Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2022

'B^{++}' Grade(CGPA 2.96)

Name of the Faculty: Science & Technology

(As per New Education Policy 2020)

Syllabus: ZOOLOGY

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

(To be effective from the academic year June-2024).

Punyashlok Ahilyadevi Holkar Solapur University, Solapur,
Faculty of Science & Technology
Choice Based Credit System (CBCS) (w.e.f. June 2024)

~ About National Education Policy (NEP) – 2020 ~

With the directions and guidelines issued by **Government of Maharashtra resolution dated 20th April 2023 and 16th May, 2023** regarding the implementation of NEP at UG and PG level, the Punyashlok Ahilyadevi Holkar Solapur University, Solapur has taken decision to implement NEP 2020 with Choice Based Credit System (CBCS) at Undergraduate level and Post Graduate level. This has been done to achieve the goals and objectives set in NEP-2020 such as- worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing undergraduate and post-graduate degree.

The CBCS provides an opportunity for the students to select from the prescribed courses comprising core, elective/minor or skill based. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations.

Outline of NEP:

The structure of the Three/Four-year bachelor's degree programme allows the opportunity to the students to experience the full range of holistic and multidisciplinary education in addition to a focus on the chosen major and minors as per their choices and the feasibility of exploring learning in different institutions. The structure allows students to learn various components like:

(a) Major (Core) Subject (DSC): This comprises of Mandatory and Elective Courses that require students to achieve:

- Minimum 50% of total credits corresponding to Three/Four - year UG Degree- Mandatory Courses are offered in all four years;
- 2 credit courses on Major Specific IKS shall be included under Major;
- Elective courses of Major will be offered in the third and/or final year;
- Vocational Skill Courses, Internship/ Apprenticeship, Field Projects, Research Projects are related to Major

(b) Minor Subject (18-20 Credits)

- The Minor subjects may be from the different disciplines of the same faculty of DSC Major (Core) or they can be from different faculty altogether;

- The credits of Minor subjects shall be completed in the first three years of UG Programme

(c) Generic/ Open Elective Courses (OE) (10-12 credits)

- GE/OE are to be offered in I and/or II year;
- Faculty-wise baskets of OE shall be prepared by Autonomous College.
- OE/GE is to be chosen compulsorily from faculty other than that of the Major or as per the directions issued by NEP-Steering Committee

(d) Vocational and Skill Enhancement Courses (VSEC)

i) Vocational Skill Courses (VSC): (8-10 credits): Includes Hands on Training corresponding to the Major and/or Minor Subjects:

- To be offered in first three years;
- Wherever applicable vocational courses will include skills based on advanced laboratory practical's of Major

ii) Skill Enhancement Courses (SEC): (06 credits)

- To be offered in I and II year;
- To be selected from the basket of Skill Courses approved by Autonomous College

(e) Ability Enhancement Courses (AEC), Indian Knowledge System (IKS) and Value Education Courses (VEC): (14 Credits) **i) AEC:** (08 credits)

- To be offered in I and II year
- English: 04 Credits
- Modern Indian Language: 04 credits
- To be offered from the Basket approved by Autonomous College; The focus for both languages should be on linguistic and communication skills.

ii) IKS: (2 Credits)

- To be offered in I Year
- Courses on IKS to be selected from the basket of IKS courses approved by Autonomous College **iii) VEC:** 04 Credits • To be offered in I year
- Value Education Courses (VEC) such as Understanding India, Environmental Science/Education, and Digital and Technological Solutions.

(f) Field Projects/ Internship/ Apprenticeship/ Community Engagement and Service corresponding to the Major (Core) Subject, Co-curricular Courses (CC) and Research Project • Internship/Apprenticeship corresponding to the Major (Core) Subject: (8 Credits)

- Field Projects/Community Engagement and Service (CEP) corresponding to the Major (Core) Subject

  (minimum 4-6 credits)

  -To be offered in II and III years of UG Degree Programmes.

- Co-curricular Courses (CC) such as Health and Wellness, Yoga education, sports and fitness, Cultural

Activities, NSS/NCC and Fine/ Applied/Visual/ Performing Arts: (8 credits)
-To be offered in I and/or II year

- Research Projects: (12 credits)
  -To be offered in the final year for 4-year Honor's with Research UG Degree

- **CREDIT:**
- Credit is a numerical value that indicates students work load (Contact Hours, Lab work, Seminar, Tutorials, Field work etc.) to complete a course unit. The contact hours are transformed into credits. Moreover, the grading system of evaluation is introduced for B.Sc. course wherein process of Continuous Internal Evaluation is ensured.
- **Theory: '**15 contact hours' for theory course constitute 'one credit'
- **Practical/Tutorial: '**30 contact hours' for practical course constitute 'one credit'.
- **Workshop based activities/Skill based activities:** Minimum 30 contact hours per credit in a semester is required
- **Internship/On-Job Training: '**30 contact hours' per credit in a semester is required (1 credit/week)
- **Community Engagement and Service-CEP/Field Project:** 30 contact hours per credit in a semester is required
- **Credit Framework under Three/Four Years UG Programme with Multiple Entry and Multiple Exit Options:**

The minimum and maximum credit structure for different levels under three- or four-year UG programme with multiple entry and multiple exit options are as given below:

Levels	Code	Qualification Titles	Credit Requirements		Semester	Year
			Minimum	Maximum		
4.5	100-199	UG Certificate	40	44	2	1
5.0	200-299	UG Diploma	80	88	4	2
5.5	300-399	Three Year Bachelor's Degree	120	132	6	3
6.0	400-499	Bachelor's Degree Honours OR Bachelor's Degree-Honours with Research	160	176	8	4
	500-599	First Year PG & or PG Diploma	40	44	2	1
6.5	600-699	PG Degree	80	88	4	2
8.0	700-799	Ph.D.	16+ Ph.D. Work		---	---

2. CHOICE BASED CREDIT SYSTEM (CBCS):

Each course carries a defined number of credits. The credits are based on the course structure, including the teaching mode and the number of contact hours for lecture,

tutorial, and practical classes. One hour of theory/tutorial teaching per week equals one credit, and two hours of laboratory/demonstration classes per week equals one credit. Credits are considered based on the number of contact hours, course content, teaching methodology, allotted maximum marks.

While calculating the grading, one credit is equal to 25 marks in a semester. Thus, 4 credit courses will receive 100 marks, 2 credit courses will receive 50 marks, and a single credit course will receive 25 marks. The proportion of marks earned in a course and the credits given to that course will be used to calculate the Semester Grade Point Average (SGPA) or Cumulative Grade Point Average (CGPA).

General Education credit refers to a unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching [lecture or tutorial] or two hours of practical work/field work per week. Accordingly, one Credit would mean equivalent to 15 hrs' of theory or **30 hrs' of workshop/ lab/Internship/OJT/FP/CEP/CC work per semester.** For the ease of calculation, the break-up of credits with respect to general education component is as in the table below:

Table 1: Break-Up of Credits and contact hours per credit is as follows

Sr. No.	One Credit	Number of Contact Hours
1	Theory	15 Contact Hours
2	Practical	30 Contact Hours
3	Experiential learning including relevant experience and professional levels acquired	30 Contact Hours

3. DEFINITIONS OF KEYWORDS:

a) **Academic Year**: Two consecutive (one odd + one even) semesters constitute one academic year.

b) **Choice Based Credit System (CBCS):** The CBCS will provides options for students to select courses from the prescribed courses (core, open elective, discipline elective, ability and skill enhancement language, soft skill courses and so on).

c) **Course**: Usually referred to as 'papers' is a component of a programme. All courses need not carry the same weight. The courses will define learning objectives and learning outcomes. A course will be designed to comprise Contact Hours / tutorials / laboratory

work / field work / project work / vocational training / viva / seminars / term papers / assignments/ presentations / self-study or a combination of some of these.

d) **Credit-Based Semester System (CBSS)**: Under the CBSS, the requirement for awarding a degree /diploma /certificate is prescribed in terms of the number of credits to be earned.

e) **Credit**: A unit by which the course work is measured. It determines the number of hours of instructions required per week in a semester. One credit is equivalent to one hour of lecture or tutorial or two hours of practical work/field work per week in a semester. It will generally be equal to 15 hours of instructions.

f) **Grade Point**: It is a numerical weight allotted to each letter grade on a 10-point scale.

g) **Credit Point**: It is the product of grade points and the number of credits for a course.

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

i) **Programme**: A programme leading to the award of a degree, diploma, or Certificate.

j) **Semester**: Each semester will consist of over 15 weeks of academic work equivalent to 90 actual teaching days. The odd semester may be generally scheduled from June to November and even semester from January to May.

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

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

m) **Transcript or Grade Card or Certificate:** Based on the grades earned, a graded certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured).

4. Eligibility Criteria:

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

5. Examination and Evaluation:

As suggested in NEP 2020, continuous internal evaluation is proposed. Total evaluation proposed is **80:20** ratio for external: internal evaluation. There will be no internal evaluation for lab courses (Excluding project/dissertation).

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 No chordates	20	30	50	2
PRDSC1-1 (2)	Practical based on DSC1	20	30	50	2
SEC 1(2)	Ecotourism	20	30	50	2
IKS **Generic** (2)	Indian knowledge system-Indian Natural History-Animal conservation	20	30	50	2
FP/RP/CC	NCC/NSS/Culture/sports/Social activities	20	30	50	2
L1-1 (2)	English	20	30	50	2
VEC1 (2)	Constitution of India	20	30	50	2
Total Marks + Credit for Semester - I			20	30	**22**
Semester –II					
DSC1-2 (2)	Animal diversity-II Chordates	20	30	50	2
PRDSC1-2 (2)	Practical based on DSC1-2	20	30	50	2
OE-1 (2)	Human Nutrition and Health	20	30	50	2
SEC 2 (2)	Bio fertilizers	20	30	50	2
FP/RP/CC	NCC/NSS/Culture/sports/Social activities	20	30	50	2
L1-1 (2)	English	20	30	50	2
VEC1 (2)	Environmental Science	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**

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology
NEP Choice Based Credit System
(CBCS) (W.e.f. June2024)

- **Title of the Course:** B.Sc. Part-I

- **Subject:** Zoology

Introduction: This course provides a broad overview of Zoology and to produces expert hands that would have sufficient knowledge and expertise to solve the urgent problems of the region by using Zoology. The course structure is basic science centric where students learn core science and are taught necessary fundamental subject or that purpose.

- **Objectives of the course:** The objectives of B.Sc. Zoology course are:
  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.
  d. To train the students to take up wide variety of roles like researchers, scientists, consultants, entrepreneurs, academicians, industry leaders and policy.

Course outcome and Advantages: Zoology has tremendous job potential.

a) The successful students will beableto establish research organizations with the help of agriculture, environment protection and also their own industry for transgenic animals, clinical pathology, genetic counseling, human karyotyping etc.
b) To disseminate information on economic aspects of zoology like apiculture, sericulture, fisheries, poultry science.
c) To encourage young learners for self employment
d) Learners would gain knowledge on animals useful to mankind and the means to make the most of it. Learners would learn the modern techniques in animal husbandry. Learners would be pursuing entrepreneurship as careers

- **Eligibility and Admission:** A Candidate passing 10+2 with biology MLT , dairy science ,Fisheries, Agricultural science as one of the subject and passed from state syllabus / CBSE /equivalent with minimum passing percentage of as per the directives of the higher education and Solapur university, Solapur.

- **Duration:** The duration for this program is of 3 years with semester pattern(06Semesters)
- **Medium of Instruction:** English
- **Syllabus Structure:**
- The University follows semester system. An academic year shall consist of two semesters
- Each B.Sc. course shall consist of three years i.e. six semesters.
- B.Sc. Part-I Zoology shall consist of two semesters: Semester I and Semester II.

In semester I, there will be two core papers is having paper I and paper II of 100 marks.
Similarly in Semester II there will be two core papers is having paper I and paper II of 100 marks.
English will be as Ability Enhancement Course (AECC) in both Semester I
and II. English paper carries 50 marks in each semester.
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, Homeassignment, Tutorials, Seminars, Group discussion, Brain storming
sessions etc. as given below. Scheme of Evaluation
Asper 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.

Semester–I:

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:(100m

arks)

University Examination (60marks): No. of theory papers:2(paperIII and paper IVof 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**

B.Sc. I Semester-I&II, ZOOLOGY
Choice Based Credit System (CBCS) Structure (2022)

Semester-I Major (Theory)

Paper	Title	Marks
DSC1-1	**Animal Diversity-I-NONCHORDATES**	**50 (30-UA and 20-CA)**

Semester-II Major (Theory)

Paper	Title	Marks
DSC1-2 (2)	Animal diversity-II Chordates	**50 (30-UA and 20-CA)**

Semester I
DSC 1-1
Title of the paper: Animal diversity-I (Non-Chordates)
Credit: 02, Theory: 30 Periods, Marks: 50

	Course Objectives:	**Contact Hrs.**
•	Different groups of invertebrate animals are studied in this course including Protozoa, Porifera, coelenterate, Plathyhelminthes, Aschelminthes, Annelida, Arthropoda, Mollusca and Echinodermata.	
•	To study the general characters and classification upto order.	
•	Some special features, organs, pathogenecity, life history and significance are studied here.	
Unit 1:	**Kingdom Protista**	**15**
1.1	General characters of Kingdom Protista	
1.2	Classification up to classes of; Kingdom Protista	
1.3	Nutrition in paramecium.	
Unit 2	**Phylum Porifera**	
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**	
3.1	General characters of phylum Cnidaria	
3.2	Classification up to classes phylum Cnidaria	
3.3	Reproduction in hydra	
Unit 4	**Phylum Platyhelminthes and Nemathelminthes**	
4.1	General characters of phylum Platyhelminthes	
4.2	Classification 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 lumbricoid*	
Unit 5	**Phylum Annelida**	
5.1	General characters of phylum Annelida	

5.2	Classification up to classes of phylum Annelida	
5.3	Economic importance of leech	
Unit 6	**Phylum Arthropoda**	
6.1	General characters of phylum Arthropoda.	
6.2	Classification up to classes of phylum Arthropoda.	
6.3	Economic importance of insects.	15
Unit 7	**Phylum Mollusca**	
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 Echinodermata**	
8.1	General characters of Phylum Echinodermata	
8.2	Classification up to classes of Phylum Echinodermata	
8.3	Water-vascular system in Asteroidea	

Practical Course in Zoology for B. Sc. I

Semester I (Non chordates & Cell Biology)

(Credits 02)

1. Study of the following specimens (General characters and classification)
CD/Model/Chart/Slides/Virtual

- *Amoeba,Euglena,Plasmodium,Paramecium*
- Sycon,Hyalonema,andEuplectella
- Obelia,Physalia,Aurelia, Metridium
- Taenia,Planaria,Fasciola
- Aphrodite,Nereis,Pheretima,Hirudinaria
- Peripatus,Palaemon,Crab,Limulus,Scolopendra,Julus,Periplaneta
- Chiton,Dentalium,Pila,Unio,Sepia,Octopus
- Pentaceros,Ophiura,Echinus,Cucumaria andAntedon,

2. Studyof thefollowing permanentslides/lab.Specimens:

(a) T. S. and L.S.of *Sycon*,
(b) *Taenia*-Scolex, mature & gravid proglottid
(c) Whole mount of male and female *Ascaris*

3. Collection, observation and identification of Zooplanktons / Parasites
4. **Field visit:** for the study of invertebrate diversity and submission of report in semester examination.

SEMESTER–II

Semester II

DSC 2

Title of the paper: Animal Diversity- II CHORDATES (Chordates)

Credit: 02, Theory: 30 Periods, Marks: 50

(Total credits:2 Contact Hours 30.0)

Unit Number	Title of the Unit	Contact Hours
1	**1: Protochordates:**General characters and classification of protochordata – Herdmania Balanoglossus, Amphioxus **2:Agnatha:**Generalfeatures and classification upto order:Petromyzon, Myxine **3: Gnathostomata: Pisces** • General features and classification upto orders : Chondrichthyes **4:** General features and classification upto orders :Osteichthyes Parental care in fishes	15
2	**5 :Amphibia:**General features and classification upto orders of Anura, Apoda and Urodela Parental care in Amphibia **6: Reptiles:** • General features and classification upto orders:Squamata,Testudines, Crocodilia, Sphenodontia • Venomous and non-venomous snakes : Poison apparatus • Types of snake venom, symptoms and treatments of snakebite **7:Aves** • General features and classification upto orders: Anseriformes (Duck) Columbiformes (Pegion) Cuculiformes (Cuckoo) Coraciiformes (Kingfisher) Falconiformes (Eagle) Psittaciformes (Parrot) Ciconiformes (Heron) Passeriformes (Sparrow) • Fight adaptations in birds **8:Mammals** • General features and classification upto orders: Insectivora (Mole) Chiroptera (Fat) Rodentia (Rat) Lagomorpha (Rabbit) Artiodactyla (Boar) Carnivora; (Cat) Proboscidea (Elephant) Cetacea (Whale) • Adaptive radiation in mammals	15

Practical Course in Zoology for B. Sc. I

DSC-2 Semester II (Credits 02)

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1. Study of the following specimens (General characters and classification)
CD/Model/Chart/Slides/Virtual

- Balanoglossus,Herdmania,Branchiostoma
- Petromyzon,Sphyrna,Pristis,Torpedo, Labeo,Exocoetus,Anguilla
- Ichthyophis,Salamandra, Bufo,Hyla
- Chelone,Hemidactylus, Chamaeleon,Draco,Vipera,Naja,Crocodylus,Gavialis
- **Any six** common birds from different orders studied:
- Ornithorhynchus, Pteropus, Rattus, Loris,Funambulus

2. 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

General Elective

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

B. SC. Part – I Semester-II (w.e.f. June, 2024)

Subject: Open Elective-II: Human Nutrition and Health

Semester-II: Theory Syllabus (OE-II)

Marks: 50 **Credits: 02 (Contact Hours-30)**

Unit Number	Title of the Unit	Contact Hours
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	15
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	15

About the course

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.

Learning 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.

Recommended readings:

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.

SEC-1 Ecotourism

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

B.Sc. I Zoology (NEP 2020), w.e.f. 2024-25

Semester-I:

SEC-1 Ecotourism Credit: 02

Contact Hours: 30

Unit Number	Title of the Unit	Contact Hours
1	**Introduction to ecosystem and its significance** 1.1 Definition of ecotourism 1.2 Types of tourism: Extreme and mass 1.3 Characteristics of ecotourism 1.4 World ecotourism summit: Policies and formulations 1.5 Ecotourism as a tool of capacity building and conservation 1.6 Tourist resort 1.7 Environmental, socio-cultural and economic impact of ecotourism 1.8 Tourism organizations: International. National, State and Private Sector 1.9 Tourism industry in India 1.10 Ecotourism in Maharashtra-Sanctuary,wild life parks;Zoo	15
2	**Unit 2: Management and marketing of ecotourism** 2.1 Tourism planning 2.2 Involvement of local bodies and officials in tourism 2.3 Coordination between tourist and host 2.4 Tourist sites and attraction 2.5 Managing personnel in tourism 2.6 Managerial practices in tourism 2.7 Seasonality and destination in tourism 2.8 Preparation of maps and charts 2.9 Definition, concepts and features of Tourism marketing 2.10 Communications skills and ecotourism 2.11 Advertising and publicity in tourism 2.12 International and domestic tourism market 2.13 Use of technology in tourism marketing	15

Learning outcomes: Upon successful completion of this course student should be able to:

1. Identify and manage for ecological impacts to soil, water, vegetation and wildlife resulting from recreation and tourism development.
2. Understand ecological impact and ecotourism management approaches in a variety of ecosystems under diverse landowners.
3. Ability to analyze the environmental and social consequences of ecotourism management strategies and decisions.

References:

1. **Mowforth, M., & Munt, I. (2009).** Tourism and sustainability (3rd Edition). London, UK: Routledge.
2. **Newsome, D., Moore, S.A., & Dowling, R.K. (2002).** Natural area tourism. Bristol, UK: Channel View (Publications).
3. **Weaver, D. (2008).** Ecotourism (2nd Edition). Hoboken, NJ:JS Wiley. Staff: Dr Julian Clifton.

General Elective II

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
B.Sc. I Zoology (NEP 2020), w.e.f. 2024-25
Semester-I: General Elective I
SEC-2 Biofertilizers Credit: 02

About the course

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

Learning outcomes:

On the completion of this course, the students will be able to;

 Develop their understanding on the concept of bio-fertilizer

 Identify the different forms of biofertilizers and their uses

 Compare between the Green manuring and organic fertilizers

 Develop the integrated management for better crop production by using both nitrogenous and phosphate bio fertilizers and vesicular arbuscular mycorrhizal (VAM).

 Interpret and explain the components, patterns, and processes of bacteria for growth in crop production

Unit I: Microbes as fertilizers 25 Lectures

General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, inoculum production and field application, legume/pulses plants. carrier based inoculants, Actinorrhizal symbiosis. Azospirillum: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.

Blue green algae, Phosphate solubilising microbes Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation. Phosphate solubilizing microbes - Isolation, characterization, mass inoculum production, field application.

Unit II: Mycorrhizal effect on plant growth 12 Lectures

General account of Mycorrhizae; Types of mycorrhizae: ectomycorrhizae and endomycorrhizae; Types of associations, occurrence and distribution, Nutrition, growth and yield – colonization of vesicular-arbuscular mycorrhiza (VAM)– isolation and inoculums; production of VAM and its influence on growth and yield of crop plants.

Microbial use in bioinsecticides and biocompost **13 Lectures**

Microbes used as bioinsecticides and their merits over synthetic pesticides, Bacillus thuringiensis, production and Field application. Viruses – cultivation and field applications.

Organic farming – Green manuring and organic fertilizers, Recycling of bio-degradable wastes: municipal, agricultural and Industrial wastes.

Methods of making biocompost; Procedure of vermicomposting and field application.

Recommended readings

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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Nature of Question Paper for CBCS Pattern
B. Sc. / B.C.A (Part- I) w.e.f. AY 2024-25

Time: Total Marks: 30

Instructions
1) All Questions are compulsory
2) Figure to right indicate full marks.

Q.1 Choose correct alternative. (MCQ) 06 Marks

1)
a) b) c) d)

2)
a) b) c) d)

3)
a) b) c) d)

4)
a) b) c) d)

5)
a) b) c) d)

6)
a) b) c) d)

Q.2. Answer the following. (Any three) 6 (2+2+2)

A)

B)

C)

D)

E)

Q.3. Answer the following (Any two). 6 (3+3)

A)

B)

C)

Q.4. Answer the following (Any two). 6 (3+3)

A)

B)

C)

Q.5. Answer the following (Any one). 6 Marks

A)

B)

CA

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Nature of Question Paper for CBCS Pattern
B. Sc. / B.C.A. (Part- I) w.e.f. AY 2024-25

Time: Total Marks: 20

- Internal Evaluation System for 20 Marks
  - Choose any two of the following
  - Home Assignment / Unit Test / Tutorial /Seminar

- Pattern of Examination:
  - External Evaluation + Internal Evaluation
  - 30 Marks + 20 Marks = 50 Marks
- Passing Criteria:
  - Written Exam – 12 out of 30
  - Continuous Assessment (CA) – 08 out of 20
