Annexure - B (1-20)

Ch. Ranbir Singh University, Jind

Syllabus of VAC, SEC, VOC
for Under-Graduate Programme
Under Multiple Entry-Exit, Internship and CBCS-LOCF in accordance to NEP-2020w.e.f. 2023-24 (in phased manner)

VAC-VALUE ADDED COURSE								
Course Type	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
VAC-3	**B23-VAC-320**	**Indian Biodiversity**	**2**	**2**	**15**	**35**	**50**	**3 hrs.**

Level of the course: NA

Pre-requisite for the course (ifany): NA

Course Learning Outcomes (CLO):

1. Know about an overview of Indian Biodiversity
2. Understand various strategies of biodiversity conservation
3. Improve their knowledge about Important Protected areas
4. To identify the local biodiversity

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	An overview of Indian Biodiversity; Faunal and Floral Indian biodiversity, Definition and concept of Biodiversity; Important Biodiversity area of India, Biodiversity: levels, values and threats and conservation	8
II	Popular Biosphere Reserves and their biodiversity, Popular Tourist spots of Rich Biodiversity, In-situ and Ex-situ conservation of biodiversity	8
III	Protected Areas and their roles in biodiversity conservation, Important National Park and Wildlife sanctuaries, IUCN categories, Threatened categories	7
IV	Terrestrial Biodiversity, Aquatic and Coastal biodiversity, Biodiversity hotspots, their characteristic flora and fauna, Biodiversity resources of north-east India	7

Suggested Evaluation Methods

InternalAssessment:

- **Theory**
  - Class Participation: 4
  - Seminar/presentation/assignment/quiz/class test etc.: 4
  - Mid-Term Exam: 7

End Term Examination:

- **Theory**
  - Written Examination: 35

Learning Resources

1. Thammineni Pullaiah and Sandhya Rani (2016) " Biodiversity in India" Volume: RegencyPublications
2. Shukla Mahanty and Anjali Srivastava (2016). "Biodiversity And It's Conservation" **DishaInternational Publishing House**
3. Ramakrishanan, N "Biodiversity in Indian Scenarios" Daya Publishing House, New Delhi
4. Erach Bharucha (2002) "The Biodiversity of India" Mapin Pub.
5. Asad R. Rahmani and Dhritiman Mukherjee (2016) "Magical Biodiversity Of India" OxfordUniversity Press

VAC-VALUE ADDED COURSE								
Course Type	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
VAC-4	**B23-VAC-407**	**Ecology and Environment**	**2**	**2**	**15**	**35**	**50**	**3 hrs.**

Level of the course: NA

Pre-requisite for the course (ifany): NA

Course Learning Outcomes (CLO):

1. Know about basics of ecological science
2. Understand various strategies for research and development on ecological succession and dynamics
3. Improve their knowledge about conservation science
4. Describe about various conservation projects

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	Environmental components: biotic and abiotic components and their interactions. Concept of habitat and niche; Major terrestrial biomes; Biogeographical zones of India.	8
II	Population and Community ecology: Characteristics of a population; life history strategies (r and K selection); concept of metapopulation – demes and dispersal, Species Interactions: Types of interactions, interspecific competition, Community Ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones.	8
III	Ecosystem and Ecological Succession: Ecosystem: structure and function; energy flow and mineral cycling (C,N,P); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial and aquatic. Ecological Successions: Types; mechanisms; changes involved in succession; concept of climax.	7
IV	Applied Ecology and Conservation Biology: Environmental pollution; biodiversity: status, monitoring and documentation; biodiversity management approaches; Principles of conservation and it's management; Project Tiger, Biosphere reserves.	7

Suggested Evaluation Methods

InternalAssessment:

- **Theory**
  - Class Participation: 4
  - Seminar/presentation/assignment/quiz/class test etc.: 4
  - Mid-Term Exam: 7

End Term Examination:

