Dr. B. R. AMBEDKAR UNIVERSITY-SRIKAKULAM

B.Sc. ZOOLOGY

STRUCTURE UNDER CHOICE BASED CREDITS SYSTEM
REVIEWED SYLLUBUS w.e.f. 2016-17

Structure of Syllabus

YEAR	SEMESTER	PAPER	TITLE	MARKS	CREDITS
I	I	I	Biology of Non-chordates	100	03
			Practical - I	50	02
	II	II	Biology of Chordates	100	03
			Practical - II	50	02

BSc ZOOLOGY SYLLABUS FOR
I SEMESTER
ZOOLOGY - PAPER - I

ANIMAL DIVERSITY - NONCHORDATES

Max. Marks: 100

Periods: 60

1.1 Brief history, Significance of Diversity of Non Chordates

1.2 Protozoa

1.2.1 General characters

1.2.2 Classification of Protozoa up to classes with examples

1.2.3 *Elphidium* (type study)

1.3 Porifera

1.3.1 General characters

1.3.2 Classification of Porifera up to classes with examples

1.3.3 *Sycon* – External Characters, Types of cells,

1.3.4 Skelton in Sponges

1.3.5 Canal system in sponges

Unit - II

2.1 Coelenterata

2.1.1 General characters

2.1.2 Classification of Coelenterata up to classes with examples

2.1.3 *Obelia* - External Characters, Structure of Polyp and Medusa

2.1.4 Polymorphism in coelenterates

2.1.5 Corals and coral reef formation

2.2 Platyhelminthes

2.1.1 General characters

2.1.2 Classification of Platyhelminthes upto classes with examples

2.1.3 *Fasciola hepatica* - External Characters, Excretory system, Reproductive System,

Life History and pathogenicity

Unit - III

3.1 Nemathelminthes

3.1.1 General characters

3.1.2 Classification of Nemathelminthes up to classes with examples

3.2 Annelida

3.2.1 General characters

3.2.2 Classification of Annelida up to classes with examples

3.2.3 *Hirudinaria granulosa* - External Characters, Digestive System, Excretory System

and Reproductive System

3.2.4 Coelomoducts

ZOOLOGY PRACTICAL SYLLABUS FOR
I SEMESTER
ZOOLOGY - PAPER - I
ANIMAL DIVERSITY - NONCHORDATES

Periods: 24 **Max. Marks: 50**

Observation of the following slides / spotters / models

Protozoa	:	*Elphidium, Paramecium* - Binary fission and conjugation
Porifera	:	*Spoonbill, Euspongia, Sycon, Sycon* - T.S and L.S
Coelenterata	:	*Obelia* - colony and medusa, *Physalia, Velella, Corallium, Gorgonia, Pennatula*
Platyhelminthes	:	*Planaria, Fasciola hepatica, Fasciola* larval forms - Miracidium, Redia, Cercaria, *Echinococcus granulosus*
Nemathelminthes	:	*Ascaris* - Male and female, *Ancylostoma duodenale*
Annelida	:	*Neries, Heteroneries, Aphrodite, Hirudo,* Trochophore larva
Arthropoda	:	Mouth parts of male and female *Anopheles* and *Culex,* Mouth parts of housefly, Mouth parts of Scorpion, Nauplius, Mysis, Zoea larvae, crab, prawn, *Scolopendra, Sacculina, Limulus, Peripatus*
Mollusca	:	*Chiton, Murex, Sepia, Loligo, Octopus, Nautilus,* Glochidium larva
Echinodermata	:	*Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon, Asterias,* Bipinnaria larva
Hemichordata	:	*Balanoglossus,* Tornaria larva

Demonstration of dissection / dissected / virtual dissection :

1. Leech / Prawn / Scorpion / Crab - Digestive system
2. Prawn - Appendages
3. Prawn / Scorpion / Crab - Nervous system
4. *Pila / Unio* - Digestive system
5. Mounting of Statocyst
6. Mounting of Radula

b **Laboratory record work shall be submitted at the time of practical examination**

b **Compulsory one species to be adopted for demonstration only by the faculty**

b **Computer aided techniques should be adopted as per UGC guide lines**

3.2.5 Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost

Unit - IV

4.1 Arthropoda

4.1.1 General characters

4.1.2 Classification of Arthropoda up to classes with examples

4.1.3 Prawn - External Characters, Appendages, Respiratory system and Circulatory System

4.1.4 *Peripatus* - Structure and affinities

4.2 Mollusca

4.2.1 General characters

4.2.2 Classification of Mollusca up to classes with examples

4.2.3 Pearl formation in Pelecypoda

4.2.4 Torsion in gastropods

Unit - V

5.1 Echinodermata

5.1.1 General characters

5.1.2 Classification of Echinodermata up to classes with examples

5.1.3 Water vascular system in star fish

5.2 Hemichordata

5.2.1 General characters

5.2.2 Classification of Hemichordata up to classes with examples

5.2.3 *Balanoglossus* - Structure and affinities

5.3 Non-Chordata larval forms

5.3.1 Amphiblastula

5.3.2 Ephyra

5.3.3 Trochophore

5.3.4 Nauplius

5.3.5 Glochidium

5.3.6 Bipinnaria

5.3.7 Tornaria

Unit - IV

4.1 Aves

4.1.1 General characters of Aves

4.1.2 Classification of Aves upto subclasses with examples.

4.1.3 *Columba livia* - External features, Digestive system, Respiratory system, Heart, Brain

4.1.4 Migration in Birds

4.1.5 Flight adaptation in birds

Unit - V

5.1 Mammalia

5.1.1 General characters of Mammalia

5.1.2 Classification of Mammalia upto sub - classes with examples

5.2 Comparision of Prototherians, Metatherians and Eutherians

5.3 Dentition in mammals

ZOOLOGY SYLLABUS FOR
II SEMESTER
ZOOLOGY - PAPER - II

ANIMAL DIVERSITY - CHORDATES

Periods: 60 **Max. Marks: 100**

Unit - I

1.1 General characters of Chordata

1.2 Prochordata

1.2.1 Salient features of Cephalochordata

1.2.2 Structure of *Branchiostoma*

1.2.3 Affinities of Cephalochordata

1.2.4 Salient features of Urochordata

1.2.5 Structure and life history of *Herdmania*

1.2.6 Significance of Retrogressive metamorphosis

Unit - II

2.1 Cyclostomata

2.1.1 General characters of Cyclostomata

2.1.2 Comparision of the *Petromyzon* and *Myxine*

2.2 Pisces

2.2.1 General characters of Fishes

2.2.2 Classification of fishes up to sub - class level with examples

2.2.3 *Scoliodon* - External features, Digestive system, Respiratory system, Heart, Brain

2.2.4 Migration in Fishes

2.2.5 Types of Scales

2.2.6 Dipnoi

Unit - III

3.1 Amphibia

3.1.1 General characters of Amphibian

3.1.2 Classification of Amphibia upto orders with examples.

3.1.3 *Rana hexadactyla* - External features, Digestive system, Respiratory system, Heart, Brain

3.2 Reptilia

3.2.1 General characters of Reptilia

3.2.2 Classification of Reptilia upto orders with examples

3.2.3 Calotes - External features, Digestive system, Respiratory system, Heart, Brain

3.2.4 Identification of Poisonous snakes and Skull in reptiles

Dr. B. R. AMBEDKAR UNIVERSITY-SRIKAKULAM

B.Sc. ZOOLOGY

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BSc ZOOLOGY SYLLABUS FOR
I SEMESTER
ZOOLOGY - PAPER - I

ANIMAL DIVERSITY - NONCHORDATES

Periods: 60 **Max. Marks: 100**

1.1 Brief history, Significance of Diversity of Non Chordates

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1.2.1 General characters

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1.3.1 General characters

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1.3.3 *Sycon* – External Characters, Types of cells,

