sc. Part-I (Sem.I & II) as per NEP-2020 (2.0) degree programme under the Faculty of Science and Technology.

Ref: SU/BOS/Science/876/ Date: 26/12/2023 & SU/BOS/Science/350/ Date: 24/06/2024 Letter.

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 Minor Change syllabi, nature of question paper of B.Sc. Part-I (Sem.I & II) as per NEP-2020 (2.0) degree programme under the Faculty of Science and Technology.

B.Sc.Part-I (Sem. I & II) as per NEP-2020 (2.0)			
1.	Mathematics	2.	Zoology

This syllabus, nature of question and equivalence shall be implemented from the academic year 2024-2025 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk(Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2024 & March/April 2025. These chances are available for repeater students, if any.

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

Thanking you,


Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	4	B.Sc. Exam/ Appointment Section
2	Director, Board of Examinations and Evaluation	5	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	6	Affiliation Section (U.G.) (P.G.)



SU/BOS/Science/350

Date: 24/06/2024

To,

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

Subject: Regarding Minor Change syllabi of B.Sc. Part-I (Sem.I & II) as per NEP-2020 (2.0) degree programme under the Faculty of Science and Technology.

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B.Sc.Part-I (Sem. I & II) as per NEP-2020 (2.0)			
1.	Botany	9.	Geology
2.	Physics	10.	Zoology
3.	Statistics	11.	Chemistry
4.	Astrophysics	12.	Geography
5.	Mathematics	13.	Electronics
6.	Microbiology	14.	Drug Chemistry
7.	Plant Protection	15.	Industrial Microbiology
8.	Astrophysics and Space Science	16.	Sugar Technology (Entire)

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Estd. 1962
"A++" Accredited by
NAAC (2021)
With CGPA 3.52

**SHIVAJI UNIVERSITY, KOLHAPUR - 416004,
MAHARASHTRA**

PHONE:EPABX-2609000, www.unishivaji.ac.in, bos@unishivaji.ac.in

शिवाजी विद्यापीठ, कोल्हापूर - ४१६००४, महाराष्ट्र

दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१-२६०९०९४
०२३१-२६०९४८७



SU/BOS/Science/876

Date: 26/12/2023

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All Concerned Affiliated Colleges/Institutions
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B.Sc.-I (Sem. I & II) as per NEP-2020 (2.0)			
1.	Mathematics	7.	Electronics
2.	Statistics	8.	Chemistry
3.	Physics	9.	Sugar Technology (Entire)
4.	Botany	10.	Geography
5.	Microbiology	11.	Geology
6.	Industrial Microbiology	12.	Zoology

This syllabus, nature of question and equivalence shall be implemented from the academic year 2024-2025 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in)

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**Dy Registrar
Dr. S. M. Kubal**

Copy to:

1	The Dean, Faculty of Science & Technology	8	P.G. Admission/Seminar Section
2	Director, Board of Examinations and Evaluation	9	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	10	Affiliation Section (U.G.) (P.G.)
4	B.Sc. Exam/ Appointment Section	11	Centre for Distance Education

SHIVAJI UNIVERSITY, KOLHAPUR.



Accredited By NAAC with 'A' Grade

National Education

Policy (NEP) 2.0

Syllabus for

B. Sc. Zoology

Syllabus to be implemented from

June 2024 onwards.

Shivaji University, Kolhapur
Bachelor of Science Credit Framework
First-Year (B. Sc. I-Zoology)

SEM (Level)	COURSES			OE	VSC/SEC	AEC/VEC/IKS	OJT/FP/CEP /CC/RP	Total Credits	Degree/Cum. Cr. MEME
	Course-1	Course-2	Course-3						
SEM I (4.5)	ZOO 101 Paper I Animal Diversity (2) ZOO 102 Paper II Cell Biology (2) ZOO PR 103 Practical I (2)	DSC I (2) DSC II (2) DSC P1(2)	DSC I (2) DSC II (2) DSC P1 (2)	ZOOOE 101 OE I (2) Diet and Nutrition		IKS I (2) Introduction to IKS			UG Certificate 44 Credits
Credits	4 (T) + 2 (P) = 6	4 (T) + 2 (P) = 6	4 (T) + 2 (P) = 6	2		2		22	
SEM II (4.5)	ZOO 201 Paper III Genetics (2) ZOO 202 Paper IV ecology, ethology, evolution, entomology (2) ZOO 203 Practical II (2)	DSC III (2) DSC IV (2) DSC P II (2)	DSC III (2) DSC IV (2) DSC P II (2)	ZOOOE 201 OE II (2) Vermiculture		VEC I (2) (Democracy, Election and Constitution)			
Credits	4 (T) + 2 (P) = 6	4 (T) + 2 (P) = 6	4 (T) + 2 (P) = 6	2		2		22	
Total	8(T)+4(P)=12	8(T)+4(P)=12	8(T)+4(P)=12	2+2=4 (T/P)	--	2+2=4	--	44	