- **Theory**
  - Written Examination: 35

Learning Resources

1. H.R. Singh & Neeraj Kumar (2014)"Ecology and Environmental Science" Vishal PublishingCo.
2. P D Sharma (2017) "Ecology and Environment" Rastogi Publications
3. Eugene Odum (2017)"Fundamentals of Ecology" Cengage India Private Limited Publishers,Noida
4. Pranav Kumar and Usha Mina (2021)"Fundamentals Of Ecology And Environment" 3 rdEdition , Pathfinder Academy
5. N. Arumugam " Concepts of Ecology" Saras Publication

SEC-SKILL ENHANCEMENT COURSE								
Course Type	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
SEC-2	**B23-SEC-220**	**Techniques in Bird Watching**	**2**	**2**	**15**	**35**	**50**	**3 hrs.**
		Practical	**1**	**2**	**5**	**20**	**25**	**4 hrs.**

Level of the course: NA

Pre-requisite for the course (ifany): NA

Course Learning Outcomes (CLO):

1. Students will be able to learn about the theory of camera trap
2. Learners will be able to learn about installation of camera trap
3. This Practice will be effective for students for collection of data with camera trap
4. Learners will be able theory of camera trap field operations
5. Students will get practical exposure of camera trap

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	Introduction to Bird watching Characteristics of Birds with flight adaptations Important field signs of bird watching	8
II	Zoological Names of Important birds Field characters of important birds Sexual dimorphism in birds	8
III	Important Indian Bird areas Important Bird areas of Haryana Resident & Migratory Birds	7
IV	Birds as bio-indicators Birds in food chain and Agriculture Bird Migration	7
V Practical	1. Instruments in Bird watching 2. Identification of Birds 3. Sexual Dimorphism studies in Birds 4. Field visits to local Bird areas	30

Suggested Evaluation Methods

InternalAssessment:	**End Term Examination:**
➢ **Theory**	➢ **Theory**

• Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: 4 • Mid-Term Exam: 7 ➢ **Practicum** • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 5 • Mid-Term Exam: NA	• Written Examination: 35 ➢ **Practicum** ➢ Practical Examination: 20

Learning Resources

1. Birds of Indian subcontinent by Richard Grimmett, Inskipp.
2. Birds of Haryana. A field guide by Kalsi and Coworkers
3. Birds of Basai Wetlands Haryana by Deepak Rai and Coworkers.
4. Birding basics: Tips, tools and techniques for great bird watching by Noah Stryckar.

SEC-SKILL ENHANCEMENT COURSE								
Course Type	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
SEC-2	**B23-SEC-223**	**Taxidermy**	**2**	**2**	**15**	**35**	**50**	**3 hrs.**
		Practical	**1**	**2**	**5**	**20**	**25**	**4 hrs.**

Level of the course: NA

Pre-requisite for the course (ifany): NA

Course Learning Outcomes (CLO):

1. Students will be able to learn about the materiality of the taxidermy animal within the museum context
2. Learners will be able to develop a knowledge and understanding of how to sustain a line of enquiry in a series of related art works
3. This Practice will be effective in the uses of a range drawing and in development studies which consider a creative response to the taxidermy animal.
4. Learners will be able for editing of visual ideas derived from research and study of the taxidermy animal.
5. Students will get practical exposure of Taxidermy procedure

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	General introduction to Taxidermy; Past and present scenario of Taxidermy; Types of Taxidermy for different animals; Applications of taxidermy	8
II	Layout of Taxidermy- Techniques and Materials used for Skinning, Cleaning and Preservation of dead animals; Keeping the record of dead animal- age, sex, infestation of pests	8
III	Methods of Taxidermy in Fishes, Snakes and Birds; Instruments used in Taxidermy; Maceration; Chemical treatments and procedure of Tanning	7
IV	Economic importance of Taxidermy; Role of Taxidermy in conservation and education; Factors affecting Taxidermy; Ethical issues; Pros and cons of Taxidermy	7
V Practical	1. Visit to the museum; 2. Identification of animals in Museum; 3. Prepare small models of animals; 4. To study the best and easiest method of Taxidermy of Birds; 5. Procedure of Taxidermy in mammals; Enlist the different types of chemicals used for Taxidermy; 6. Enlist the different types of instruments used for taxidermy	30