1.3.4 Skelton in Sponges

1.3.5 Canal system in sponges

Unit - II

2.1 Coelenterata

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2.1.3 *Obelia* - External Characters, Structure of Polyp and Medusa

2.1.4 Polymorphism in coelenterates

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2.1.1 General characters

2.1.2 Classification of Platyhelminthes upto classes with examples

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Life History and pathogenicity

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3.2.1 General characters

3.2.2 Classification of Annelida up to classes with examples

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and Reproductive System

3.2.4 Coelomoducts

3.2.5 Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost

Unit - IV

4.1 Arthropoda

4.1.1 General characters

4.1.2 Classification of Arthropoda up to classes with examples

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4.1.4 *Peripatus* - Structure and affinities

4.2 Mollusca

4.2.1 General characters

4.2.2 Classification of Mollusca up to classes with examples

4.2.3 Pearl formation in Pelecypoda

4.2.4 Torsion in gastropods

Unit - V

5.1 Echinodermata

5.1.1 General characters

5.1.2 Classification of Echinodermata up to classes with examples

5.1.3 Water vascular system in star fish

5.2 Hemichordata

5.2.1 General characters

5.2.2 Classification of Hemichordata up to classes with examples

5.2.3 *Balanoglossus* - Structure and affinities

5.3 Non-Chordata larval forms

5.3.1 Amphiblastula

5.3.2 Ephyra

5.3.3 Trochophore

5.3.4 Nauplius

5.3.5 Glochidium

5.3.6 Bipinnaria

5.3.7 Tornaria

ZOOLOGY PRACTICAL SYLLABUS FOR
I SEMESTER
ZOOLOGY - PAPER - I
ANIMAL DIVERSITY - NONCHORDATES

Periods: 24 **Max. Marks: 50**

Observation of the following slides / spotters / models

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Porifera	:	*Spoonbill, Euspongia, Sycon, Sycon* - T.S and L.S
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Echinodermata	:	*Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon, Asterias,* Bipinnaria larva
Hemichordata	:	*Balanoglossus,* Tornaria larva

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5. Mounting of Statocyst
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ZOOLOGY SYLLABUS FOR
II SEMESTER
ZOOLOGY - PAPER - II

ANIMAL DIVERSITY - CHORDATES

Periods: 60 **Max. Marks: 100**

Unit - I

1.1 General characters of Chordata

1.2 Prochordata

1.2.1 Salient features of Cephalochordata
1.2.2 Structure of *Branchiostoma*
1.2.3 Affinities of Cephalochordata
1.2.4 Salient features of Urochordata
1.2.5 Structure and life history of *Herdmania*
1.2.6 Significance of Retrogressive metamorphosis

Unit - II

2.1 Cyclostomata

2.1.1 General characters of Cyclostomata
2.1.2 Comparision of the *Petromyzon* and *Myxine*

2.2 Pisces

2.2.1 General characters of Fishes
2.2.2 Classification of fishes up to sub - class level with examples
2.2.3 *Scoliodon* - External features, Digestive system, Respiratory system, Heart, Brain
2.2.4 Migration in Fishes
2.2.5 Types of Scales
2.2.6 Dipnoi

Unit - III

3.1 Amphibia

3.1.1 General characters of Amphibian
3.1.2 Classification of Amphibia upto orders with examples.
3.1.3 *Rana hexadactyla* - External features, Digestive system, Respiratory system, Heart, Brain

3.2 Reptilia

3.2.1 General characters of Reptilia
3.2.2 Classification of Reptilia upto orders with examples
3.2.3 Calotes - External features, Digestive system, Respiratory system, Heart, Brain
3.2.4 Identification of Poisonous snakes and Skull in reptiles

Unit - IV

4.1 Aves

4.1.1 General characters of Aves

4.1.2 Classification of Aves upto subclasses with examples.

4.1.3 *Columba livia* - External features, Digestive system, Respiratory system, Heart, Brain

4.1.4 Migration in Birds

4.1.5 Flight adaptation in birds

Unit - V

5.1 Mammalia

5.1.1 General characters of Mammalia

5.1.2 Classification of Mammalia upto sub - classes with examples

5.2 Comparision of Prototherians, Metatherians and Eutherians

5.3 Dentition in mammals

ZOOLOGY PRACTICAL SYLLABUS FOR
II SEMESTER
ZOOLOGY - PAPER - II

ANIMAL DIVERSITY - CHORDATES

Periods: 24 **Max. Marks: 50**

Observation of the following slides / spotters / models

Protochordata	:	*Herdmania, Amphioxus, Amphioxus* T.S. through pharynx
Cyclostomata	:	*Petromyzon, Myxine*
Pisces	:	*Pristis, Torpedo, Channapleuronectes, Hippocampus, Exocoetus, Eheneis, Labeo, Catla, Clarius, Auguilla, Protopterus*
		Placoid scale, Cycloid scale, Ctenoid scale
Amphibia	:	*Ichthyophis, Amblystoma, Siren, Hyla, Rachophous*
		Axolotl larva
Reptilia	:	*Draco, Chemaeleon, Uromastix, Vipera russeli, Naja, Bungarus, Enhydrina, Testudo, Trionyx, Crocodilus*
Aves	:	*Passer, Psittacula, Bubo, Alcedo, Columba, Corvus, Pavo,* Study of different types of feathers : Quill, Contour, Filoplume down
Mammalia	:	*Ornithorthynchus, Tachyglossus, Pteropus, Funambulus, Manis, Loris,* Hedgehog
Osteology	:	Appendicular skeletons of Varanus, Pigeon
		Rabbit - Skull, fore limbs, hind limbs and girdles

Demonstration of dissection / dissected / virtual dissection:

1. V, VII, IX, X cranial nerves of shark / locally available fishes
2. Arterial system, venous system of Shark / Calotes / Fowl / Rat
3. Digestive system of fish

b **Laboratory record work shall be submitted at the time of practical examination**

b **Compulsory one species to be adopted for demonstration only be the faculty**

Revised Common Framework of CBCS for Colleges in Andhra Pradesh

w.e.f. 2015-16, Revised in April, 2016

Table-I: B.Sc., SEMESTER – I

Sno	Course	Total Marks	Mid Sem Exam*	Sem End Exam	Teaching Hours	Credits
1	First Language (Tel/Hin/Urdu/Sans...)	100	25	75	4	3
2	Second Language English	100	25	75	4	3
3	*Foundation Course - 1* Human Values & Professional Ethics	50	0	50	2	2
4	*Foundation course -2* Environmental Studies	50	0	50	2	2
5	DSC-1 Paper-1 (Core)	100	25	75	4	3
6	DSC 1 Lab Practical	50	0	50	2	2
7	DSC 2 Paper-1 (Core)	100	25	75	4	3
8	DSC 2 Lab Practical	50	0	50	2	2
9	DSC 3 Paper-1 (Core)	100	25	75	4	3
10	DSC 3 A Lab Practical	50	0	50	2	2
	Total	750	-	-	30	25

#DSC: Domain (Subject) Specific Course (Paper)
Foundation Course: value or skill based
Note: For Science Domain Subjects which had no lab practical component earlier (eg. Mathematics) the following format is applicable. They, however, will have co-curricular activities (eg. Problem solving sessions etc.). The total marks will change accordingly for such combinations. For example for Maths, Physics and Chemistry the total marks will be 700.