Exit Option: If a students choose to exit after B. Sc. I, he/she will be awarded an UG certificate after successful completion of 44 credits + a 4 credits course of NSQF/ Internship / a Skill course

B. Sc. I Structure in Zoology NEP 2.0

Discipline-specific Courses

Sr. No.	Semester	Course Code	Course Title	Credits	Hours of teaching	Marks
1.	I	ZOO 101	Paper I Animal Diversity	2	30	50
2.		ZOO 102	Paper II Cell Biology	2	30	50
3.		ZOOPR 103	Practical I	2	60	50
4.	II	ZOO 201	Paper III Genetics	2	30	50
5.		ZOO 202	Paper IV Ecology, Ethology, Evolution and Entomology	2	30	50
6.		ZOOPR 203	Practical II	2	60	50

Program Outcomes (POs): B. Sc. Zoology

PO1: The students will learn about the basic concepts of Zoology and a platform for the entry of students in post-graduation studies, competitive examinations, paramedical fields, and agricultural business will be prepared.

PO2: Students will understand the concepts in zoology and be able to understand, classify, describe, and discuss different aspects of zoology like animal Phyla, conservation of animals, animal physiology, etc.

PO3: Students can apply their knowledge to solve problems related to genetics, and ecology and become competent to apply their knowledge of physiology, ethology, and entomology in their day-to-day life.

PO4: The students acquire various practical skills and dissection skills.

PO5: The students will be able to diagnose problems related to environmental issues, health and hygiene, agriculture and pest management, conservation of natural resources, etc., and try to solve them with scientific aptitude.

PO6: The students will apply their knowledge of zoology for the development of entrepreneurship and also practice it in their day-to-day lives.

Program Specific Outcomes (PSOs): B. Sc. I Zoology

PSO 1: The students will learn about animal diversity, cell biology, genetics, ecology, ethology, evolution, and entomology.

PSO 2: The students will understand various basic concepts and be able to describe them.

PSO 3: The students can apply their knowledge to classify, distribute, and organize the animals.

PSO 4: The students can solve the problems related to patterns of heredity, pedigree analysis, etc.

PSO 5: The students will acquire skills like sketching the diagrams, karyotype analysis, dissection, and other practical skills.

B. Sc. Part – I Semester – I
ZOOLOGY Paper - I
ZOO 101 ANIMAL DIVERSITY

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Objectives (COs): Animal Diversity

The course on animal diversity is aimed at making the student to:

1. understand the concept and importance of biodiversity
2. Enable the students to identify the similarities and differences among the animals in different Phyla and classes.
3. develop sensitivity for the conservation of biodiversity in their day-to-day life.
4. equip the students with the skills of dissection.

Unit I

(10 Hrs)

Principles of classification, Five Kingdom classification
Binomial nomenclature
Levels of Organizations in Kingdom Animalia
Germ layers and coelom concept
Different modes of nutrition
Non-chordates concept, Phyla with prominent characters and examples
Phylum Chordata: Characters, subphyla/ classes with prominent characters and examples
Difference between non-chordates and chordates
Generalized body plans of non-chordates (Annelida/Arthropods) and chordates

Unit II

(10 Hrs)

Animal Diversity concept and its importance
Zoogeographical regions and distribution of animals: Global and Indian biodiversity.
Extinct and threatened animals
Hotspots of biodiversity and Biodiversity Centres
Need for conservation and conservation strategies

Unit III

(10 Hrs)

Cockroach: a representative of non-chordates
Habit and habitat
Systematic position
Morphology
Anatomy: Digestive system, nervous system, blood vascular system, Respiratory system, excretory system, reproductive system, and receptor organs.

References:

- Hyman, L. H. – The invertebrate, Vol. I (McGraw Hill)
- Hyman, L. H. – The invertebrate, Vol. II (McGraw Hill)
- Barnes, R. D. – Invertebrate Zoology (W. B. Saunders Co.). 1987
- Parker and Haswell – A Text Book of Zoology – Invertebrate Vol. I Edited by Marshall and Williams, C. B. S. Publishers and Distributors, New Delhi. 1972
- P.S. Dhami and J. K. Dhami – Invertebrates, S. Chand and Company, New Delhi 1979
- A Text Book of Invertebrates – N. C. Nair, N. Soundara Pandian, S. Leelavathy, T. Murugan Saras Publication 2010
- Invertebrate Zoology by R. L. Kotpal Rastogi Publications 2020

B. Sc. Part – I Semester – I
ZOOLOGY Paper - II
ZOO 102 CELL BIOLOGY

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Objectives (COs): Cell Biology

The Course on cell biology is aimed at making the students to:

1. understand the general organization of cell organelles and their functions.
2. apply their knowledge to study the functioning of a cell and cell divisions and its regulation.
3. analyze the role of cell organelles and cell cycle checkpoints with examples of anemia, diabetic wounds, and cancer.
4. equip the students with skills like handling the microscope, micrometry, staining techniques, etc.

Unit I

General organization of cell

(10 Hrs)

1. Organization of prokaryotic and eukaryotic cells
2. Nucleus: nuclear membrane, nucleoplasm, chromatin, and nucleolus
3. Chromosome: morphology of metaphase chromosome and its organization (Solenoid model)
4. Cytoskeleton

Unit II

(10Hrs)

Ultra-structure and functions of

1. Plasma membrane (Fluid Mosaic Model)
2. Mitochondria
3. Endoplasmic reticulum
4. Golgi complex
5. Lysosome
6. Ribosome

Unit III

(10 Hrs)

1. Concept of Cell cycle and its regulation
2. Mitosis
3. Meiosis
4. Abnormalities in cell division: Hypoproliferation (Anemia and diabetic wound) and Hyperproliferation (Cancer)

References:

- Cell and Molecular Biology by De Robertis EDP and De Robertis EME VIII ED ©1997
- Principles of Cell and Molecular Biology by Kleinsmith and Kish Pearson Publisher ©1997
- Molecular cell biology by Harvey Lodish, Berk A, Matsudaira P., Baltimore, D & Darnel I . W. H. Freeman and Co. © 2001
- Becker's World of the Cell by Jeff Hardin and James P. Lodolce, Pearson Publisher © 2020
- Molecular biology of the cell by Bruce Alberts, Johnson A., Lewis J., Raff M., Roberts K & Walter P., 4th Ed. Garland Science Publishing, New York© 2002
- The Cell: A molecular approach by Geoffrey Cooper. OUP USA, © 2019

B. Sc. Part – I Semester – I
ZOOLOGY Practical– I
ZOOPR 103 (ANIMAL DIVERSITY AND CELL BIOLOGY)

Practical: 60 hrs.

Marks-50 (Credits: 02)

I: Practical course based on Animal Diversity

1. One example of each non-chordate phyla
2. One example of each chordate subphyla/class
3. One example of each mode of nutrition
4. Dissection of cockroach digestive system
5. Dissection of cockroach nervous system
6. Placing the animals on a world map according to zoo-geographical distribution
7. One example of each rare, endangered, critically endangered, and extinct animal as per the red data book.
8. DIGI studio

II: Practical course based on Cell Biology

9. Cytological experiments

- a. Study of light microscope: Principles of microscopy; study of its parts; focusing of a slide at low power and high power and study of Image Formation.
- b. Study of cells by micrometry.
- c. Isolation of Nucleus and Staining of the nucleus by any nuclear stain

10. Cytological Preparations:

- a. Study of constitutive heterochromatin (Barr body)
 - b. Staining of mitochondria by Janus green B in oral mucosa or any suitable tissue.
 - c. Study of osmosis using salt solutions
11. Study of mitosis in onion root tips
 12. Study of meiosis – observation of permanent slides
 13. Study of anemia and diabetic wound and histology of cancerous tumor

B. Sc. Part – I Semester – II
ZOOLOGY Paper - III
ZOO 201 GENETICS

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Objectives (COs): Genetics

The course in Genetics is aimed to make the students to:

1. understand heredity and variation.
2. apply their knowledge to draw the genetic crosses based on patterns of heredity.
3. Culture the *Drosophila* and handling skills among the students.
4. enable the students to develop
 - a. a gene map using data of crossing over and linkage study,
 - b. draw, and analyze pedigree
 - c. analyze karyotypes.

Unit I

(10 Hrs)

Molecular Basis of Genetic Information (Central Dogma)

Mendel's work and Principles of Inheritance

Test cross, back cross, and reciprocal cross

Incomplete dominance and co-dominance,

Unit II

(10 Hrs)

Gene interaction (Epistasis): Supplementary gene interaction. Complementary gene interaction

Multiple alleles: definition, ABO blood group system, and coat colour in rabbit,

Sex-linked inheritance: definition, Haemophilia, and colour blindness

Linkage and crossing over: Linkage, types of linkage and process of crossing over, Cytological evidence of crossing over.

Unit III

(10 Hrs)

Chromosomal Abnormalities

Human karyotype analysis

Numerical abnormalities: Aneuploidy and Polyploidy,

Chromosomal aberrations: Deletion, Duplication, Inversion, Translocation,

Pedigree analysis

Sex determination

Chromosomal theory of sex determination, Genic balance theory, Haploidy-Diploidy mechanism, Environmental sex determination.

References

- Genetics by Strickberger, M.W. 3rd Edition Pearson Education India, © 2015
- Human Genetics by Winchester A.M. Charles E.Merrill Publishing International; 4th Revised edition© 1983
- Concepts of Genetics by Klug, Cummings, Spencer, and Palladino. Pearson Education India, 2015
- Principles of Genetics by Tamarin, R. H. McGraw-Hill Education © 2001
- Fundamental of Genetics by B. D. Singh. Medtech Science Press © 2022

B. Sc. Part – I Semester – II
ZOOLOGY Paper - IV
ZOO 202 (ECOLOGY, ETHOLOGY, EVOLUTION, AND ENTOMOLOGY)

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Objectives (COs): Ecology, Ethology, Evolution, and Entomology

The Course in ecology, ethology, evolution, and entomology is aimed to make the students to:

1. understand the basic concepts.
2. enable the students to identify the amazing features of the insect world.
3. train students to arrange the animals on a geological time scale.
4. mold the student to apply their knowledge to construct food chains, food webs, and ecological pyramids.

Unit 1

2. Ecology (10 hrs.)

- a. Introduction and Scope of Ecology
- b. Basic concepts in ecology: Biosphere, biome, Species, Population, Community, Niche
- c. Ecosystem: Definition, concept, types, pond ecosystem, and grassland ecosystem
- d. Food chain, food web
- e. Ecological pyramids
- f. Ecological adaptations
- g. Symbiotic relationships

Unit 2

3. Ethology and Evolution (10 hrs.)

Ethology

- a. Introduction to the study of animal behavior
- b. Mimicry in Monarch butterfly and stick insect
- c. Camouflage in chameleon and Leaf insect
- d. Courtship behavior in scorpion and weaver birds
- e. Social behavior in honeybee

Evolution

- a. Types of fossils, Formation and dating of fossils
- b. Incompleteness of Fossil record
- c. Geological time scale

Unit 3

4. Entomology– (10 hrs.)

- a. Introduction to Entomology

- b. Brief morphology of insects and types of mouth parts
- c. Entomophagy: Introduction, Nutritional value, economic importance, Examples.
- d. Wonders in insects
 - i. Mud wasp
 - ii. Praying mantis
 - iii. Giant cockroach
 - iv. Ladybird beetle
 - v. Firefly
 - vi. Parasitoids- *Apanteles* in *Helicoverpa*