Suggested Evaluation Methods	
InternalAssessment: ➢ **Theory** • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: 4 • Mid-Term Exam: 7 ➢ **Practicum** • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 5 • Mid-Term Exam: NA	**End Term Examination:** ➢ **Theory** • Written Examination: 35 ➢ **Practicum** ➢ Practical Examination: 20

Learning Resources

1. Taxidermy by Alexis Turner. Rizzoli.
2. Taxidermy by Leon Pray.
3. Barber's Manual : A text book on taxidermy by T.J. McConnaughay
4. Home Book of taxidermy and tanning by Gerold . J Grantz. Stackpole Books, 1985.

SEC-SKILL ENHANCEMENT COURSE

Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
SEC-2	B23-SEC-224	Camera Trapping in Wildlife Studies	2	2	15	35	50	3 hrs.
		Practical	1	2	5	20	25	4 hrs.

Level of the course: NA

Pre-requisite for the course (ifany): NA

Course Learning Outcomes (CLO):

1. Students will be able to learn about the theory of camera trap
2. Learners will be able to learn about installation of camera trap
3. This Practice will be effective for students for collection of data with camera trap
4. Learners will be able theory of camera trap field operations
5. Students will get practical exposure of camera trap

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACTHOURS
I	Camera trap, Theory and practice Various modes and settings of Camera trap.	8
II	Installation of Camera Trap. How to operate it in field	8
III	Collection of data through camera trap. What the collected data can tells us., Information retrieval	7
IV	Use of Camera Trap in wildlife studies. Field studies for hands on experience on camera trap	7
V Practical	Practical Knowledge of camera trap Practical working of camera trap Extraction of field data from camera trap	30

Suggested Evaluation Methods

InternalAssessment:

- **Theory**
  - Class Participation: 4
  - Seminar/presentation/assignment/quiz/class test etc.: 4
  - Mid-Term Exam: 7
- **Practicum**
  - Class Participation: NA
  - Seminar/Demonstration/Viva-voce/Lab records etc.: 5
  - Mid-Term Exam: NA

End Term Examination:

- **Theory**
  - Written Examination: 35
- **Practicum**
  - Practical Examination: 20

Learning Resources

1. Camera trapping for wildlife research by Frensco Rovero and Fridolin Zimmerman

2. Camera traps in animal ecology. Methods and Analyses by Allan F.O. Channel, James D. Nichols
3. Camera trapping Guide. Tracks, signandbehaviour of eastern wild life by Janet Pesaturo.

SEC-SKILL ENHANCEMENT COURSE								
Course Type	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
SEC-3	**B23-SEC-321**	**Microtomy**	**2**	**2**	**15**	**35**	**50**	**3 hrs.**
		Practical	**1**	**2**	**5**	**20**	**25**	**4 hrs.**

Level of the course: NA

Pre-requisite for the course (ifany): NA

Course Learning Outcomes (CLO):

1. Students will have thorough understanding of modern development in microtomy.
2. Learners will be able to process animal samples for permanent slide preparation.
3. Gain knowledge regarding various biological stains.
4. Localize histochemical of proteins, lipids and nucleic acids.
5. Students will get practical exposure of Microtomy