	DSC (without Lab Practical)	100	25	75	6	5

*Mid sem exam at the college (The marks split between Formal Test and Co-curricular activities may be decided by the University concerned). End Sem Exam by the Univ.
*Practical component will not be applicable to those science subjects which had no such component earlier (ex. Mathematics)
**Syllabus size shall be in accordance with the number of teaching hours

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B.Sc. ZOOLOGY

STRUCTURE UNDER CHOICE BASED CREDITS SYSTEM
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Structure of Syllabus

YEAR	SEMESTER	PAPER	TITLE	MARKS	CREDITS
II	III	III	Cell biology, Genetics and Evolution	100	03
			Practical - III	50	02
	IV	IV	Embryology, Physiology and Ecology	100	03
			Practical - IV	50	02

ZOOLOGY SYLLABUS FOR
III SEMESTER
ZOOLOGY - PAPER - III

CYTOLOGY, GENETICS AND EVOLUTION

Periods: 60 **Max. Marks: 100**

Unit - I

1. Cytology - I

1.1 Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma

1.2 Electron microscopic structure of eukaryotic cell.

1.3 Plasma membrane – Different models of plasma membrane.

Unit – II

2. Cell organelles

2.1 Structure and functions of Endoplasmic Reticulum

2.2 Structure and functions of Golgi apparatus

2.3 Structure and functions of Lysosomes

2.4 Structure and functions of Ribosomes

2.5 Structure and functions of Mitochondria

2.6 Nucleus

2.7. Chromatin - Structure and significance, Chromosomes - Structure, types, functions

Unit - III

3.1 Genetics - I

3.1.1 Mendel's work on transmission on traits

3.1.2 Principles of inheritance

3.1.3 Incomplete dominance and codominance

3.1.4 Lethal alleles, Epistasis, Pleiotropy

Unit - IV

4.1 Genetics - II

4.1.1 Sex determination

4.1.2 Sex linked inheritance

4.1.3 Linkage and crossing over

4.1.4 Extra chromosomal inheritance

4.1.5 Human karyotyping

Unit - V

5.1 Evolution

5.1.1 Origin of life

5.1.2 Lamarckism, Darwinism, Neo – Darwinism, Hardy-Weinberg Equilibrium.

5.1.3 Variations, isolating mechanisms, natural selection

5.1.4 Types of natural selection (directional, stabilizing, disruptive)

5.1.5 Artificial selection and forces of evolution

5.1.6 Speciation (Allopatric and Sympatric)

5.1.7 Macro evolutionary principles (Example: Darwin's finches)

ZOOLOGY SYLLABUS FOR
IV SEMESTER
ZOOLOGY - PAPER - IV

EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY

Periods: 60 **Max. Marks: 100**

Unit - I

1.1 Developmental Biology and Embryology

1.1.1 Gametogenesis

1.1.2 Fertilization

1.1.3 Types of eggs

1.1.4 Types of cleavages

1.2 Development of Frog upto formation of primary germ layers

1.3 Formation and functions of Foetal membrane in chick embryo

1.4 Development, types and functions of Placenta in mammals

Unit - II

2.1 Physiology - I

2.1.1 Elementary study of process of digestion

2.1.2 Absorption of digested food

2.1.3 Respiration - Pulmonary ventilation, transport of oxygen and carbondioxide

2.1.4 Circulation - Structure and functioning of heart, Cardiac cycle

2.1.5 Excretion - Structure of nephron, urine formation, counter current mechanism

Unit - III

3.1 Physiology - II

3.1.1 Nerve impulse transmission - Resting membrane potential, origin and propagation of action potentials along myelinated and non-myelinated nerve fibers

3.1.2 Muscle contraction - Ultra structure of muscle fibre, molecular and chemical basis of muscle contraction

3.1.3 Endocrine glands - Structure, secretions and the functions (of hormones) of pituitary, thyroid, parathyroid, adrenal glands and pancreas

3.1.4 Hormonal control of reproduction in a mammal

Unit - IV

4.1 Ecology - I

4.1.1 Meaning and scope of Ecology

4.1.2 Important abiotic factors of Ecosystem - Temperature, light, water, oxygen and CO_2

4.1.3 Nutrient cycles - Nitrogen, carbon and phosphorus

4.1.4 Components of Ecosystem (Example: lake), food chains and food web, energy flow in ecosystem

Unit - V

5.1 Ecology - II

5.1.1 Habitat and ecological niche

5.1.2 Community interactions - Mutualism, commensalism, parasitism, competition, predation

5.1.3 Ecological succession

5.1.4 Population studies

5.2 Zoogeography

5.2.1 Zoogeographical regions

5.2.2 Study of physical and faunal peculiarities of Oriental, Australian and Ethiopian regions

ZOOLOGY PRACTICAL SYLLABUS FOR III SEMESTER

ZOOLOGY - PAPER - III

CYTOLOGY, GENETICS AND EVOLUTION

Periods: 24 **Max. Marks: 50**

I. Cytology

1. Preparation of temporary slides of Mitotic divisions with onion root tips
2. Observation of various stages of Mitosis and Meiosis with prepared slides
3. Mounting of salivary gland chromosomes of *Chiranomous*

II. Genetics

1. Study of Mendelian inheritance using suitable examples
2. Study of linkage recombination, gene mapping using the data
3. Study of human karyotypes

III. Evolution

1. Study of fossil evidences
2. Study of homology and analogy from suitable specimens and pictures
3. Phylogeny of horse with pictures
4. Darwin's finches (pictures)
5. Visit to natural history museum and submission of report

ZOOLOGY PRACTICAL SYLLABUS FOR
IV SEMESTER
ZOOLOGY - PAPER - IV

EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY

Periods: 24 **Max. Marks: 50**

I. Embryology

1. Study of T.S. of testis, ovary of a mammal
2. Study of different stages of cleavages (2, 4, 8 cell stages)
3. Study of chick embryos of 18 hours, 24 hours, 33 hours and 48 hours of incubation

II. Physiology

1. Qualitative tests for identification of carbohydrates, proteins and fats
2. Qualitative tests for identification of ammonia, urea and uric acid
3. Study of activity of salivary amylase under optimum conditions
4. Study of prepared slides of T.S. of duodenum, liver, lung, kidney, spinal cord, bone and cartilage

III. Ecology

1. Determination of pH of given sample
2. Estimation of dissolved oxygen of given sample
3. Estimation of total alkalinity of given sample
4. Estimation of salinity of given sample

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III B.Sc. (ZOOLOGY) SYLLABUS

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	II	II	Biology of Chordates	100	03
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II	III	III	Cell biology, Genetics and Evolution	100	03
			Practical - III	50	02
	IV	IV	Embryology, Physiology and Ecology	100	03
			Practical - IV	50	02
III	V	V	Animal Biotechnology	100	03
			Practical - V	50	02
		VI	Animal Husbandry	100	03
			Practical - VI	50	02
	*Any one Paper from A, B and C ** Any one cluster from I, II and III	VII (A)*	Immunology	100	03
			Practical - VII (A)	50	02
		VII (B)*	Cellular Metabolism and Molecular Biology	100	03
			Practical - VII (B)	50	02
		VII (C)*	Bioinformatics	100	03
			Practical - VII (C)	50	02
	VI	Cluster VIII-A**	**Cluster Electives –VIII-A : Medical Diagnostics**		
			1. Clinical Biochemistry	100	03
			2. Haematology	100	03
			3. Clinical Microbiology	100	03
			Practical – VIII: 1	50	02
			Practical – VIII: 2	50	02
			Project Work	50	02
		Cluster VIII-B**	**Cluster Electives –VIII-B : Aquaculture**		
			1. Principles of Aquaculture	100	03
			2. Aquaculture Management	100	03
			3. Postharvest Technology	100	03
			Practical – VIII: 1	50	02
			Practical – VIII: 2	50	02
			Project Work	50	02
		Cluster VIII-C**	**Cluster Electives – VIII-C : Sericulture**		
			1. Gen. Sericulture, Mulberry cultivation and Management	100	03
			2. Biology of Mulberry Silkworm and Silkworm rearing Technology	100	03
			3. Silk Technology, Silk	100	03