References

- Environmental Studies – Based on UGC Syllabus – N. Arumugam and V. Kumaresan. Saras Publisher 2014
- Organic Evolution – N. Arumugam. Saras Publisher ©2019
- Organic Evolution – Lul. Forgotten Books ©2018
- Ecology by E. P. Odum. Oxford and LBH 2008
- Fundamentals of Ecology – Odum – Saunders Publisher ©1971
- Ecology – Rickelfs. W. H. Freeman Publisher ©1999
- Immelmann- Introduction to Ethology. Plenum Press, ©1980
- The Foundations of Ethology. Springer Verlag, ©1981
- Economic Zoology – Shukla and Upadhyaya – Rastogi Publications
- Economic Zoology – Venkitaraman (Sudarshana Publishers)
- The Insect structure function and biodiversity by Ambrose P. Kalyani Publisher ©2015

B. Sc. Part – I Semester – II
ZOOLOGY Practical– II
ZOOPR 203 (GENETICS AND ECOLOGY, ETHOLOGY, EVOLUTION,
AND ENTOMOLOGY)

Practical: 60 hrs.

Marks-50 (Credits: 02)

I. Practical based on Genetics

1. Study Mendel's work with the help of different coloured beads and other simulations.
2. Examples based on Gene mapping using data of crossing over and linkages
3. Study of sex-linked inheritance by pedigree study.
4. Study of normal human spread chromosomes and sex determination
5. Identification of genetic syndrome by karyotype analysis
6. Identification of chromosomal aberration by studying karyotype
7. Identification ABO blood group
8. *Drosophila* culture, handling, Life cycle, and identification of male and female *Drosophila* and mutants (After induction of mutation)
9. Examples based on Gene interactions and Multiple alleles

II. Practical based on Ecology, Ethology, Evolution, and Entomology

10. **Ecology** – Preparation of the following about pond and grassland ecosystems.
 - a. Arranging the organisms in the Food chain and food web
 - b. Arranging the organisms in different trophic levels of Ecological Pyramids
11. **Ethology** –
 - a. Mimicry in – monarch butterfly and stick insect
 - b. Castes of Honey bee
12. **Evolution** –
 - a. Types of fossils
 - b. Arrangement of the animals as per the Geological Time Scale
13. **Entomology** –
 - a. Morphology of insects (Typical body parts of Grasshopper)
 - b. Entomophagy – Examples of edible insects according to theory
 - c. Wonders in insects (Based on theory)

Visit to sea shore or any suitable place to study the Ecosystem, Animal diversity, Animal Behavior, etc

EXAMINATION PATTERN FOR DSC ZOOLOGY

1) **PATTERN:** Theory and practical examinations will be conducted at the end of each semester. Internal examinations will be conducted after completing about half of the syllabus.

2) **MEDIUM OF INSTRUCTION:** The medium of instruction shall be in English.

3) **STRUCTURE OF COURSE:** B.Sc. I – Zoology theory and practical and Internal Assessments as per the Framework Set by the Shivaji University

SEMESTER-I (Theory and Practical)

Sr. No.	Subject	Internal Exam	University Exam	Total	Credits
1	ZOO 101 Paper - I	10	40	50	2
2	ZOO 102 Paper - II	10	40	50	2
3	ZOOPR 103 Practical I	--	50	50	2
				Total=150	6

SEMESTER-II (Theory and Practical)

Sr. No.	Subject	Internal Exam	University Exam	Total	Credits
1	ZOO 201 Paper - I	10	40	50	2
2	ZOO 202 Paper – II	10	40	50	2
3	ZOOPR 203 Practical I	--	50	50	2
				Total=150	6

Minimum Marks required for passing

	Internal Exam	Theory	Practical
Maximum Marks	10	80	50
Minimum Marks	04	28	18

SCHEME OF EXAMINATION

The question paper will be set on the entire syllabus and preferably covering each unit of syllabi.

COMMON NATURE OF QUESTION FOR THEORY PAPER:

SEMESTER – I Zoology Paper (I, II)

SEMESTER – II Zoology Paper (III, IV)

Q. 1	Multiple Choice Questions (Eight questions)	08
	a.	
	b.	
	c.	
	d.	
	e.	
	f.	
	g.	
	h.	
Q. 2	Long answer questions (Attempt any two)	16
	a.	
	b.	
	c.	
Q. 3	Short Notes (Attempt any four)	16
	a.	
	b.	
	c.	
	d.	
	e.	
	f.	

SKELETON PAPER FOR PRACTICAL EXAMINATION

B. Sc. Part – I Semester – I

ZOOLOGY Practical - I

ZOOPR 103 (Animal Diversity and Cell Biology)

Marks-50

Que No. 1 Dissect to expose its system	10
Que No. 2 Cytological experiments	08
Que No. 3 Cytological Preparation	07
Que No. 4 Distribution of animals with their zoogeographical regions	05
Que No. 5 Categorization of animals as per the abundance	05
Que No. 6 Preparation of stained slide of mitosis and identification of stages	10
Que No. 7 Journal	05

B. Sc. Part – I Semester – II

ZOOLOGY Practical - II

ZOO PR 203 (Genetics, Ecology, Ethology, Evolution and Entomology) Marks-50

Que No. 1 Determination of blood group according to ABO blood group system/ Drosophila culture-related experiments	07
Que No. 2 Questions based on karyotype study/ Gene Mapping/construction of pedigree	06
Que No. 3 Construction of food chain/food web/ Ecological Pyramids from the given data	04
Que. No. 4 Experiments based on monohybrid/ dihybrid cross	06
Que No. 5 Example in Genetics	07
Que No. 6 Identification	10
Que No. 7 Excursion Report	05
Que No. 8 Certified Journal	05

SHIVAJI UNIVERSITY, KOLHAPUR.



**Accredited By NAAC with 'A'
Grade**

National Education Policy (NEP) 2.0

Syllabus for

Bachelor of science Part I

in Zoology

Open elective courses (OE)

Syllabus to be implemented

from June 2024 onwards.

Shivaji University, Kolhapur
Bachelor of Science Credit Framework
First-Year (B. Sc. I-Zoology)

SEM (Level)	COURSES			OE	VSC/SEC	AEC/VEC/IKS	OJT/FP/CEP/CC/RP	Total Credits	Degree/Cum. Cr. MEME
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SEM I (4.5)	ZOO 101 Paper I Animal Diversity (2) ZOO 102 Paper II Cell Biology (2) ZOO PR 103 Practical I (2)	DSC I (2) DSC II (2) DSC PI(2)	DSC I (2) DSC II (2) DSC P _I (2)	ZOOOE 101 OE I (2) Diet and Nutrition		IKS I (2) Introduction to IKS			UG Certificate 44 Credits
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SEM II (4.5)	ZOO 201 Paper III Genetics (2) ZOO 202 Paper IV ecology, ethology, evolution, entomology (2) ZOO 203 Practical II (2)	DSC III (2) DSC IV (2) DSC P II (2)	DSC III (2) DSC IV (2) DSC P II (2)	ZOOOE 201 OE II (2) Vermiculture		VEC I (2) (Democracy, Election and Constitution)			
Credits	4 (T) + 2 (P) = 6	4 (T) + 2 (P) = 6	4 (T) + 2 (P) = 6	2		2		22	
Total	8(T)+4(P)=12	8(T)+4(P)=12	8(T)+4(P)=12	2+2=4 (T/P)	--	2+2=4	--	44	
Exit Option: If a students choose to exit after B. Sc. I, he/she will be awarded an UG certificate after successful completion of 44 credits + a 4 credits course of NSQF/ Internship / a Skill course									

B. Sc. I Structure in Zoology NEP 2.0

Open Electives

Sr. No.	Semester	Course Code	Course Title	Credits	Hours of teaching	Marks
1.	I	ZOOOE 101	OE I Diet and Nutrition (Practical) OE I आहार आणि पोषण (प्रात्यक्षिक)	2	60	50
2.	II	ZOOOE 201	OE II Vermiculture (Practical) OE II गांडूळ पालन (प्रात्यक्षिक)	2	60	50

B. Sc. Part – I Semester – I
ZOOOE 101

OE I Title: Diet and Nutrition

Practical-60 Hrs

Marks-50 (Credits: 02)

Course Objectives (COs): Diet and Nutrition

The course, Diet and Nutrition is aimed at making the students to:

1. understand the components of the diet
2. know the importance of a balanced diet and apply the knowledge to day-to-day life.
3. enable students to calculate the BMI and caloric needs of a person.
4. develop the skill of designing the diet for different physiological and pathological conditions.

1. Components of Diet
2. Sources of Carbohydrates (Minimum 5)
3. Nutritive values of Rice and wheat
4. Iodine test for starch
5. Sources of Proteins (Minimum 5)
6. Nutritive value of any one pulse
7. Sources of Lipids (Minimum 5)
8. Filter paper/ emulsification test for fats
9. Sources of Vitamins
10. Sources of Minerals (Minimum 5)
11. Sources of fibers
12. Drinking Water quality testing (transparency, odor, pH, TDS, microbial contamination)
13. Designing a balanced diet for a normal healthy person/ Balance diet thali/ Recipes of a balanced diet dish
14. BMI: calculation of BMI
15. Calculation of caloric need based on occupation (Any 2)
16. Designing a diet for Weight loss/ Weight gain

References

1. John E. Hall and Michael Hall (1984). Guyton and Hall textbook of medical physiology. Pp. 1091.
2. Sumati R. Mudambi and M. V. Rajagopal (2007). Fundamentals of Food, Nutrition and Diet Therapy. New Age International Publishers. New Delhi. Pp. 425.
3. Shubhangini A. Joshi (2015). Nutrition and dietetics. McGraw Hill Education Private Ltd. pp. 645.
4. Nutrition Sciences by B. Srilakshmi (2006). New Age International (P) Ltd. Publishers. Pp. 406

बॅचलर ऑफ सायन्स भाग I

ZOOOE १०१

OE I आहार आणि पोषण

प्रात्यक्षिक- ६० तास

गुण- ५० (श्रेय : ०२)

अभ्यासक्रमाची उद्दिष्टे (COs): आहार आणि पोषण

अभ्यासक्रम, आहार आणि पोषण हे विद्यार्थ्यांना पुढील गोष्टी करण्यास सक्षम बनवण्याचा उद्देश आहे:

1. आहारातील घटक समजून घ्या
2. संतुलित आहाराचे महत्त्व जाणून घ्या आणि दैनंदिन जीवनात ज्ञान लागू करा.
3. विद्यार्थ्यांना एखाद्या व्यक्तीच्या BMI आणि उष्मांक गरजांची गणना करण्यास सक्षम करा.
4. विविध शारीरिक आणि पॅथॉलॉजिकल परिस्थितींसाठी आहाराची रचना करण्याचे कौशल्य विकसित करा.

1. आहारातील घटक
2. कर्बोदकांमध्ये स्त्रोत (किमान 5)
3. तांदूळ आणि गहू यांची पौष्टिक मूल्ये
4. स्टार्चसाठी आयोडीन चाचणी
5. प्रथिनांचे स्रोत (किमान 5)
6. कोणत्याही एका डाळीचे पौष्टिक मूल्य
7. लिपिड्सचे स्त्रोत (किमान 5)
8. फॅट्ससाठी फिल्टर पेपर/ इमल्सिफिकेशन टेस्ट
9. जीवनसत्त्वे स्रोत
10. खनिजांचे स्रोत (किमान 5)
11. तंतूचे स्रोत
12. पिण्याच्या पाण्याची गुणवत्ता चाचणी (पारदर्शकता, गंध, pH, TDS, सूक्ष्मजीव दूषित)
13. सामान्य निरोगी व्यक्तीसाठी संतुलित आहार तयार करणे / संतुलित आहार थाली / संतुलित आहाराच्या पाककृती
14. BMI: BMI ची गणना
15. व्यवसायावर आधारित उष्मांक गरजेची गणना (कोणतेही 2)
16. वजन कमी करण्यासाठी/वजन वाढवण्यासाठी आहार तयार करणे

संदर्भ :

- जॉन ई. हॉल आणि मायकेल हॉल (1984). मेडिकल फिजियोलॉजीचे गायटन आणि हॉल पाठ्यपुस्तक. पृ. १०९१.
- सुमती आर. मुदांबी आणि एम. व्ही. राजगोपाल (2007). अन्न, पोषण आणि आहार थेरपीची मूलभूत तत्त्वे. न्यू एज इंटरनॅशनल पब्लिशर्स. नवी दिल्ली. पृ. ४२५.
- शुभांगिनी ए. जोशी (2015). पोषण आणि आहारशास्त्र. मॅकग्रा हिल एज्युकेशन प्रायव्हेट लिमिटेड pp.645.
- बी. श्रीलक्ष्मी (2006) द्वारे पोषण विज्ञान. न्यू एज इंटरनॅशनल (पी) लि. प्रकाशक. पृ. 406

B. Sc. Part – I Semester – II
ZOOOE 201

OE II Title: Vermiculture

Practical-60Hrs

Marks-50 (Credits: 02)

Course Objectives (COs): Vermiculture
<ol style="list-style-type: none">1. The course, Vermiculture is aimed at acquiring knowledge about vermiculture, and its importance.2. It is aimed at understanding the biology of earthworm and earthworm culture.3. It is aimed to enable the students to become familiar with the procedure of setting up a vermicomposting bed.4. It is aimed so that the students can use the vermicompost and vermivash in their fields.

1. Vermiculture: types
2. Study of different species of earthworm
3. Pre-requisite for vermiculture
4. Preparation of vermiculture bed
5. Monitoring Temperature, pH, and moisture of vermicomposting bed
6. Harvesting vermicompost
7. Composition of vermicompost
8. Seed germination test for vermicompost
9. Harvesting vermivash
10. Economic importance of vermiculture
11. Study of soil characters
 - a. Water holding capacity
 - b. pH of soil
12. Measuring organic matter in a soil sample
13. Study of the morphology of earthworm
14. Study of the digestive system of earthworm
15. Study of different stages in the life cycle of an earthworm

References:

- Dr. Keshav Singh (2022). Textbook of Vermicompost: Vermivash and Biopesticides. Biotech Books. New Delhi.
2. EIRI Board of Consultants & Engineers (2009). Handbook Of Biofertilizers and Vermiculture (Pb). Engineers India Research.
 3. Sathe T. V. (2022). Vermiculture and Organic Farming. Daya Publishing House.

बॅचलर ऑफ सायन्स भाग I (SEM II)

ZOOOE २०१

OE II गांडूळ पालन

प्रात्यक्षिक- ६० तास

गुण- ५० (श्रेय : ०२)

अभ्यासक्रमाची उद्दिष्टे (COs): गांडूळ पालन

1. गांडूळ या अभ्यासक्रमाचा उद्देश गांडूळ आणि त्याचे महत्त्व जाणून घेणे आहे.
2. हे मातीकाम आणि गांडूळ संस्कृतीचे जीवशास्त्र समजून घेण्याचा उद्देश आहे.
3. विद्यार्थ्यांना सेट अप करण्याच्या प्रक्रियेशी परिचित होण्यासाठी सक्षम करणे हे उद्दिष्ट आहे गांडूळ खत घालणे.
4. विद्यार्थ्यांना त्यांच्या शेतात गांडूळ खत आणि वर्मीवॉश वापरता यावे, हा उद्देश आहे.

1. गांडूळ पालन: प्रकार
2. गांडूळाच्या विविध प्रजातींचा अभ्यास
3. गांडूळ लागवडीसाठी पूर्व-आवश्यकता
4. वर्मीकल्चर बेड तयार करणे
5. गांडूळ खताचे तापमान, pH आणि ओलावा यांचे निरीक्षण करणे
6. गांडूळ खत काढणी
7. गांडूळ खताची रचना
8. गांडूळ खतासाठी बियाणे उगवण चाचणी
9. वर्मीवॉश काढणी
10. गांडूळाचे आर्थिक महत्त्व
11. मातीच्या वर्णाचा अभ्यास
 - a. पाणी धारण क्षमता
 - b. मातीचा pH
12. मातीच्या नमुन्यातील सेंद्रिय पदार्थ मोजणे
13. गांडूळाच्या आकारविज्ञानाचा अभ्यास
14. गांडूळाच्या पचनसंस्थेचा अभ्यास
15. गांडूळाच्या जीवन चक्रातील वेगवेगळ्या टप्प्यांचा अभ्यास

संदर्भ:

- डॉ. केशव सिंग (2022). वर्मीकंपोस्टचे पाठ्यपुस्तक: वर्मीवॉश आणि बायोपेस्टिसाइड्स. बायोटेक पुस्तके. नवी दिल्ली.
- 2. EIRI सल्लागार आणि अभियंता मंडळ (2009). जैव खते आणि गांडूळाची हँडबुक (Pb). इंजिनियर्स इंडिया रिसर्च.
- 3. साठे टी. व्ही. (2022). गांडूळ आणि सेंद्रिय शेती. दया पब्लिशिंग हाऊस.