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACTHOURS
I	Microtomy:- Introduction, definition, History and Applications in Biological sciences; Types of microtomes- Rotary microtome, Sledge Microtome and Cryomicrotome	8
II	Collection and transportation of sample/specimens for histological examination; Basic concepts of fixation- Various types of fixatives used in microtomy; Process of fixation; Embedding-Block formation	8
III	Section Cutting: Paraffin section cutting ; Streching- Spreading the sections and attachment to the glass slides; Staining – Principle and procedure; Preparation of Stains and solvents	7
IV	General Staining Procedures for Paraffin Embedded tissue; Nuclear Stains and Cytoplasmic stains- Haematoxylin and Eosin staining, Mercury Bromophenol Blue staining; Toulidine Blue; Commonly used mountants in microtomy.	7
V Practical	1. Collection and labeling of histological samples/specimens 2. To demonstrate various part and types of microtome 3. Preparation of various fixatives- Bouin's fluid, Corney's fluid; 10% Neutral formalin,Normal saline 4. Processing of tissue by manual method 5. To perform embedding and casting of block, section cutting, stretching	30

	6. To perform & practice the Haematoxylin and Eosin staining, Mercury Bromophenol Blue staining; Toulidine Blue Staining 7. Study the permanent slides of different tissues	

Suggested Evaluation Methods

InternalAssessment:	**End Term Examination:**
➢ **Theory** • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: 4 • Mid-Term Exam: 7 ➢ **Practicum** • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 5 • Mid-Term Exam: NA	➢ **Theory** • Written Examination: 35 ➢ **Practicum** ➢ Practical Examination: 20

Learning Resources

1. Principles and interpretation of laboratory practices in surgical pathology by S. S.and Kaler Amrit Kaur
2. Practical approach to histopathology staining and microtomy by Prof. Punit Puri
3. Histopathology Techniques and it's management by Ramdas Nayak.
4. Troubleshooting histopathology stains by Richard.W. Horobin and John D. Baneroft.

VOC-VOCATIONAL COURSE								
Course Type	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
VOC-1	B23-VOC-102	Apiculture	2	2	15	35	50	3 hrs.
		Practical	2	4	15	35	50	4 hrs.

Level of the course: NA

Pre-requisite for the course (ifany): NA

Course Learning Outcomes (CLO):

1. Students will be able to understand the significance of honey bees and Apiculture
2. Students will acquire knowledge about different species and castes of the honey bees
3. Students will learn to manage beehives for honey production and pollination, and Learn various product of honey bees and value addition in these products,
4. Students will be aware about economic importance of honey bees, and use of Apiculture for employment, self employment and conservation of nature
5. Students will gain practical knowledge about various methods of bee keeping and extraction of honey thus create scope for entrepreneurship.

Instructions for Paper-Setter

3. Nine questions will be set in all. All questions will carry equal marks.
4. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	Apiculture meaning, definition scope and history Status of Apiculture Industry in India Classification and Life Cycle of Honey Bee. Identification of Indigenous and exotic Honey bee species	8
II	Cultivable species of Honey Bee with reference to India Social organization of honey bees:the castes- queen, drone and workers, Nesting behavior of Honey bees,Bee foraging, Seasonal management, swarming in Honey bees, waggle dance, defense in honey bees Diseases and Enemies. of Bees ,Control and Preventive measures.	8
III	Role of Bees in cross pollination in horticulture and agriculture Methods of Artificial Bee keeping Equipments used in Bee keeping Industry Methods of extraction of Honey and other products	7
IV	Products of Apiculture Industry and their Uses (Honey, Bee Wax, Royal Jelly, Bee Venom, Propolis and Pollen) Bee Keeping Industry: Present and future Prospects of apiculture as self employment venture. Economics of Apiculture: Expenditure, Net Income, and Additional benefits	7
V Practical	**Practical Exercises on** 1. Identification of different bee species 2. Training of Bee keeping in Artificial boxes 3. Demonstration of Modern Bee Keeping Equipment and Methods. 4. Training of methods of Extraction of Honey (Indigenous and Modern) 5. Field visit to Honey Bee farm/Unit	60

	6. Report of field visit	

Suggested Evaluation Methods

InternalAssessment:	**End Term Examination:**
➢ **Theory** • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: 4 • Mid-Term Exam: 7 ➢ **Practicum** • Class Participation: 5 • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	➢ **Theory** • Written Examination: 35 ➢ **Practicum** ➢ Practical Examination: 35

Learning Resources

- Prost, P. J. (1962). Apiculture. Oxford and IBH, New Delhi.
- Bisht, D.S. (2004). Agricultural Development in India, Anmol Pub. Pvt. Ltd.
- Singh S. (1964). Beekeeping in India, Indian council of Agricultural Research, NewDelhi
- Mehrotra, K.N. Bisht, D.S. (1981). Twenty-five years of apiculture research at IARI. I. Apiculture in relation to agriculture.
- The Social Behaviour of the Bees, 1974 : By Missioner C.D
- The Social Behaviour of the Bees, A Comparative Study 1974, C.D.Mathener, Harvard University Press, Cambridge, England.
- Bees and Mankind 1982, J.B.Free, George Allen & Unwin (Pub.), Limited London, UK. 25. Biogeography and Taxonomy of Honeybees 1985, F.Ruttnar, Springer-Verlag, Berlin, Jermany.

VOC-VOCATIONAL COURSE								
Course Type	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
VOC-2	**B23-VOC-202**	**Vermicomposting**	**2**	**2**	**15**	**35**	**50**	**3 hrs.**
		Practical	**2**	**4**	**15**	**35**	**50**	**4 hrs.**

Level of the course: NA

Pre-requisite for the course (ifany): NA

Course Learning Outcomes (CLO):

1. Student will get the knowledge of composting
2. The student will get the knowledge of biodiversity of local earthworms
3. The student can generate income by supplying worms, vermiwash and vermicompost.
4. It leads towards organic farming and healthy food.
5. Student will be trained to identify Earthworms and their use in small vermicompost bin for converting the home waste.

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	Vermiculture: Introduction, definition, history, general characters of Annelida, systematic position of earthworm, habits and habitat of earthworm, diversity of earthworms, collection of earthworms, preservation of earthworms.	8
II	Vermitechnology: Role of earthworm in maintance of soil structure and their role as recycling, reduce, reuse, restore (4r's), choosing right species of earthworm.	8
III	Earthworm biology and rearing: Key to identify the species of earthworm, life cycle of *Eisenia fetida*, *Lampitomauritii* and their role on ecology, an eco-friendly approach to sustainable agriculture	7
IV	Vermicomposting (methods and products): Preparation of vermibed, small scale earthworm farming for home garden, large scale commercial composting, properties of vermicompost and vermiwash, application on crop plants economic development and self-employment.	7
V Practical	**Practical** 1. Key to identify different types of earthworms. 2. Collection of some native earthworms and identification. 3. Study of systematic position, habits, habitat and external feature of earthworm 4. Study of life stages of *Eliseniafetida*, *Eudriluseugeniae*, *Lampitomauritii* 5. Preparation of vermibeds, maintance of vermicompost and climatic	60

	conditions. 6. Field visit of Vermicomposting unit. 7. Report of field visit.	

Suggested Evaluation Methods

InternalAssessment:	End Term Examination:
➢ **Theory** • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: 4 • Mid-Term Exam: 7 ➢ **Practicum** • Class Participation: 5 • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	➢ **Theory** • Written Examination: 35 ➢ **Practicum** ➢ Practical Examination: 35

Learning Resources

1. Dash, M. C. (2012). Charles Darwin's Plough Tool for Vermitechnology. I.K. International Publishing House Pvt Ltd. New Delhi, India.
2. Tripathi, G (2003). Vermiresources Technology Discovery Publishing House, New Delhi.
3. Rajnesh Kumar Sharma and Poonam Bhardwaj (2018). Green Farming- Earthworms and Vermitechnology. RAR Publication, New Delhi.

VOC-VOCATIONAL COURSE								
Course Type	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
VOC-2	B23-VOC-223	**DNA Fingerprinting**	2	2	15	35	50	3 hrs.
		Practical	2	4	15	35	50	4 hrs.

Level of the course: NA

Pre-requisite for the course (ifany): NA

Course Learning Outcomes (CLO):

1. The students will get the knowledge of basic structure of DNA molecules
2. The students will understand of various DNA typing methods.
3. The students will get knowledge of performing DNA profiling of any biological samples aiming at investigations.
4. The students will get the application of DNA profiling.
5. Students will be able to learn practical exposure of DNA fingerprinting

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	DNA Profiling: Introduction, History of DNA Typing, human genetics – heredity, alleles, mutations, molecular biology of DNA and RNA, DNA types.	8
II	DNA Polymorphism: VNTR, STR, SNP, Mt DNA, DNA Markers, sequence polymorphism. DNA typing systems- RELP analysis, PCR amplifications.	8
III	DNA profiling methods: Sample collection and preservation for DNA profiling, DNA Extraction Analysis of SNP, STR, Y-STR. Mitochondrial DNA, evaluation of results, database, quality control, certification and accreditation.	7
IV	Forensic applications of DNA Profiling: Applications in disputed paternity cases, child swapping, missing person's identity – civil immigrations, veterinary, wildlife and agriculture cases, legal perspectives – legal standards for admissibility of DNA profiling. New and future technologies: DNA chips, Rapid DNA analyser, imitations of DNA profiling.	7
V Practical	Practical based on Sample extraction, DNA Isolation and DNA profiling 1. To extract DNA from biological samples. 2. Quantification of DNA. 3. Report Writing: Role of DNA typing in identifying.	60

	4. Blood grouping from fresh and dried blood. 5. Quality Assurance of DNA 6. Project Report	

Suggested Evaluation Methods

InternalAssessment:	**End Term Examination:**
➢ **Theory** • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: 4 • Mid-Term Exam: 7 ➢ **Practicum** • Class Participation: 5 • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	➢ **Theory** • Written Examination: 35 ➢ **Practicum** ➢ Practical Examination: 35

Learning Resources

1. J.M. Butler, Forensic DNA Typing, Elsevier, Burlington (2005).
2. K. Inman and N. Rudin, An Introduction to Forensic DNA Analysis, CRC Press, Boca Raton (1997).
3. H. Coleman and E. Swenson, DNA in the Courtroom: A Trial Watcher's Guide, GeneLex Corporation, Washington (1994).
4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).

VOC-VOCATIONAL COURSE								
Course Type	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
VOC-3	**B23-VOC-302**	**Poultry Farming**	**2**	**2**	**15**	**35**	**50**	**3 hrs.**
		Practical	**2**	**4**	**15**	**35**	**50**	**4 hrs.**

Level of the course: NA

Pre-requisite for the course (ifany): NA

Course Learning Outcomes (CLO):

1. Understand the field level structure and functioning of Poultry Farming
2. This course will enlighten the students about the operation of livestock and poultry farming.
3. It will develop the knowledge of poultry in an operational farm for more profit management, feed requirements etc.
4. Learning of poultry farming will generate a source of employment opportunities in rural areas and employment to the farmers.
5. Will gain all round knowledge of Poultry Farming as a business enterprise rather than as a community profession

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	General introduction to poultry farming -Definition of Poultry Past and present scenario of poultry industry in India. Breeds, Varieties and Strains, Life cycle of poultry birds	8
II	Poultry feed management – Principles of feeding Nutrient requirements for different stages of layers and broilers. Feed formulation Methods of feeding.	8
III	Layer Industry in India Systems of layer farming – Location & Lay out of the farm Systems of housing –Types of roof, materials, pillars, trusses for poultry house Management of layers in different systems of rearing.	7
IV	Poultry diseases – viral, bacterial, fungal and parasitic (two each); symptoms, control and management. Vaccination programme Cleaning, Disinfection and Fumigation of Poultry Houses	7
V	**Following Practical Exercises shall be taught**	60

Practical	1. Identification of External Body Parts of a Bird 2. Identification of Chicken Breeds 3. General View of Poultry Farm 4. Rearing, Feeding and Watering of Chicks, Growers and Layers 5. Debeaking, Delicing, Deworming and Spraying 6. Candling and Grading of Eggs 7. Field visit of Poultry farm 8. Report of field visit	

Suggested Evaluation Methods

InternalAssessment:	**End Term Examination:**
➢ **Theory** • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: 4 • Mid-Term Exam: 7 ➢ **Practicum** • Class Participation: 5 • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	➢ **Theory** • Written Examination: 35 ➢ **Practicum** ➢ Practical Examination: 35

Learning Resources

1. Das D, Das B C, Nayak N, Jena B, Sahu A R 2021,"TextBook on Poultry Management" Narendra Publishing House
2. Ghosh N 2015,"Poultry Science And Practice: A Textbook" CBS Publishers & Distributors
3. Prasad Rajeshwar (2010): Poultry Management Alfa Publications.
4. Singh R A 2009," Poultry Production" Kalyani Publishers
5. Shukla, G. S. and Upadhyay, V. B. (2011): Economic Zoology. Rastogi Publications.

VOC-VOCATIONAL COURSE

Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
VOC-3	B23-VOC-318	Fish Farming	2	2	15	35	50	3 hrs.
		Practical	2	4	15	35	50	4 hrs.

Level of the course: NA

Pre-requisite for the course (ifany): NA

Course Learning Outcomes (CLO):

1. Create awareness about food security, significance of protein in diet and will learn the skills to develop business enterprise
2. Students will learn about various methods and significance of fish farming
3. Student/s will learn identification of fish species using classical morphological methods
4. Students will get acquainted about bye products of fish farming industry and fish health
5. Students will develop capability of identifying different species of fishes and will be trained for analysis of water quality and fish culture in ponds

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	General introduction -Definition of Fish, Fisheries, Aquaculture and Pisciculture Significance of fish farming. Production, Utilization and Demand of Fish in India General description of Capture and Culture Fisheries	8
II	Culture fisheries and its types Criteria for the selection of fish species for farming Important culturable Fishes in India and Identification of commercially important fish species Basics of induced breeding in fishes	8
III	Pond fish culture : Types, Design and construction of fish farming ponds Maintenance of fish culture ponds Ecology of Fish pond ecosystem: Water quality(Physico-chemical and Biological) and Soil quality Weeds of fish farming ponds and their control	7
IV	Nutrition of cultured fishes: Natural, supplementary and artificial feed, Nutrient composition and common dietary ingedients	7

	By products of fish farming Industry Methods of Fish harvesting and marketing Common fish diseases and their control	
V Practical	**Practical Exercises on** 1. Identification of important fishes 2. Identification of developmental stages of fishes 3. Analysis of physical and chemical properties of water: (Temperature, pH, turbidity, salinity, total solids, Dissolved oxygen, Free carbon-di-oxide, hardness, chlorides) 4. Study of aquatic weeds 5. Study of crafts and gears 6. Visit to fish farm and/or fish market and preparation of report	**60**

Suggested Evaluation Methods

InternalAssessment:	**End Term Examination:**
➢ **Theory** • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: 4 • Mid-Term Exam: 7 ➢ **Practicum** • Class Participation: 5 • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	➢ **Theory** • Written Examination: 35 ➢ **Practicum** ➢ Practical Examination: 35

Learning Resources

1. APHA (1995) Standard Methods of Examination of Water and Wastewater. American Public Health Association, AWWA, WCPF, Washington DC.

2. Bardach, JE, Ryther & McLarney, Wo (1972) Aquaculture, New York: Wiley-Interscience. 896pp

3. Gupta S.K. and Gupta P.C. (2006) General & Applied Ichthyology: Fish and Fisheries. S Chand Publications. New Delhi

4. Jhingran, VG (1983) Fish and Fisheries of India. Hindustan Publishing Corporation (India) 954 pp

5. Khanna, S.S. and Singh, H.R. (2014). Text book of Fish Biology and Fisheries 3rd edn (PB) Narendra Publishing House, India