ZOOLOGY SYLLABUS FOR VI SEMESTER

ZOOLOGY –ELECTIVE PAPER: VII-(A)

IMMUNOLOGY

Periods: 60 **Max. Marks: 100**

Unit - I

1.1 Overview of Immune system

1.1.1 Introduction to basic concepts in Immunology

1.1.2 Innate and adaptive immunity

1.2 Cells and organs of Immune system

1.2.1 Cells of immune system

1.2.2 Organs of immune system

Unit - II

2.1 Antigens

2.1.1 Basic properties of antigens

2.1.2 B and T cell epitopes, haptens and adjuvants

2.1.3 Factors influencing immunogenicity

Unit - III

3.1 Antibodies

3.1.1 Structure of antibody

3.1.2 Classes and functions of antibodies

3.1.3Monoclonal antibodies

Unit - IV

4.1 Working of Immune system

4.1.1 Structure and functions of major histocompatibility complexes

4.1.2 Exogenes and Endogenes pathways of antigen presentation and processing

4.1.3 Basic properties and functions of cytokines

Unit - V

5.1 Immune system in health and disease

5.1.1 Classification and brief description of various types of hyper sensitivities

5.1.2 Introduction to concepts of autoimmunity and immunodeficiency

5.2 Vaccines

5.2.1 General introduction to vaccines

5.2.2 Types of vaccines

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AP STATE COUNCIL OF HIGHER EDUCATION

ZOOLOGY SYLLABUS FOR CLUSTER ELECTIVE –VIII-B:
VI SEMESTER

AQUACULTURE

Cluster Elective Paper: VIII-B-1

PRINCIPLES OF AQUACULTURE

Periods:60 **Max.Marks:100**

Unit – I

1.1 Introduction / Basics of Aquaculture

1.1.1 Definition, Significance and History of Aquaculture

1.1.2 Present status of Aquaculture – Global and National scenario

1.1.3 Major cultivable species for aquaculture: freshwater, brackish water and marine.

1.1.4 Criteria for the selection of species for culture

Unit – II

2.1 Types of Aquaculture

2.1.1 Freshwater, Brackishwater and Marine

2.1.2 Concept of Monoculture, Polyculture,Composite culture, Monosex culture and Integrated fish farming

2.2Culture systems

2.2.1 Ponds, Raceways, Cages, Pens, Rafts and water recirculating systems

2.3Culture practices

2.3.1Traditional, extensive, modified extensive, semi-intensive and intensive cultures of fish and shrimp.

Unit – III

3.1 Design and construction of aquafarms

3.1.1Criteria for the selection of site for freshwater and brackish water pond farms

3.1.2 Design and construction of fish and shrimp farms

3.2 Seed resources

3.2.1 Natural seed resources and Procurement of seed for stocking: Carp and shrimp

3.3 Nutrition and feeds

3.3.1 Nutritional requirements of a cultivable fish and shellfish

3.3.2 Natural food and Artificial feeds and their importance in fish and shrimp culture

Unit – IV

4.1Management of carp culture ponds

4.1.1 Culture of Indian major carps: Pre-stocking management – Dewatering, drying, ploughing/desilting; Predators, weeds and algal blooms and their control, Liming and fertilization; Stocking management – Stocking density and stocking; Post-stocking management – Feeding, water quality, growth and health care; and Harvesting ofponds

4.2Culture of giant freshwater prawn, *Macrobrachium rosenbergii*

Unit – V

5.1Culture of shrimp (*Penaeus monodon* or *Litopenaeus vannamei*)
5.2 Culture of pearl oysters
5.3 Culture of seaweeds-species cultured, culture techniques, important by-products, prospects
5.4 Culture of ornamental fishes – Setting up and maintenance of aquarium; and breeding.

REFERENCES BOOKS

1. Bardach, JE *et al*. 1972. *Aquaculture – The farming and husbandry of freshwater and marine organisms*, John Wiley & Sons, New York.
2. Bose AN et al.1991. *Coastal aquaculture Engineering*. Oxford & IBH Publ.Co.Pvt.Ltd.
3. Chakraborty C & Sadhu AK. 2000. *Biology Hatchery and Culture Technology of Tiger Prawn and Giant Freshwater Prawn*. Daya Publ. House.
4. FAO. 2007. *Manual on Freshwater Prawn Farming*.
5. Huet J. 1986. *A text Book of Fish Culture*. Fishing News Books Ltd.
6. ICAR. 2006. *Hand Book of Fisheries and Aquaculture*. ICAR.
7. Ivar LO. 2007. *Aquaculture Engineering*. Daya Publ. House.
8. Jhingran V.G. 2007. *Fish and Fisheries of India*. Hindustan Publ. Corporation, India.
9. Landau M. 1992. *Introduction to Aquaculture*. John Wiley & Sons.
10. Lovell RT.1998. *Nutrition and Feeding of fishes*. Chapman & Hall.
11. Mcvey JP. 1983. *Handbook of Mariculture*. CRC Press.
12. MPEDA: *Handbooks on culture of carp, shrimp, etc.*
13. New MB. 2000. *Freshwater Prawn Farming*. CRC Publ.
14. Pillay TVR.1990. *Aquaculture- Principles and Practices*, Fishing News Books Ltd., London.
15. Pillay TVR & Kutty MN. 2005. *Aquaculture- Principles and Practices*. 2nd Ed. Blackwell
16. Rath RK. 2000. *Freshwater Aquaculture*. Scientific Publ.
14. Stickney RR. 1979. *Principles of Warmwater Fish Culture*, John Wiley & Sons
15. Wheaton FW. 1977. *Aquacultural Engineering*. John Wiley & Sons.

Cluster Elective Paper: VIII-B-2

AQUACULTURE MANAGEMENT

Periods : 60 **Max.Marks : 100**

Unit – I

1.1Breeding and Hatchery Management

1.1.1 Bundh Breeding and Induced breeding of carp by Hypophysation; and use of synthetic hormones

1.1.2Types of fish hatcheries; Hatchery management of Indian major carps

1.1.3 Breeding and Hatchery management of *Penaeus monodon*/ *Litopenaeus vannamei*

1.1.4 Breeding and Hatchery management of giant freshwater prawn.

Unit – II

2.1 Water quality Management

2.1.1Water quality and soil characteristics suitable for fish and shrimp culture

2.1.2 Identification of oxygen depletion problems and control mechanisms in culture ponds

2.1.3 Aeration: Principles of aeration and Emergency aeration

2.1.4 Liming materials, Organic manures and Inorganic fertilizers commonly used and their implications in fish ponds

Unit – III

3.1 Feed Management

3.1.1Live Foods and their role in shrimp larval nutrition.

3.1.2 Supplementary feeds: Principal foods in artificial diets; Types of feeds; Feed additives and Preservatives; role of probiotics.

3.1.3 Feed formulation and manufacturing; Feed storage

3.1.4 Feeding strategies: Feeding devices, feeding schedules and ration size; Feed evaluation- feed conversion efficiencies and ratios

Unit – IV

4.1 Disease Management

4.1.1 Principles of disease diagnosis and health management;

4.1.2 Prophylaxis, Hygiene and Therapy of fish diseases

4.1.3 Specific and non-specific defense systems in fish; Fish immunization and vaccination

4.1.4Etiology, Symptoms, prophylaxis and therapy of common fish diseases in fish ponds

4.1.5Etiology, Symptoms, prophylaxis and therapy of common shrimp diseases in shrimp ponds

Unit – V

5.1 Economics and Marketing

5.1.1 Principles of aquaculture economics – Capital costs, variable costs, cost-benefit analysis

5.1.2Fish marketing methods in India; Basic concepts in demand and price analysis

5.2 Fisheries Extension

5.1.3 Fisheries Training and Education in India; Role of extension in community development.

5.3 Fish Genetics

5.1.4 Genetic improvement of fish stocks – Hybridization of fish.

5.1.5 Gynogenesis, Androgenesis, Polyploidy, Transgenic fish, Cryopreservation of gametes, Production of monosex and sterile fishes and their significance in aquaculture.

REFERENCE BOOKS

1. Boyd CE. 1979. *Water Quality in Warm Water Fish Ponds*. Auburn University
2. Boyd, CE. 1982. *Water Quality Management for Pond Fish Culture*. Elsevier Sci. Publ. Co.
3. Chakraborty C & Sadhu AK. 2000. *Biology Hatchery and Culture Technology of Tiger Prawn and Giant*
Freshwater Prawn. Daya Publ. House
4. Conroy CA and Herman RL. 1968. *Text book of Fish Diseases*. TFH (Great Britain) Ltd, England.
5Halver J & Hardy RW. 2002. *Fish Nutrition*. Academic Press.
6. Ian C. 1984. *Marketing in Fisheries and Aquaculture*. Fishing News Books.
7. ICAR. 2006. *Handbook of Fisheries and Aquaculture*. ICAR.
8. Jhingran VG. 2007. *Fish and Fisheries of India*. Hindustan Publishing Corporation, India.
9. Jhingran VG & Pullin RSV. 1985. *Hatchery Manual for the Common, Chinese and Indian Major Carps*.
ICLARM, Philippines.
10. Kumar D. 1996. *Aquaculture Extension Services Review: India*. FAO Fisheries CircularNo. 906, Rome.
11. Lavens P & Sorgeloos P. 1996. *Manual on the Production and Use of Live Food for Aquaculture*. FAO
Fisheries Tech. Paper 361, FAO.
12. MPEDA. 1993. *Handbook on Aqua Farming - Live Feed. Micro Algal Culture*. MPEDA Publication
13. New MB. 1987. *Feed and Feeding of Fish and Shrimp. A Manual on the Preparation and Preservation of*
Compound Feeds for Shrimp and Fish in Aquaculture. FAO – ADCP/REP/87/26
14. Pandian TJ, Strüssmann CA & Marian MP. 2005. *Fish Genetics and Aquaculture Biotechnology*. Science Publ.
15.Pilley, TVR & Dill, WMA. 1979. *Advances in Aquaculture*. Fishing News Books, Ltd. England.
16. Pillay TVR & Kutty MN. 2005. *Aquaculture- Principles and Practices*. Blackwell.
17. Ray GL. 2006. *Extension, Communication and Management*. 6th Ed. Kalyani Publ. Delhi.
18. ReddyPVGK, AyyappanS, ThampyDM & Gopalakrishna 2005.*Text Book of Fish Genetics and Biotechnol.*
ICAR
19. Reichenbach KH. 1965. *Fish Pathology*. TFH (Gt. Britain) Ltd, England.
20.Shang YC. 1990. *Aquaculture Economic Analysis - An Introduction*. World Aquaculture Society, USA.
21. Singh B. 2006. *Marine Biotechnology and Aquculture* Development. Daya Publ. House
22.Stickney RR. 1979. *Principles of Warm waterAquaculture*. John-Willey & sons Inc.
23. Swain P, Sahoo PK & Ayyappan S. 2005. *Fish and Shellfish Immunology: An Introduction*. Narendra
Publ.
24. Thomas PC, Rath SC & Mohapatra KD.2003.Breeding and Seed Production of Finfish and Shellfish.
Daya Publ.

Cluster Elective Paper: VIII-B-3

POSTHARVEST TECHNOLOGY

Periods : 60 **Max.Marks : 100**

Unit – I

1.1 Handling and Principles of fish Preservation

1.1.1 Handling of fresh fish, storage and transport of fresh fish, post mortem changes (rigor mortis and spoilage), spoilage in marine fish and freshwater fish.

1.1.2 Principles of preservation– cleaning, lowering of temperature, rising of temperature, denudation, use of salt, use of fish preservatives, exposure to lowradiation of gamma rays.

Unit – II

2.1 Methods of fish Preservation

2.1.1 Traditional methods - sun drying, salt curing, pickling and smoking.

2.1.2 Advanced methods – chilling or icing, refrigerated sea water, freezing, canning, Irradiation and Accelerated Freeze drying (AFD).

Unit – III

3.1 Processing and preservation of fish and fish by-products

3.1.1Fish products – fish minced meat, fish meal, fish oil, fish liquid (ensilage), fish protein concentrate, fish chowder, fish cake, fish sauce, fish salads, fish powder, pet food from trash fish, fish manure.

3.1.2 Fish by-products – fish glue, ising glass, chitosan, pearl essence, shark fins, fish leather and fish maws.

3.2Seaweed Products

3.2.1Preparation of agar, algin and carrageen. Use of seaweeds as food for humanconsumption, in diseasetreatment and preparation of therapeutic drugs.

Unit – IV

4.1Sanitation and Quality control

4.2.1 Sanitation in processing plants - Environmental hygiene and Personal hygiene in processing plants.

4.2.2 Quality Control of fish and fishery products – pre-processing control, control during processing and control after processing.

4.2 Regulatory affairs in industries

Unit – V

5.1 Quality Assurance, Management and Certification

5.1.1Seafood Quality Assurance and Systems: Good Manufacturing Practices (GMPs); Good Laboratory Practices (GLPs); Standard Operating Procedures (SOPs); Concept of Hazard Analysis and Critical Control Points (HACCP) in seafood safety.

5.1.2 National and International standards – ISO 9000: 2000 Series of Quality Assurance System, *Codex Alimentarius*.

ANDHRAPRADESHSTATECOUNCILOFHIGHEREDUCATION
(A Statutory body of the Government of Andhra Pradesh)
REVISED UG SYLLABUS UNDER CBCS
(Implemented from Academic Year - 2020-21)
PROGRAMME: FOUR YEAR B.SC. (Hons)
Domain Subject: **ZOOLOGY**
Skill Enhancement Courses (SECs) for Semester V, from 2022-23
(Syllabus with Learning Outcomes, References, Co-curricular Activities & Model Q.P. Pattern)

Structure of SECs for Semester–V
(To choose one pair from the four alternate pairs of SECs)

Univ Code	Course Number 6&7	Name of Course	Hours/Week Theory +Practical	Credits Theory+ Practical	Marks	
					IA–20 FW- 05	Sem End T+P
	6A	SUSTAINABLE AQUACULTURE MANAGEMENT	3+3	3+2	25	75+50
	7A	POST HARVEST TECHNOLOGY OF FISH AND FISHERIES	3+3	3+2	25	75+50
		OR				
	6B	LIVE STOCK MANAGEMENT-I (BIOLOGY OF DAIRY ANIMALS	3+3	3+2	25	75+50
	7B	LIVE STOCK MANAGEMENT -II (DAIRY PRODUCTION AND MANAGEMENT)	3+3	3+2	25	75+50
		OR				
	6C	POULTRY MANAGEMENT- I (POULTRY FARMING)	3+3	3+2	25	75+50
	7C	POULTRY MANAGEMENT- II (POULTRY PRODUCTION AND MANGEMENT	3+3	3+2	25	75+50
		OR				
	6D	SERI CULTURE -I***	3+3	3+2	25	75+50
	7D	SERI CULTURE -II	3+3	3+2	25	75+50

*** To be taught by Zoology Teachers

Note: For Semester–V, for the domain subject Zoology, any one of the four pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C or 6D & 7D. The pair shall not be broken (ABCD allotment is random, not on any priority basis).

Note-2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the skills embedded in syllabus citing related real field situations.

A.P. State Council of Higher Education
Semester-wise Revised Syllabus under CBCS, 2020-21

Course Code:

Four – year B.Sc. (Hons)
Domain Subject: **ZOOLOGY**
IV Year B. Sc.(Hons)–Semester –V

Max. Marks: 100+50

Course6 A: SUSTAINABLE AQUACULTURE MANAGEMENT

(Skill Enhancement Course (Elective), -Credits: 05)

I. Learning Outcomes:

Students at the successful completion of this course will be able to

- Evaluate the present status of aquaculture at the Global level and National level
- Classify different types of ponds used in aquaculture
- Demonstrate induced breeding of carps
- Acquire critical knowledge on commercial importance of shrimps
- Identify fin and shell fish diseases

II. Syllabus: (*Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.*)

Unit: 1

1.1 Present status of Aquaculture – Global and National scenario
1.2 Major cultivable species for aquaculture: freshwater, brackish water and marine.
1.3 Traditional, extensive, modified extensive, semi-intensive and intensive cultures of fish and shrimp.
1.4 Design and construction of fish and shrimp farms

Unit: 2

2.1 Functional classification of ponds – head pond, hatchery, nursery ponds
2.2 Functional classification of ponds -rearing, production, stocking and quarantine ponds
2.3 Need of fertilizer and manure application in culture ponds
2.4 Physio-chemical conditions of soil and water optimum for culture (Temperature, depth, turbidity, light, water, PH, BOD, CO_2 and nutrients)

Unit: 3

3.1. Induced breeding in fishes
3.2. Culture of Indian major carps: Pre-stocking management (Dewatering, drying ploughing/desilting; Predators, weeds and algal blooms and their control, Liming and fertilization)
3.3. Culture of Indian major carps - Stocking management
3.4. Culture of Indian major carps - post-stocking management

Unit: 4

4.1 Commercial importance of shrimp & prawn
4.2 *Macrobrachium rosenbergii*- biology, seed production.
4.3 Culture of *L. vannamei* – hatchery technology and culture practices
4.4 Mixed culture of fish and prawns

Unit: 5

5.1 Viral diseases of Fin Fish & shell fish
5.2 Fungal diseases of Fin & Shell fish
5.3 Bacterial diseases of Finfish & Shell fish
5.4 Prophylaxis in aquaculture

III. References:

1. Pillay TVR & M A Dill, 1979. Advances in Aquaculture. Fishing News Books Ltd., London
2. Stickney RR 1979. Principles of Warm Water Aquaculture. John Wiley & Sons Inc 1981
3. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsivier Scientific Publishing Company.
2. Bose AN et.al. 1991. Costal Aquaculture Engineering. Oxford & IBH Publishing Company Pvt. Ltd.

Web Links:

1. http://www.fao.org/fishery/docs/CDrom/FAO_Training/FAO_Training/General/x6709e/x6709e[illegible].htm
2. [illegible]aquafiles[illegible].org/1666/1/Better-Practice3_opt.pdf
3. http://www.[illegible].com/india/fishery/fish-diseases-symptoms-and-control-[illegible]/[illegible]

Course6 A: SUSTAINABLE AQUACULTURE MANAGEMENT
PRACTICAL SYLLABUS

IV. Learning Outcomes:

On successful completion of this practical course, student shall be able to:

- Identify the characaters of Fresh water cultivable species
- Estimate physico chemical characateristics of water used for aquaculture
- Examine the diseases of fin and shell fish
- Suggest measures to prevent diseases in aquaculture

V. Practical (Laboratory) Syllabus: (30hrs) (Max.50Marks)

1. Fresh water Cultivable species any (Fin & Shell Fish Specimens – Observation of morphological characters by observation and drawings)-5
2. Brackish water cultivable species (Fin &Shell fish- Specimens- Observation of Morphological Character by observing drawing) -5
3. Hands on training on the use of kits for determination of water quality in aquaculture (DO, Salinity, pH, Turbidity- Testing kits to be used for the estimation of various parameters/ Standard procedure can be demonstrated for the same)
4. Demonstration of Hypophysation(Procedure of hypophysation to be demonstrated in the practical lab with any edible fish as model)
5. Viral diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of viral pathogens in fin/ shell fish – one edible specimen can be used for observation of same in the laboratory)
6. Bacterial diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of Bacterial pathogens in fin/ shell fish – One edible specimen can be used for observation of same in the laboratory)
7. Fungal diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of Bacterial pathogens in fin/ shell fish – One edible specimen can be used for observation of same in the laboratory)

VI. Lab References

1. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsevier Scientific Publishing Company
2. http://www.fao.org/fishery/docs/CDrom/FAO_Training/FAO_Training/General/x6708e/x6708e06.htm
3. http://aquaticcommons.org/1666/1/Better-Practice3_opt.pdf
4. https://www.notesonzoology.com/india/fishery/fish-diseases-symptoms-and-control-fishery/871

Web resources suggested by the teacher concerned and the college librarian including reading material

VII. **Co-Curricular Activities**

a) **Mandatory**:*(Student training by teacher in field skills: Total 15 hrs., Lab:10 - field 05)*

1. For Teacher: Training of students by the teacher in laboratory/field fornotlessthan15 hours on Breeding- Induced breeding in carps -hatchery technology of *L. Vennami*- Farming techniques- disease diagnostic techniques—concepts –Demonstration @ any aqua laboratory
2. For Student: Students shall (individually) visit a Hatchery/Farm/ Aqua diagnostic center and make careful observations of the process method and implements- protocols and report on the same in 10 pages hand written Fieldwork/Project work Report.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work: Title page, student details, index page, details of place visited, observations made, findings and acknowledgements.
5. (IE).Unit tests.

b) Suggested Co-Curricular Activities

1. Preparation of Model/Charts of Cultivable species of fin fish shell fish
2. Preparation of Model/Chart of Ideal fish Pond- with the standards prescribed.
3. Observation of aquaculture activities in their area (Observation of any activity related to aquaculture in the vicinity of the college/village)
4. Preparation of Model – charts of Fin /Shell fish Diseases with eco-friendly material.
5. Assignments, Group discussion, Seminar, Quiz, Collection of Material, Video preparation etc., Invited lecture

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A.P. State Council of Higher Education
Semester-wise Revised Syllabus under CBCS, 2020-21

Course Code:

Four – year B.Sc. (Hons)
Domain Subject: ZOOLOGY
IV Year B. Sc.(Hons)–Semester –V

Max Marks: 100+50

Course 7 A: **POSTHARVEST TECHNOLOGY OF FISH AND FISHERIES**
(Skill Enhancement Course (Elective), - Credits: 05)

I. Learning Outcomes:

Students at the successful completion of this course will be able to

- Identify the types of preservation methods employed in aquaculture
- Choose the suitable Processing methods in aquaculture
- Maintain the standard quality control protocols laid down in aqua industry
- Identify the best Seafood quality assurance system

II. **Syllabus:** *Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)*

Unit – I Handling and Principles of fish Preservation

1. 1 Handling of fresh fish, storage and transport of fresh fish, post mortem changes (rigor mortis and spoilage), spoilage in marine fish and freshwater fish.

1.2 Principles of preservation – cleaning, lowering of temperature, rising of temperature, denudation, use of salt, use of fish preservatives, exposure to low radiation of gamma rays.

Unit – II Methods of fish Preservation

2.1 Traditional methods - sun drying, salt curing, pickling and smoking.

2.2. Advanced methods – chilling or icing, refrigerated sea water, freezing, canning, irradiation and Accelerated Freeze drying (AFD).

Unit – III Processing and preservation of fish and fish by-products

3.1 Fish products – fish minced meat, fish meal, fish oil, fish liquid (ensilage), fish protein concentrate, fish chowder, fish cake, fish sauce, fish salads, fish powder, pet food from trash fish, fish manure.

3.2 Fish by-products – fish glue, Using glass, chitosan, pearl essence, shark fins, fish Leather and fish maws.

Unit – IV Sanitation and Quality control

4.1 Sanitation in processing plants - Environmental hygiene and Personal hygiene in processing plants.

4.2 Quality Control of fish and fishery products – pre-processing control, control during processing and control after processing.

Unit – V Quality Assurance, Management and Certification

5.1. Seafood Quality Assurance and Systems: Good Manufacturing Practices (GMPs); Good Laboratory Practices (GLPs); Standard Operating Procedures (SOPs); Concept of Hazard Analysis and Critical Control Points (HACCP) in seafood safety.

5.2 National and International standards – ISO 9000: 2000 Series of Quality Assurance System, *Codex Aliment Arius*.

III. References:

1. Santharam R. N Sukumaran and P Natarajan 1987. A manual of aquaculture. Oxford & IBH NewDelhi
2. Lakshmi Prasad's, Fish Processing Technology 2012, Arjun Publishing House
3. Dr Sunitha Rai, Fish Processing Technology, 2015, Random Publications
4. Safety and Quality Issues in Fish Processing (Woodhead Publishing Series in Food Science Technology and Nutrition)by H A Bremner
5. K.A Mahanthy, Innovations in Fishing and Fish Processing Technologies, January 2021

Web Resources:

1. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=145743
2. https://ecourses.icar.gov.in/e-Learningdownload3_new.aspx?Degree_Id=03

Course 7 A: POSTHARVEST TECHNOLOGY OF FISH AND FISHERIES
PRACICAL SYLLABUS

IV. Learning Outcomes: On successful completion of this practical course, student shall be able to:

- Identify the quality of aqua processed products.
- Determine the quality of fishery by products by observation
- Analyze the protocols of aqua processing methods

V. **Practical(Laboratory) Syllabus**:

1. Evaluation of fish/ fishery products for organo leptic, chemical and microbial quality.
2. Preparation of dried, cured and fermented fish products
   For detailed procedure method visit sites:
3. Examination of salt, protein, moisture in dried / cured products
4. Examination of spoilage of dried / cured fish products, marinades, pickles, sauce.
5. Preparation of isinglass, collagen and chitosan from shrimp and crab shell.
6. Developing flow charts and exercises in identification of hazards – preparation of hazard analysis worksheet
7. Corrective action procedures in processing of fish- flow chart- work sheet preparation
   (** Refer the following web sites for complete procedure method and estimations of above listed practicals)

VI. References:

1. Dr Sunitha Rai, Fish Processing Technology, 2015, Random Publications
2. https://ecourses.icar.gov.in/e-Learningdownload3_new.aspx?Degree_Id=03
3. https://vikaspedia.in/agriculture/fisheries/post-harvest-and-marketing/processing-in-fisheries/fermented-products
4. https://krishi.icar.gov.in/jspui/bitstream/123456789/20500/1/Fermentation%20technology%20for%20fish.pdf
5. http://jebas.org/0020062012014/Abujam%20et%20al%20JEBAS.pdf
6. https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20Manual_Hygienic%20drying%20and%20packing%20of%20fish.pdf
7. https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20Manual_Hygienic%20drying%20and%20packing%20of%20fish.pdf
8. https://agritech.tnau.ac.in/fishery/fish_byproducts.html
9. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5352841/
10. http://www.fao.org/3/i1136e/i1136e.pdf
11. http://www.fao.org/3/x5989e/X5989e01.htm#What%20is%20sensory%20assessment?

Web resources suggested by the teacher concerned and the college librarian including reading material

VII. **Co-Curricular Activities**

a) **Mandatory:** *(Lab/field training of students by teacher (lab 10 + field 05):*

1. For Teacher: Training of students by the teacher in laboratory/fieldfornotlessthan15hourson various steps of post-harvest techniques of fishes, on the advanced techniques in post-harvest technology – Training of students on other employability skills in the Post-harvest sector of Aquaculture Industry- like Processing, Packing, marketing of processed aqua products.
2. For Student: Students shall (individually) visit - Any fish/shrimp Processing Plant/Packing industry and make observations on post harvesting techniques and submit a brief handwritten Fieldwork/Project work Report with pictures and data /survey in 10 pages.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations made, findings and acknowledgements*
5. (If): Unit tests.

b) Suggested Co-Curricular Activities

1. Observation of fish/shrimp processing plants – visit web sites of processing companies and record the details of that Unit
2. Interaction with local fishermen to know the method of preservation and details with the available traditional technology
3. Collection of web resources on the Quality assurance, quality control measures in Aqua Industries- cross checking the standards during the visit to any processing units.
4. Assignments, Seminar, Group discussion, Quiz, Collection of Material, Invited lecture, Video preparation etc.,

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A.P. State Council of Higher Education
Semester-wise Revised Syllabus under CBCS, 2020-21

Course Code:

Four – year B.Sc. (Hons)
Domain Subject: ZOOLOGY
IV Year B. Sc.(Hons)–Semester –V

Max Marks: 100+50

Course6 B: **LIVE STOCK MANAGEMENT-I**
(BIOLOGY OF DAIRY ANIMALS)
(Skill Enhancement Course (Elective), - Credits: 05)

I. **Learning Outcomes:**

- Students at the successful completion of the course will be able to
- Select the suitable breeds of livestock for rearing
- Relate the anatomy of udder with letdown of milk
- Identify and manipulate the reproductive behavior of cattle
- Inspect the economics of dairy farming
- Apprise the various breeding techniques employed in live stock

II. **Syllabus:** (*Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.*)

Unit 1: Livestock census; Breeds of Dairy cattle, Buffaloes and Goats. Indigenous, Exotic and Crossbred Cattle breeds

Unit 2: Anatomy of Udder; Development of udder; Lacto genesis and Galactopoises; Letdown of milk.

Unit 3: Artificial insemination; Oestrous cycle; Symptoms of heat in cows and buffaloes. Conception, Pregnancy diagnosis in cattle. Multi ovulation and embryo transfer technique. Cloning.

Unit4: Economic traits of Dairy cattle. Methods of selection of dairy animals.

Unit5: Systems of Dairy cattle breeding. Inbreeding, out breeding, Cross breeding, Grading up. Breeding systems (Cross breeding of cattle and Grading up of buffaloes).

III. **References:**

1. Textbook of Animal Husbandry-GC Benarjee
2. Handbook of Animal Husbandry –ICAR Edition
3. Principles and practices of Dairy Farm–Jagdish Prasad

Web resources:

1. http://ecoursesonline.iasri.res.in/course/index.php?categoryid=42
2. https://vetsebooks.blogspot.com/p/e-books.html
3. https://www.basu.org.in/study-materials/veterinary-science/
4. https://vikaspedia.in/agriculture/livestock/cattle-buffalo/breeds-of-cattle-buffalo

Course 6 B: LIVE STOCK MANAGEMENT-I-PRACTICAL SYLLABUS (BIOLOGY OF DAIRY ANIMALS)

IV. Learning Outcomes:

On successful completion of this practical course, student shall be able to

1. Examine the points of dairy cow
2. Understand the behavioral changes of cow during the reproductive period
3. Differentiate the merits and demerits of cross breeds in cattle

V. Practical(Laboratory) Syllabus:(30hrs) (Max.50Marks)

1. Points dairy cow. (Explanation with observation of charts- Model evaluation to be performed by the student in the laboratory)
2. Identification of different breeds of dairy cattle and buffaloes.(Observation of Charts of breeds in the laboratory- at least 3 breeds should be identified by the students in their locality with video, photo)
3. Male and female reproductive systems of cow – Model/ Chart (Student has to draw a labeled diagram of the male and female reproductive systems of cow – acquire skill to identify the parts).
4. Symptoms of heat in cow (Study and Understanding the physiological symptoms during heat).
5. Artificial in semi nation (Flow chart of implements – Procedure- precautions)
6. Pregnancy diagnosis in cattle.
7. Study comparative merits of cows and buffaloes; zebu and cross bred cows (Examination of merits

VI. Lab References:

1. Principles and practices of Dairy Farm–Jadish Prasad
2. Dairy cow points: https://www.icar.org/Guidelines/05-Conformation-Recording.pdf
3. Pregnancy test protocol: https://cgspace.cgiar.org/bitstream/handle/10568/109408/Milk%20testing%20lab%20protocol.pdf?sequence=1&isAllowed=y

Web resources suggested by the teacher concerned and the college librarian including reading material

VII. Co-Curricular Activities

a) **Mandatory**:*(Lab/ field training of students by teacher :(lab:10 + filed: 05):*

1. For Teacher: Training of students by the teacher in laboratory/field fornotlessthan15hoursonprinciples and practices of dairy industry- breeds –artificial insemination- reproductive behavior of cows etc. as per the syllabus above.
2. For Student: Students shall individually visit to any of the nearby cattle rearing centers/ veterinary hospital/Raithu Bharosa Kendra and make observations of the procedure and quality enhancement activities and submit a handwritten Fieldwork/Project work Report in 10 pages.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work Report: *Title page, student details, index page, details of place visited, observations made, findings and acknowledgements*
5. (IE)Unit tests.

b) **Suggested Co-Curricular Activities**

1. Collection of various cattle breed images from the web to prepare a album
2. Visit the sites of Veterinary colleges in India and preparation of brief report on the videos and content/ employment details
3. Sketch a model dairy farm with details
4. Invited lecture and presentation on related topics by experts
5. Seminar, Assignment, Group discussion, Quiz, Collection of Material, Invited lecture, Video preparation etc.

A.P. State Council of Higher Education
Semester-wise Revised Syllabus under CBCS, 2020-21

Course Code:

Four – year B.Sc. (Hons)
Domain Subject: ZOOLOGY
IV Year B. Sc.(Hons)–Semester –VY

Max Marks: 100+50

Course 7B: **LIVE STOCK MANAGEMENT -II**
(DAIRY PRODUCTION AND MANAGEMENT)
(Skill Enhancement Course (Elective). - Credits: 05)

I. Learning Outcomes:

Students at the successful completion of the course will be able to

- Identify and suggest the suitable housing system for the dairy farming
- Understand management practices for the dairy farming
- Learn the process of milk pasteurization
- Prepare cream from milk

II. Syllabus: (*Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.*)

Unit1: Systems of Housing of Dairy cattle- Loose Housing and Conventional Dairy Barns. Drawing of layouts for dairy cattle dwellings; Criteria for selecting site for establishing Dairy farm buildings; Water requirement of dairy animals.

Unit2: Management of different classes of Dairy animals- Milk producing animals, pregnant animals dry animals, heifers and calves. Management practices for Dairy farm; Identification, Dehorning, Castration, Deworming, Vaccination, Disinfection, and Milking.

Unit 3: (a) Pasteurization of milk: Definition, objects of pasteurization, objections to pasteurization. Principles of heat exchange. Methods of pasteurization: LTLT, HTST and Uperization.
(b)Sterilization of milk. Homogenization: Factors influencing homogenization

Unit 4: Market milk: Toned milk, double toned milk, Reconstituted milk, Standardized milk and full cream milk–Standards and methods of manufacture.

Unit 5: Cream: Types of cream, composition, methods of cream separation, gravity and centrifugal methods, types of cream separators, factors affecting fat losses in skim milk and fat percentage in cream.

III. References:

1. Textbook of Animal Husbandry-G C Benarjee
2. Handbook of Animal Husbandry –ICAR Edition
3. Principles and practices of Dairy Farm–Jagdish Prasad
4. http://ecoursesonline.iasri.res.in/course/index.php?categoryid=42
5. https://vetsebooks.blogspot.com/p/e-books.html
6. https://www.basu.org.in/study-materials/veterinary-science/
7. https://vikaspedia.in/agriculture/livestock/cattle-buffalo/breeds-of-cattle-buffalo

Course 7 B: LIVE STOCK MANAGEMENT -II – **PRACTICAL SYLLABUS**
(DAIRY PRODUCTION AND MANAGEMENT)

IV. Learning Outcomes:

On successful completion of this practical course, student shall be able to:

- Design a model dairy farm layout
- Understand procedure of milk pasteurization at milk processing centers
- Identify various important management practices in dairy farming

V **Practical (Laboratory) Syllabus**:(30hrs) (Max.50Marks)

1. Dairy Farm layout (In the laboratory student has to sketch a dairy farm with all its components)
2. Identification of cows (students have to identify the breeds of cows form the images/charts – have to identify any two breeds in the vicinity of the college/ their locality).
3. Dehorning of calves : (Method - protocol- precautions)
4. Castration of bulls (Method – Apparatus- Time-importance)
5. Deworming of dairy cattle : (Schedule – method- benefits)
6. Pasteurization of milk (Batch Method- procedure- Observation)
7. Sterilization of milk (In bottle sterilization- procedure – protocol)
8. Cream separation (By gravity method- procedure- hands on experiment)

VI. Lab References

1. Handbook of Animal Husbandry –ICAR Edition
2. Dairy farm layout : https://www.youtube.com/watch?v=dmukHUFUfvKc
3. Dehorning procedure : http://www.omafra.gov.on.ca/english/livestock/dairy/facts/09-003.htm
4. Castration of bulls: https://vikaspedia.in/agriculture/livestock/general-management-practices-of-livestock/castration-of-ruminants
5. Deworming: https://kvk.icar.gov.in/API/Content/PPupload/k0347_10.pdf
6. Pasteurization of milk : http://www.jnkvv.org/PDF/08042020170652part%203.pdf
7. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=1690
8. Cream separation: http://ecoursesonline.iasri.res.in/mod/page/view.php?id=147910

Web resources suggested by the teacher concerned and the college librarian including reading material

VII. **Co-Curricular Activities**

a) **Mandatory:** *(Lab/field training of students by teacher: lab 10+ field :05)*

1. For Teacher: Training of students by the teacher in laboratory and filed fornotlessthan15 hours on skills of dairy management – housing-management of dairy animals of various stages- procedure of preparation of marketable milk with procedures like sterilization. pasteurization and other techniques)
2. For Student: Student shall (individually) visita nearby dairy farm- house hold cattle rearing – make observations on aspects like housing – management – feed- milk- revenue- breed selection- qualities of breed –etc. A handwritten Fieldwork/Project work Report to be submitted inn the given format.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work Report: *Title page, student details, index page, details of place visited, observations made, findings and acknowledgements.*
5. (IE)Unit tests.

b) Suggested Co-Curricular Activities

1. Sketch model dairy house with details
2. Web resources on Protocols in the management of stages of cattle
3. Properties of varieties of milk from the market observation
4. Assignment, Seminar, Invited lecture, