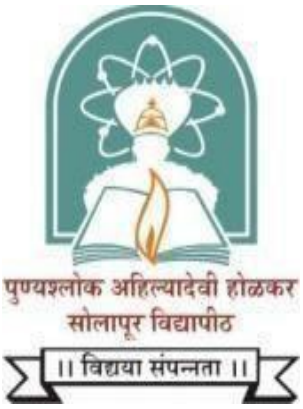
Punyashlok Ahilyadevi Holkar Solapur University, Solapur



NAAC Accredited-2022
'B^{++}'Grade (CGPA2.96)

Name of the Faculty: Science &Technology

(As per New Education Policy 2020)

Syllabus: Zoology

Name of the Course: B.Sc. I (Sem. I & II)

(Syllabus to be implemented from June 2024)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
Nep 2020 Compliant Curriculum
B. Sc. (Zoology) Program Preamble

The Bachelor of Science (BSc) in Zoology is a comprehensive and dynamic program designed to provide students with a deep understanding of the fundamental principles of Zoology, along with the practical skills required to apply this knowledge in various scientific and technological contexts. Aligned with the vision of the National Education Policy (NEP) 2020, the program offers a flexible, multidisciplinary, and learner-centric curriculum that encourages critical thinking, innovation, and holistic development. The BSc Zoology program spans four years, with each year offering a progressively advanced curriculum designed to build a strong foundation in Zoology while allowing for specialization and interdisciplinary learning. The curriculum is structured around several key components:

1. **Major Courses:**These core courses form the backbone of the program, providing in-depth knowledge and understanding of essential Zoology concepts, theories, and methodologies. Students will engage with topics ranging from classical mechanics, electromagnetism, and thermodynamics to quantum Zoology, relativity, and modern Zoology, ensuring a robust and comprehensive education in the discipline.
2. **Minor Courses:** Students have the opportunity to choose minor courses from related or distinct disciplines, promoting an interdisciplinary approach to learning. This flexibility allows students to complement their Zoology education with insights from fields such as mathematics, computer science, or engineering, enhancing their versatility and broadening their career prospects.
3. **Open Electives/General Electives:**The program encourages intellectual exploration beyond the core discipline by offering a wide range of elective courses. These electives enable students to pursue their interests in diverse subjects, fostering creativity, critical thinking, and a well-rounded educational experience.
4. **Vocational and Skill Enhancement Courses:**Practical skills and technical proficiency are integral to the program, with vocational and skill enhancement courses providing hands-on experience in areas such as computational Zoology, electronics, and instrumentation. These courses are designed to prepare students for immediate employment and equip them with the tools necessary for career advancement in various scientific and technological fields.
5. **Ability Enhancement Courses (AEC), Indian Knowledge System (IKS), and Value Education Courses (VEC):**In alignment with NEP 2020, the program integrates courses that emphasize the Indian Knowledge System, ethical values, and life skills. These courses foster a deep appreciation for India's rich cultural heritage, while also developing essential communication and ethical decision-making skills that are vital for personal and professional growth.
6. **Field Projects/Internships/Apprenticeships/Community Engagement Projects/On-Job Training:** To bridge the gap between theoretical knowledge and real-world applications, the program includes opportunities for field projects, internships, apprenticeships, and community engagement. These experiences provide students with practical insights, problem-solving abilities, and exposure to professional environments, enhancing their readiness for careers in Zoology and related fields.
7. **Research Methodology and Research Projects:** Research is a critical component of the BSc Zoology program, with students acquiring skills in research methodology, data collection, analysis, and scientific inquiry. By engaging in

independent research projects, students are encouraged to develop innovative solutions to complex scientific problems, preparing them for advanced studies and research-oriented careers.

Multiple Entry and Multiple Exit Options

In accordance with the NEP 2020, the BSc Zoology program incorporates a Multiple Entry and Multiple Exit framework, offering students the flexibility to enter or exit the program at various stages. This approach ensures that students can tailor their educational journey according to their personal and professional goals, with options to earn certificates, diplomas, or degrees based on the duration of study completed.

- **Year1:**
  Upon completion of the first year, students may exit with a **Certificate in Zoology**.
- **Year2:**
  After two years, students may choose to exit with a **Diploma in Zoology**.
- **Year3:**
  Completion of the third year qualifies students for a **BSc Degree in Zoology**.
- **Year4:**
  The fourth year offers an advanced curriculum with a focus on research, allowing students to graduate with an **Honors Degree in Zoology**.

Eligibility For BSc Zoology: A candidate should have bachelor's degree in Zoology/Life Sciences/Equivalent subjects (three years course after 10+2) from the recognized university.

The scheme of evaluation of performance of candidates shall be based on

University assessment as well as College internal assessment as given below. For B.Sc. Part-I Zoology sem I& II the internal assessment will be based on Internal tests, Home assignment, Tutorials, Seminars, Group discussion, Brain storming sessions etc. as given below. Scheme of Evaluation As per the norms of the grading system of evaluation, out of 100 marks, the candidate has to appear for college internal assessment of 40 marks and external evaluation(University assessment)of 60 marks.

Theory:(100marks)

University Examination (60 marks): No. of theory papers:2(paper I and paper II of 30 marks each)

Internal Continuous Assessment:(40 marks and 20 marks each for two papers)

(a) Internal test-Home assignment/tutorials/seminars/viva/group discussion/outreach programs.

II Semester -Theory:(100marks)

University Examination (60marks): No. of theory papers:2(paper-III and paper –IV of 30 marks each)

Internal Continuous Assessment:(40 marks and 2 marks each for two papers)

(a) Internal test-Home assignment/tutorials/seminars/viva/group discussion/outreach programs.

Internal Continuous Assessment:(20marks):

(a) Internal practical test-Scheme of marking:**10marks**

(b) Viva/group discussion/model or chart/attitude/attendance/overallbehavior:**10marks**

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
Nep 2020 Compliant Curriculum

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

Students graduating from BSc (Zoology) will able to :

PSO1: Mastery of Core Zoology Concepts: Techniques and Methodologies discussed in the vital topics like Cell Biology, Genetics, Molecular Biology manifest the knowledge in research specific areas and studies by protection of endangered species, Wildlife Management, Climatic changes and Global Management are discussed as a paper to improvise the subject knowledge for identifying any problems related and in helping the impacted environment and biodiversity.

PSO2: Experimental and Analytical Skills: demonstrate proficiency in designing and conducting experiments, using modern laboratory equipment, and employing analytical techniques to interpret and present scientific data effectively.

PSO3: Application of Zoology in Technology and Research: Exhibit Skills in areas related to their individual specialization like genetic engineering, biotechnology, bioinformatics in relation to current developments and related fields in the domain; helps to apply the knowledge of internal structure of cell, its functions in control of various metabolic functions of organisms.

PSO4: Demonstrated Understanding of Animal Diversity:

- Knowledge of scientific classification and evolutionary relationships of major animal groups.
- Appreciation of the breadth of animal diversity.

PSO5: Structure-Function Relationships:

- Recognized how structure relates to function across different biological levels (molecules, cells, organs, organisms, populations, species) for major animal groups.

PSO6: Applied Biological Sciences and Career Opportunities:
Familiarity with applied zoology fields (e.g., sericulture, apiculture, aquaculture, industrial microbiology, DNA technology, medicine) and their career prospects

Program Outcome (POs):

PO 1: Fundamental Knowledge: Gain a comprehensive understanding of the basic concepts and principles of zoology, including the classification, structure, function, and evolution of animals. This includes studying various animal phyla, their physiological processes, and ecological interactions.

PO 2: Laboratory Skills: Develop proficiency in laboratory techniques and procedures essential for zoological research. This includes skills in microscopy, dissection, histology, and molecular biology techniques such as DNA extraction, PCR, and gel electrophoresis.

PO 3: Fieldwork Competence: Acquire the ability to conduct field studies to observe and analyze animal behavior, population dynamics, and habitat interactions. This involves learning methods for sampling, data collection, and ecological surveying in various environments.

PO 4: Data Analysis: Learn to analyze and interpret biological data using appropriate statistical methods and software. This includes understanding how to design experiments, collect data, perform statistical tests, and present findings in a scientifically rigorous manner.

PO 5: Research Skills: Develop the ability to design and conduct independent research projects in zoology. This involves formulating research questions, developing hypotheses, designing experiments, collecting and analyzing data, and drawing valid conclusions.

PO 6: Critical Thinking: Enhance critical thinking skills to evaluate scientific literature, research findings, and current issues in zoology. This includes the ability to critically assess the methodology, results, and implications of scientific studies.

PO 7: Ethical Practice: Apply ethical principles in the study and practice of zoology. This includes understanding the ethical considerations in animal research, conservation efforts, and the responsible use of biological resources.

PO 8: Co**mmunication:** Develop effective communication skills to convey zoological concepts and research findings to both scientific and general audiences. This includes writing scientific reports, presenting research findings, and engaging in public outreach and education.

PO 9: Interdisciplinary Integration: Integrate knowledge from related fields such as genetics, ecology, environmental science, and biotechnology to enhance the understanding of zoological studies. This interdisciplinary approach helps in addressing complex biological questions and environmental issues.

PO 10: Lifelong Learning: Foster a commitment to lifelong learning to stay updated with advancements in zoology and related fields. This includes engaging in continuous professional development, attending workshops and conferences, and staying informed about new research and technologies.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology

Three Majors in First Year structure as per NEP-2020 Approved in For AC Meeting on 18/04/2024

4- Year Multidisciplinary UG Program with DSC as a Major (4 -Year Bachelor of Science (Honors)/(Honors with Research)

Level/ Difficulty	Sem.	Faculty			Generic/ Open Elective GE/ OE	Vocational and Skill Enhancement Courses (SEC/VSC)	Ability Enhancement Course (AEC), IKS, VEC	Field Project/ RP/CC/Internship/Apprenticeship/ Community Engagement & Services	Credits	Cumulative Credits
		Major		Minor						
		DSC	DSE							
4.5 100-200	I	DSC1-1 (2+2)#	--		GE1/ OE1(2)	SEC1 (2)	L1-1(2) IKS (2) VEC1(2) (Indian Constitution And Democracy)	--	22	44 UG Certificate (44)
		DSC2-1 (2+2)#	--							
		DSC3-1 (2+2)#	--							
	II	DSC1-2 (2+2)#	--		GE2/ OE2(2)	SEC 2 (2)	L1-2(2) VEC2(2) (Environmental Studies)	CC1 (2)	22	
		DSC2-2 (2+2)#	--							
		DSC3-2 (2+2)#	--							
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor										
5.0/200	III	DSC1-3 (2+1)	---	DSC2-3 (2+1)	GE3 / OE3(2)	VSC1 (2) (DSC1) VSC2(2) (DSC2)	L2-1 (2)	CC2 (2)	22	44 UG Diploma (88)
		DSC1-4 (2+1)	---	DSC-2-4 (2+1)						
	IV	DSC1-5 (2+1)	---	DSC2-5 (2+1)	GE4/ OE4 (2)	VSC3 (2) (DSC1) VSC4(2) (DSC2)	L2 -2(2)	FP1/CEP1(2)	22	
		DSC1-6 (2+1)	--	DSC2-6 (2+1)						
Exit option: Award of UG Diploma in Major with 88 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major										

5.5/300	V	DSC1-7 (3+2) DSC1-8 (3+2) DSC1-9 (3+2)	DSE1-1 (2+1) or DSE1-2 (2+1)	----	----	VSC3 (2) (Hands on Training related to DSE)	IKS 2 (2) (related to major subject)	--	22	**44 UG degree (132)**
	VI	DSC1-10 (3+2) DSC1-11 (3+2) DSC1-12 (3+2)	DSE1-3 (2+1) or DSE1-4 (2+1)	----	---	VSC4 (2) (Hands on Training related to DSE)		FP2/CEP2/OJT1 (2)	22	
	Total Credits 3 Yrs	**66-8#**	**6**	**12 +8# 20**	**08**	**16**	**16**	**08**	**132**	
Exit option: Award of UG degree in Major with 132 Credits OR Continue with Major										
6.0/400	VII	DSC1-13 (4+2) DSC1-14 (4+2)	DSE1-5 (4+2)	Research Methodology (4)	------	----	----	---	22	**44 UG Honours Degree in Main faculty (176)**
	VIII	DSC1-15 (4+2) DSC1-16 (4+2)	DSE1-6 (4+2)		----	-----	----	OJT/In-house Project/ Internship/ Apprenticeship (4)	22	
	Total 4 Yrs	**90-8#**	**18**	**16+8#**	**08**	**16**	**16**	**12**	**176**	
Award of Bachelor of Science Honors., (B.Sc. Honors.) degree with Major and Minor (176 credits)										

OR

6.0/400	VII	DSC1-13 (4) DSC1-14 (4)	DSE1-5 (4)	Research Methodology (4)	------	----	----	Research Project (6)	22	**44 UG Honours with research Degree in Main faculty (176)**
	VIII	DSC1-15 (4+2) DSC1-16 (4+2)	DSE1-6 (4)		----	-----	----	Research Project (6)	22	
	Total 4 Yrs	**86-8#**	**14**	**16+8#**	**08**	**16**	**16**	**20**	**176**	

#Out of the three major courses in the first year, one major (comprising 4 credits for the 1st semester and 4 credits for the 2nd semester) will transition into a minor starting from the second year. Consequently, 8 credits will be reallocated from the major course credit count and added to the minor credit count, thereby meeting the requisite credit criteria for the minor as stipulated in the guidelines.

PAH SOLAPUR UNIVERSITY, SOLAPUR- (As per NEP 2020)					
Semester – I					
Course Code	**Title of Papers**	Distribution of Marks for Examination			**Total credit**
		CA	UA	Total	
DSC1-1 (2)	**Animal Diversity-I Non-chordates GO4-0104 (Theory)**	20	30	50	2
PRDSC1-1 (2)	**Practical based on DSC-1 GO4-0104 (Practical)**	20	30	50	2
SEC 1(2)	**Nature Tourism (Practical based on SEC- 1) GO4-SEC-104**	20	30	50	2
OE-1 ÉOE-I (2)	**Aquarium Fish Keeping and Maintenance GO4-GE-OE-104 (Theory)**	20	30	50	2
IKS **Generic** (2)	**IKS GO4- IKS- 104**	20	30	50	2
FP/RP/CC	**NCC/NSS/Culture/sports/Social activities**	20	30	50	2
L1-1 (2)	**English ENG- 104**	20	30	50	2
VEC1 (2)	**India Constitution and Democracy GO4-ICD- 104**	20	30	50	2
Total Marks + Credit for Semester - I			20	30	**22**
Semester –II					
DSC1-2 (2)	**Animal diversity-II Chordates GO4-0204 (Theory)**	20	30	50	2
PRDSC1-2 (2)	Practical based on DSC1-2 **GO4-0204 (Practical)**	20	30	50	2
SEC 2 (2)	**Organic Fertilizers Practical based on GO4—SEC-204 (Practical)**	20	30	50	2
OE-2 (2)	**Human Nutrition and Health GO4-GE-204 (Theory)**	20	30	50	2
FP/RP/CC	**NCC/NSS/Culture/sports/Social activities**	20	30	50	2
L1-1 (2)	**English ENG- 204**	20	30	50	2
VEC1 (2)	**Environmental Science ENS- 24**	20	30	50	2
Total Marks + Credit for Semester - II		**110**	**440**	**550**	**22**
Total Marks + Credit for Semester - I		110	440	550	22
Total Marks + Credit for Semester - II		110	440	550	22
Total Marks and Credit		**220**	**880**	**1100**	**44**

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ।। विद्यया संपन्नता ।। NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	**Punyashlok Ahilyadevi Holkar Solapur University, Solapur** **First Year B. Sc. (Zoology) Semester-I** **Vertical : DSC/VEC** **Course Code: G04-0104 (Theory) G04-0104 (Practical)** **Course Code: Animal Diversity- I (Nonchordate)**

***TeachingScheme**	***Examination Scheme**
Lectures:04 Hours/week, 04 Credits -2 **OR** **Practical:02Hours/week, 01Credit-2**	**UA:60 Marks** **CA: 40 Marks**

Program Specific Outcome (PSOs):

PSO 2: Analyze the anatomical and physiological adaptations of nonchordates to their environments. PSO 3: Apply knowledge of nonchordate biology to identify and classify various species.

PSO 4: Evaluate the ecological roles and significance of nonchordates in different ecosystems. PSO 5: Develop practical skills in the dissection and microscopic examination of nonchordate specimens.

PSO 6: Integrate knowledge of nonchordate biology with other disciplines such as genetics, ecology, and evolutionary biology.

PSO 7: Conduct independent research projects on nonchordate organisms, demonstrating proficiency in experimental design and data interpretation.

PSO 8: Communicate findings on nonchordate biology effectively to both scientific and general audiences.

Program Outcome:

PO 1: Taxonomic Knowledge: Understand the principles and methods of classifying nonchordate animals.

PO 2: Biodiversity Assessment: Evaluate and document the diversity of nonchordate species using modern taxonomic techniques.

PO 3: Anatomical and Physiological Analysis: Analyze the anatomical and physiological adaptations of nonchordates to their environments.

PO 4: Ecological Roles: Assess the ecological roles and significance of nonchordates in various ecosystems.

PO 5: Laboratory Skills: Demonstrate proficiency in laboratory techniques for studying nonchordate specimens, including dissection and microscopy.

PO 6: Fieldwork Competence: Conduct field studies to observe and collect nonchordate specimens, applying appropriate fieldwork techniques.

PO 7: Research Skills: Design and conduct independent research projects on nonchordate organisms, utilizing proper experimental design and data analysis methods.

PO 8: Critical Thinking: Develop critical thinking skills to evaluate scientific literature and research findings related to nonchordates.

Course Objectives:

During this course, the student is expected to:

a. To provide an intensive and in depth learning to the students in field of Zoology.

b. Beyond simulating, learning, understanding the techniques, the course also addresses the underlying recurring problems of disciplines in today scientific and changing world.

c. To develop awareness and knowledge of different organization requirement and subject knowledge through varied branches and research methodology in students.

Course Outcomes:
At the end of this course, students will be able to:
1) Understand classification of protista.
2) Study General characters and classification up to classes.
3) Describe and classify phylum Platyhelminthes and identify the problems caused by parasitic forms
4) Understand the anatomical features of non- chordates through type study.

Section I

Unit 1:Kingdom Protista	**No. of lectures-06**	**Weightage:5-9 Marks**
1.1General characters of Kingdom Protista 1.2Classificati on up to classes of; Kingdom Protista 1.3Nutrition in paramecium.		
Unit-2: Phylum Porifera	**No. of lectures-06**	**Weightage:5-9Marks**
2.1 General characters of phylum Porifera		
2.2 classification up to classes of phylum Porifera		
2.3 Canal system in sycon and its importance		
Unit- 3: Phylum Cnidaria	**No. of lectures-06**	**Weightage:05-09 Marks**
3.1General characters of phylum Cnidaria 3.2Classification up to classes of phylum Cnidaria 3.3 Reproduction in hydra		
Unit- 4: Phylum Platyhelminthes	**No. of lectures-06**	**Weightage:09- 15 Marks**
4.1General characters of phylum Platyhelminthes 4.2Classification up to classes of phylum Platyhelminthes 4.3 Life history of *Taenia solium* 4.4 General characters of phylum Nemathelminthes 4.5 Classification up to classes of phylum Nemathelminthes 4.6 Life cycle and parasitic adaptations in *Ascaris lumbricoids*		

Section II

Unit-5: Phylum Annelida	**No. of lectures- 06**	**Weightage: 6-9 Marks**
5.1 General characters of phylum Annelida 5.2 Classification up to classes of phylum Annelida 5.3Economic importance of leech		
Unit-6:Phylum Arthropoda	**No. of lectures-06**	**Weightage:8-17 Marks**
6.1 General characters of phylum Arthropoda. 6.2 Classification up to classes of phylum Arthropoda. 6.3 Economic importance of insects.		
Unit-7:Phylum Mollusca	**No. of lectures-06**	**Weightage:8-17 Marks**
7.1 General characters of phylum Mollusca 7.2 Classification up to classes of phylum Mollusca 7.3 Economic importance of molluscs		
Unit-8 :phylum E **chinodermata**	**No. of lectures-06**	**Weightage:6-16Marks**
8.1 General characters of Phylum Echinodermata 8.2 Classification up to classes of Phylum Echinodermata 8.3 Water-vascular system in Asteroidea		

Above Unit Weightage is given for 60% marks of UA assessment only. There could be variation of 10-15% in the Unitwise weightage distribution.

College Level Assessment (CA) Activities: Home assignment, Review article, Class test, Field visit, Seminar

List of Experiments/Assignments/Field visit, etc.

Any six practical's of the following

1.	1. Handling of microscope and identification of live invertebrates specimens
2.	Study of the following specimens (General characters and classification) **CD/ Model /Chart/ whole** o Amoeba, Euglena, Plasmodium, Paramecium o Sycon, Hyalonema, and Euplectella o Obelia, Physalia, Aurelia, Metridium o Taenia, Planaria, Fasciola o Aphrodite, Nereis, Pheretima, Hirudinaria o Periplaneta, Palaemon, Crab, Julus, Scolopendra, Peripatus, Limulus, o Chiton, Dentalium, Pila, Unio, Sepia, Octopus o Sea star, Sea lily , Brittle star, Sea cucumber, Sea urchin
3.	Study of the following permanent slides/lab. Specimens: (a) T. S. and L.S. of *Sycon*, (b) *Taenia* - Scolex, mature & gravid proglottid *(c)* Whole mount of male and female *Ascaris*
4.	Campus visit for the study of invertebrates diversity and submission of report in semester examination

Reference Books

1.	A Manual of Zoology, Part I: Invertebrata by M. Ekambaranath Ayyar (S. Viswanathan Pvt. Ltd., 1973)
2.	Non-chordate Zoology by P.S. Dhami and J.K. Dhami (R. Chand & Co.)
3.	Biology of Animals, Vol. I: Invertebrates by B.B. Ganguli, A.K. Sinha, and Adhikari (New Central Book Agency, Calcutta, 1977) .
4.	Invertebrate Zoology by E.L. Jordan and P.S. Verma (S. Chand & Co., 2000)
5.	Modern Textbook of Zoology – Invertebrates by R.L. Kotpal (Rastogi Publ., 2000) 1.
6.	Objective Invertebrate Zoology by G.S. Sandhu (Campus Books International, 2005) 1.
7.	Textbook of Invertebrate Zoology (2 Vols.) by G.S. Sandhu and H. Bhaskar (Campus Books International, 2004) .
8.	Advanced Invertebrate Zoology (9 Vols.) by G.S. Sandhu and H. Bhaskar (Campus Books International, 2002)
9.	A Manual of Zoology, Part I: Invertebrata by M. Ekambaranath Ayyar (S. Viswanathan Pvt. Ltd., 1973) .
10.	Non-chordate Zoology by P.S. Dhami and J.K. Dhami (R. Chand & Co.) .

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **First Year B. Sc. (Zoology) Semester-I** **Vertical : SEC-1** **Course Code: GO4-SEC-104** **Course Code: Nature Tourism (Practical Course)**
Practical:02Hours/week, 01Credit- 2	***Examination Scheme** **UA:60 Marks** **CA: 40 Marks**

Program specific Outcome:

Program Specific Outcomes (PSOs)

PSO 1: Understand the principles and practices of sustainable nature tourism.

PSO 2: Analyze the ecological, economic, and social impacts of nature tourism.

PSO 3: Develop skills in planning and managing nature-based tourism activities.

PSO 4: Apply knowledge of biodiversity conservation in the context of tourism.

PSO 5: Evaluate the role of nature tourism in promoting environmental awareness and conservation.

PSO 6: Integrate knowledge from related fields such as ecology, environmental science, and cultural studies to enhance nature tourism practices.

PSO 7: Conduct independent research projects on nature tourism, demonstrating proficiency in data collection and analysis.

PSO 8: Communicate effectively about nature tourism and its benefits to diverse audiences.

Program Outcomes (POs)

PO 1: Knowledge Application: Apply principles of sustainable tourism to develop and manage nature-based tourism activities.

PO 2: Technical Proficiency: Demonstrate proficiency in techniques for assessing and managing the impacts of nature tourism.

PO 3: Critical Thinking: Develop critical thinking skills to evaluate the sustainability of tourism practices.

PO 4: Ethical Practice: Apply ethical principles in the planning and management of nature tourism activities.

PO 5: Research Skills: Design and conduct research projects to assess the impacts and benefits of nature tourism.

PO 6: Communication: Effectively communicate the importance of sustainable nature tourism to various stakeholders.

PO 7: Problem-Solving: Utilize problem-solving skills to address challenges in nature tourism management.

PO 8: Interdisciplinary Integration: Integrate knowledge from ecology, environmental science, and cultural studies to enhance nature tourism practices.

PO 9: Technological Proficiency: Use modern tools and technologies for planning and managing nature tourism activities.

PO 10: Lifelong Learning: Engage in continuous learning to stay updated with advancements in sustainable tourism and environmental conservation.

Course Objectives:

During this course, the student is expected to:

1. This course aims at creating a basic understanding on the nature of Tourism business, meaning,type, elements and component of tourism

2. To develop the understanding regarding impacts on various aspects of life along with different service providers which are very important for the growth of tourism

3. To help students get acquainted with problems and prospects of tourism in future.

Course Outcomes:
After completing the course the student should be able to:
1. Delving into the exploration of renowned tourist destinations local as well as worldwide, expanding one's knowledge and appreciation of diverse tourist experiences.
2. Acquiring the ability to recognize and manage essential travel documents required by travelers.

Practical's

Any six of the following

List of Experiments/Assignments/Field visit, etc.	
1	Study of types of tourism in local area
2	Study of status of nature tourism industry in local area.
3	Study of sanctuaries, parks and reservoirs in the region.
4	To prepare census study of local wild life/ flora/ fauna.
5	Case study of nature tourism from local area
6	Design a map of local nature tourist places from local area.
7	To design map of nature walk using 1. mobile app 2. GPS 3. Google earth.
8	To prepare charts, illustration, picture, banner, poster of nature resources of wild fauna/ flora and land scape.
09	Visit to place of agro-tourism.
10	Survey of Govt. and NGO's organization involved in tourism from local area.
11	Review on anyone of the selected topic from the syllabus.
12	Field visit.

Note: Report on multiple excursion tours may be clubbed for preparing and submitting report at the time of final examination will be allowed;

- Reduce or avoid the use of plastic files during submission of reports / projects as an ecofriendly method.)

Reference Books	
	Suggested Reading:
1	International Ecotourism Society Handbook. The International Ecotourism Society
2	Ecotourism: Principles, Practices & Policies for Sustainability" by Megan Epler Wood
3	Sustainable Tourism & The Millennium Development Goals: Effecting Positive Change, edited by Kelly Bricker, Rosemary Black, and Stuart Cottrell
4	Sustainable Tourism Management" by John Swarbrooke
5	"Ecotourism and Sustainable Development" by R. K. Singh Publisher: Abhijeet Publications
6	"Ecotourism: Principles and Practices" by R. K. Gupta Publisher: Kanishka Publishers
7	"Ecotourism and Rural Community Development" by S. K. Mishra Publisher: Concept Publishing Company
8	"Ecotourism and Environmental Sustainability" by S. P. Bansal Publisher: Indus Publishing Company
9	"Ecotourism in India: Policy and Prospects" by S. C. Bagri Publisher: Indus Publishing Company

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ।। विद्यया संपन्नता ।। NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	**Punyashlok Ahilyadevi Holkar Solapur University, Solapur** **First Year B. Sc. (Zoology) Semester-I** **Vertical : Open Elective-I / General Elective -1** **Course Code: GO4-GE-OE-104 (Theory) GO4-GE-OE-104(P)** **Course Code: OE / GE Aquarium Fish Keeping and Maintenance**
***Teaching Scheme** **Lectures:04 Hours/week, 04 Credits**	***Examination Scheme** **UA:60 Marks** **CA: 40 Marks**

Program Specific Outcomes (PSOs):

PSO 1: Understand the principles and practices of sustainable nature tourism. PSO 2: Analyze the ecological, economic, and social impacts of nature tourism. PSO 3: Develop skills in planning and managing nature-based tourism activities. PSO 4: Apply knowledge of biodiversity conservation in the context of tourism.

PSO 5: Evaluate the role of nature tourism in promoting environmental awareness and conservation. PSO 6: Integrate knowledge from related fields such as ecology, environmental science, and cultural studies to enhance nature tourism practices.

PSO 7: Conduct independent research projects on nature tourism, demonstrating proficiency in data collection and analysis.

PSO 8: Communicate effectively about nature tourism and its benefits to diverse audiences.

Program Specific Outcomes (PSOs):

PSO 1: Understand the biological and ecological requirements of various aquarium fish species.

PSO 2: Develop skills in setting up and maintaining different types of aquariums, including freshwater and marine systems.

PSO 3: Apply knowledge of water chemistry and filtration systems to ensure optimal living conditions for aquarium fish.

PSO 4: Identify and manage common diseases and health issues in aquarium fish.

PSO 5: Implement best practices for feeding and breeding aquarium fish.

PSO 6: Evaluate the environmental impact of aquarium fish keeping and promote sustainable practices. PSO 7: Conduct independent research projects related to aquarium fish keeping and maintenance.

PSO 8: Communicate effectively about aquarium fish keeping techniques and findings to both hobbyists and professionals.

Program Outcomes (POs)

PO 1: Knowledge Application: Apply principles of biology and ecology to maintain healthy aquarium environments.

PO 2: Technical Proficiency: Demonstrate proficiency in aquarium setup, maintenance, and troubleshooting.

PO 3: Water Quality Management: Monitor and manage water quality parameters to ensure the well- being of aquarium inhabitants.

PO 4: Disease Management: Identify, diagnose, and treat common fish diseases and health issues. PO 5: Ethical Practice: Apply ethical principles in the care and management of aquarium fish.

PO 6: Communication: Effectively communicate aquarium maintenance practices and research findings.

PO 7: Problem-Solving: Utilize problem-solving skills to address challenges in aquarium fish keeping. PO 8: Interdisciplinary Integration: Integrate knowledge from related fields such as chemistry, microbiology, and environmental science to enhance aquarium maintenance practices.

PO 9: Technological Proficiency: Use modern tools and technologies for aquarium setup and maintenance.

PO 10: Lifelong Learning: Engage in continuous learning to stay updated with advancements in aquarium fish keeping and maintenance.

Course Objectives:
During this course, the student is expected to:
1. Student will be able to know the fundamentals of aquarium fish industry.
2. Student will understand the biological features of aquarium fishes.
3. Student will get to know the food and feeding habits of aquarium fishes.

Course Outcomes:
After completing the course the student should be able to:
1. Construct an aquarium.
2. Provides knowledge of ornamental fish breeding which is highly professional and attractive avenue for youth.
3. Proper handling and maintain the aquarium fish.

Section I

Unit 1: Introduction to Aquarium Fish Keeping	**No. of lectures-08**	**Weightage:9-15 Marks**
1.1 Origin and history of fish keeping and scope of aquarium fish industry. 1.2 Construction of home aquariums, materials and other equipment used. 1.3 Water quality requirements. 1.4 Exotic and Endemic species of aquarium fishes. 1.5 Benefits of Aquarium.		
Unit 2: Biology of Aquarium Fishes	**No. of lectures-07**	**Weightage:9-15 Marks**
2.1 Common characters and sexual dimorphism of Fresh water and Marine Aquarium fishes such as Molly, Sword tail, Gold fish, Angel fish, blue morph, Anemone fish band Butterfly fish. 2.2 Aquarium Fish Diseases I) Parasitic diseases; II) Bacterial diseases; III) Viral diseases; IV) Protozoan diseases; V) Fungal diseases; V) Deficiency diseases 2.3 Breeding habits. 2.4 Hatching and production of monosex fishes.		

Section II

Unit 3: Food and Feeding of Aquarium Fishes	**No. of lectures- 07**	**Weightage:9-16 Marks**
3.1 Nutritional requirements of aquarium fishes. 3.2 Different kinds of feeds. 3.3 Preparation of dry feeds. 3.4 Other ornamental organisms such as anemones, starfishes, lobsters and shrimps		
Unit 4: Fish Transportation and Maintenance	**No. of lectures-08**	**Weightage:8-17 Marks**
4.1 Live fish transport. 4.2 Packaging and forwarding techniques. 4.3 General Aquarium maintenance. 4.4 Budget for setting up an Aquarium Fish Farm as a Cottage Industry.		
Above Unit Weightage is given for 60% marks of UA assessment only. There could be variation of 10-15% in the Unitwise weightage distribution.		

Reference Books	
10.	**Suggested Reading:**
11.	David Alderton- “Freshwater Aquariums”.
12.	Mary Bailey –“The Complete Guide to Aquarium Fish Keeping”.
13.	Andrew Cleave- “Aquarium Fish”.
14.	Archana Sinha- Breeding And Culture Of Freshwater Ornamental Fish.
15.	K.V.Jayashree, C. S. Tharadevi & N. Arumugum- Home Aquarium and Ornamental
16.	Fish Culture.

Semester – II

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***Teaching Scheme** **Lectures:04 Hours/week, 04 Credits (2)** **OR** **Practical:02Hours/week, 01Credit (2)**	***Examination Scheme** **UA:60 Marks** **CA: 40 Marks**

Program Specific Outcome (PSOs):

PSO 2: Analyze the anatomical and physiological adaptations of chordates to their environments. PSO 3: Apply knowledge of chordate biology to identify and classify various species.
PSO 4: Evaluate the ecological roles and significance of chordates in different ecosystems.
PSO 5: Develop practical skills in the dissection and microscopic examination of chordate specimens. PSO 6: Integrate knowledge of chordate biology with other disciplines such as genetics, ecology, and evolutionary biology.
PSO 7: Conduct independent research projects on chordate organisms, demonstrating proficiency in experimental design and data interpretation.
PSO 8: Communicate findings on chordate biology effectively to both scientific and general audiences.

Program Outcome:

PO 1: Taxonomic Knowledge: Understand the principles and methods of classifying chordate animals.
PO 2: Biodiversity Assessment: Evaluate and document the diversity of chordate species using modern taxonomic techniques.
PO 3: Anatomical and Physiological Analysis: Analyze the anatomical and physiological adaptations of chordates to their environments.
PO 4: Ecological Roles: Assess the ecological roles and significance of chordates in various ecosystems.
PO 5: Laboratory Skills: Demonstrate proficiency in laboratory techniques for studying chordate specimens, including dissection and microscopy.
PO 6: Fieldwork Competence: Conduct field studies to observe and collect chordate specimens, applying appropriate fieldwork techniques.
PO 7: Research Skills: Design and conduct independent research projects on chordate organisms, utilizing proper experimental design and data analysis methods.
PO 8: Critical Thinking: Develop critical thinking skills to evaluate scientific literature and research findings related to chordates.

Course Objectives: During this course, the student is expected to:

1. To provide an intensive and in depth learning to the students in field of Zoology.
2. Beyond simulating, learning, understanding the techniques, the course also addresses the underlying recurring problems of disciplines in today scientific and changing world.
3. To develop awareness and knowledge of different organization requirement and subject knowledge through varied branches and research methodology in students.

Course Outcomes:

At the end of this course, students will be able to:

a) The successful students will be able to establish research organizations with the help of agriculture, environment protection and also their own industry for transgenic animals,
b) Classify phylum Protochordates to Mammalia.. Complex Vertebrate interactions

Section I

Unit 1. :Protochordates:	**No. of lectures-06**	**Weightage:9-15 Marks**
. General characters and classification of 1.1Protochordata 1.2 Herdmania 1.3 Balanoglossus 1.4 Amphioxus		
Unit 2. Cyclostomata	**No. of lectures-06**	**Weightage:9-15 Marks**
General features and classification upto order: 2.1 Petromyzon, 2.2 Myxine		
Unit 3: Gnathostomata: Pisces	**No. of lectures-06**	**Weightage:06-09 Marks**
3.1 General features and classification upto orders : Chondrichthyes 3.2 General features and classification upto orders :Osteichthyes 3.3 Parental care in fishes		
Unit 4: Amphibia	**No. of lectures-06**	**Weightage:05-09 Marks**
General features and classification upto orders of 4.1Anura 4.2 Apoda 4.3 Urodela 4.4 Parental care in Amphibia		

Section II

Unit 5: Reptiles:	**No. of lectures- 06**	**Weightage:9-16 Marks**
General features and classification upto orders: 5.1 Squamata 5.2 Testudines 5.3 Crocodilia 5.4 Sphenodontia 5.5 Venomous and non-venomous snakes : Poison apparatus, Types of snake venom, symptoms and treatments of snakebite		
Unit 6: Aves	**No. of lectures-06**	**Weightage:8-17 Marks**
General features and classification upto orders: 6.1Anseriformes (Duck) 6.2 Columbiformes (Pegion) 6.3 Cuculiformes (Cuckoo) 6.4 Coraciiformes (Kingfisher) 6.5 Falconiformes (Eagle) 6.6 Psittaciformes (Parrot) 6.7 Ciconiformes (Heron) 6.8 Passeriformes (Sparrow) 6.9 Fight adaptations in birds		
Unit 7: Mammals	**No. of lectures-06**	**Weightage:8-17 Marks**
General features and classification upto orders: 7.1 Insectivora (Mole) 7.2 Chiroptera (Bat)		

7.3 Rodentia (Rat)
7.4 Lagomorpha (Rabbit)
7.5 Artiodactyla (Boar)
7.6 Carnivora; (Cat)
7.7 Proboscidea (Elephant)
7.8 Cetacea (Whale)
7.9 Adaptive radiation in mammals

Above Unit Weightage is given for 60% marks of UA assessment only. There could be variation of 10-15% in the Unitwise weightage distribution.

College Level Assessment (CA) Activities: Home assignment, review article, field visit, self-study report

List of Experiments/Assignments/Field visit, etc.

1.	Study of the following specimens (General characters and classification) **CD/Model/Chart/Slides/Virtual**
	1. Balanoglossus, Herdmania, Branchiostoma Petromyzon,
	2. **Class Pieces :** Sphyrna, Pristis, Torpedo, Labeo, Exocoetus, Anguilla
	3. **Class Amphibia :**Ichthyophis, Salamandra, Bufo, Hyla
	4. **Class Reptile:** Chelone, Hemidactylus, Chamaeleon, Draco, Vipera, Naja, Crocodylus, Gavialis
	5. **Class Aves: Any six** common birds from different orders studied:
	6. **Class Mammal:** Ornithorhynchus, Pteropus, Rattus, Loris,Funambulus
2	(d) Key for Identification of venomous and non-venomous snakes: Cobra, Krait, Russel's viper, sea snake & Rat Snake.
3	Study of skeleton of frog: Skull, Atals, Typical vertebra, Pectoral girdle, Pelvic girdle.
4	Filed visit: study of vertebrate from any local ecosystem, visit to zoo, Museum, Aquaria, etc.
5	An '**Animal Album'** containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose.

Note -The practical's may be conducted by using specimens authorized by the wildlife and such other regulating authorities though it is strongly recommended that the same should be taught by using photographs/audio-visual aids/ simulations / models, etc. as recommended by the UGC and as envisaged in the regulations of the relevant monitoring bodies. No new specimens, however, shall be procured for the purpose of conducting practical's mentioned here-in-above.

Reference Books

1.	"Vertebrate Zoology: An Introduction to the Comparative Anatomy, Embryology, and Evolution of Chordate Animals" by Gavin De Beer
2.	"Principles of Anatomy and Physiology" by G.J. Tortora & N.P. Anagnostakos (1984):
3.	Publisher: Harper & Row Publ., N.
4.	"Textbook of Zoology, Vertebrates" by A.J. Marshall (1995):
5.	Publisher: The McMillan Press Ltd., UK
6.	"Wildlife Biology: An Indian Perspective" by Goutam Kumar Saha and Subhendu Mazumdar

7.	“Introductory Biosystematics and Taxonomy” by Dr. Madan Mohan Trigunayat and Kritika Trigunayat
8.	“Integrated Principles of Zoology” by Cleveland P. Hickman Jr., Larry S. Roberts, and Allan Larson.
9.	“Zoology: Inside the Secret World of Animals” by DK Publishing.
10.	“Handbook of Bird Biology” by Cornell Lab of Ornithology and Irby J. Lovette1.
11.	“Marine Biology” by Peter Castro and Michael E. Huber.
12.	“Zoology” (Eleventh Edition) by Stephen A. Miller and John P. Harle.
13.	“Organic Evolution” by M.P. Arora

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **First Year BSc (Zoology) Semester-II** **Vertical : SEC – II** **Course Code:GO4-SEC-204 (P)** **Course Code: Organic fertilizer (Practical Course)**
Practical:02Hours/week, 01Credit- 2	***Examination Scheme** **UA:60 Marks** **CA: 40 Marks**

Program Specific Outcomes (PSOs):

PSO 1: Understand the composition and benefits of various organic fertilizers. PSO 2: Analyze the impact of organic fertilizers on soil health and plant growth. PSO 3: Develop skills in the production and application of organic fertilizers.
PSO 4: Evaluate the environmental and economic benefits of using organic fertilizers. PSO 5: Conduct independent research projects on the effectiveness of organic fertilizers.

Program Outcomes (POs):

PO 1: Knowledge Application: Apply principles of soil science and plant nutrition to optimize the use of organic fertilizers.
PO 2: Technical Proficiency: Demonstrate proficiency in techniques for producing and applying organic fertilizers.
PO 3: Environmental Awareness: Assess the environmental impact of organic versus synthetic fertilizers.
PO 4: Research Skills: Design and conduct experiments to evaluate the effectiveness of organic fertilizers.
PO 5: Communication: Effectively communicate the benefits and practices of using organic fertilizers to various audiences

Course Objectives:

During this course, the student is expected to:

1. The course will provide information on useful microbes such as Cyanobacteria, Mycorrhiza and their role in manufacture of organic fertilizers.
2. Use of microbes in production of bioinsecticides and the methods of Organic farming, Recycling,
3. Vermicomposting etc. will also be discussed.

Course Outcomes:
1.On the completion of this course, the students will be able to;
2.Develop their understanding on the concept of bio-fertilizer
3.Identify the different forms of biofertilizers and their uses
2.Compare between the Green manuring and organic fertilizers
3. Develop the integrated management for better crop production by using both nitrogenous and phosphate bio fertilizers and vesicular arbuscular mycorrhizal (VAM).
4. Interpret and explain the components, patterns, and processes of bacteria for growth in crop production

List of Experiments/Assignments/Field visit, etc. • **Any six of the following**	
	Demonstration of symbiotic Nitrogen fixing bacteria / blue green algae
1.	Demonstration of blue green algae Cyanobacteria
2.	Study of free living nitrogen fixing bacteria : Azotobacter
3.	Study of free living nitrogen fixing bacteria Clostridium
4.	Study of Phosphate solubility microbe :Aspergillus
5.	Study of Phosphate solubility microbe : Bacillus
6.	Study of Phosphate solubility microbe :Pseudomonas
7.	Study of plant associated microbes.
8.	Study of bio-insecticides from local market
9.	Study of bio-compost from local market.
10.	Study of impact of Mycorrhizae on plant growth
11.	Demonstrate Comparative study of chemical fertilizers and organic fertilizer on plant growth
12.	Demonstration of making of bio compost- Procedure of vermicomposting and field application.
13.	Visit / Study of organic farming practices employed by local farmers/ Municipal Corporation/ industries.
14.	Review on any one topic

Note - Note: Report on multiple excursion tours may be clubbed for preparing and submitting report at the time of final examination will be allowed;

- Reduce or avoid the use of plastic files during submission of reports / projects as an ecofriendly method.)

Reference Books

1. Dubey, R.C. (2005). A Text book of Biotechnology S.Chand & Co, New Delhi.
2. John Jothi Prakash, E. (2004). Outlines of Plant Biotechnology. Emkay Publication, New Delhi.
3. Kumaresan, V.(2005). Biotechnology, Saras Publications, New Delhi.
4. NIIR Board. (2012). The complete Technology Book on Biofertilizer and organic farming. 2nd Edition. NIIR Project Consultancy Services.
5. Sathe, T.V. (2004) Vermiculture and Organic Farming. Daya publishers.
6. Subba Rao, N.S. (2017). Biofertilizers in Agriculture and Forestry. Fourth Edition. Medtech.
7. Vayas, S.C.; Vayas, S. and Modi, H.A. (1998). Bio-fertilizers and organic Farming Akta Prakashan, Nadiad

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***Teaching Scheme-** **Lectures:04 Hours/week, Credits 02**	***Examination Scheme** **UA:60 Marks** **CA: 40 Marks**

Program Specific Outcomes (PSOs):

PSO 1: Understand the role of nutrients in human health and disease prevention.
PSO 2: Analyze the impact of dietary patterns on overall health and well-being.
PSO 3: Apply knowledge of human nutrition to develop balanced and health-promoting diets.
PSO 4: Evaluate the nutritional needs of different populations across the lifespan.
PSO 5: Conduct independent research projects on nutrition and health, demonstrating proficiency in data collection and analysis.

Program Outcomes (POs):

PO 1: Knowledge Application: Apply principles of nutrition science to understand the relationship between diet and health.
PO 2: Technical Proficiency: Demonstrate proficiency in techniques for assessing dietary intake and nutritional status.
PO 3: Critical Thinking: Develop critical thinking skills to evaluate nutritional information and research findings.
PO 4: Ethical Practice: Apply ethical principles in the study and practice of human nutrition.
PO 5: Communication: Effectively communicate nutritional information and research findings to diverse audiences.
PO 6: Problem-Solving: Utilize problem-solving skills to address nutritional challenges and promote health.
PO 7: Interdisciplinary Integration: Integrate knowledge from related fields such as biochemistry, physiology, and public health to enhance understanding of nutrition.
PO 8: Lifelong Learning: Engage in continuous learning

Course Objectives:

During this course, the student is expected to:

1. The course covers the basic concepts of balanced diet for people of different ages besides focusing on the consequences of malnutrition and the deficiency diseases and the diseases caused due to poor hygiene.

Course Outcomes: After successfully completing this course, the students will be able to:

1) Understand the role of food and nutrients in health and disease.
2) Provide culturally competent nutrition services for diverse individuals.
3) Implement strategies for food access, procurement, preparation, and safety that are relevant for the culture, age, literacy level, and socio-economic status of clients and groups.
4) Perform food system management and leadership functions that consider sustainability in business, healthcare, community, and institutional arenas.
5) Understand the role of food and nutrients in health and disease.

Section I

College Level Assessment (CA) Activities: List of Experiments/Assignments/Field visit, etc.	
1	**Nutrition and Dietary Nutrients:**
	• Basic concept of Food: Components and nutrients;
	Concept of balanced diet.
	• Nutritional Requirements (Macronutrients): Carbohydrates, Lipids, Proteins-: dietary source and significance.
	• Nutritional Requirements (Micronutrients): Vitamins-Water-soluble and Fat-soluble vitamins- dietary source and significance.
	• Nutritional Requirements (Important minerals): Iron, Calcium, Phosphorus, Iodine, Selenium and Zinc & their biological functions
	• Examples of Deficiency diseases: Protein deficiency (kwashiorkor, marasmus); anemia, goiter, night-blindness, scurvy, rickets, hypocalcemia

Section- II

2	**Human Health:**
	• Definition and concept of health
	• Food and Water-borne infections: Bacterial diseases: cholera, dysentery; typhoid fever
	• Life style dependent diseases- Introduction to hypertension, diabetes mellitus, and obesity- their causes and prevention Social health problems- smoking, alcoholism, narcotics. Prevention from mental illness and disabilities, alcoholism, tobacco addiction, de-addiction, lifestyle diseases
	• Junk food and its consequence on health Exercise and keeping away from stress, pathogens and pollution
	• Health as a state of wellbeing, health awareness, Physical & mental health, immunization and vaccination;
	Community health centers: Definition, role of health centers, yoga and meditation

Suggested References

Reference Books	
1	Mudambi, S.R. and Rajagopal, M.V. (2007). Fundamentals of Foods, Nutrition and Diet Therapy; Fifth Ed;; New Age International Publishers
2	Srilakshmi, B. (2002). Nutrition Science; New Age International (P) Ltd.
3	Srilakshmi, B. (2007). Food Science; Fourth Ed; New Age International (P) Ltd.
4	Swaminathan, M. (1986). Handbook of Foods and Nutrition; Fifth Ed; BAPPCO.
5	Bamji, M.S.; Rao, N.P. and Reddy, V. (2009). Text Book of Human Nutrition; Oxford & IBH Publishing Co. Pvt Ltd.
6	Wardlaw, G.M. and Hampl, J.S. (2007). Perspectives in Nutrition; Seventh Ed; McGraw Hill
7	Mudambi, S.R. and Rajagopal, M.V. (2007). Fundamentals of Foods, Nutrition and Diet Therapy; Fifth Ed;; New Age International Publishers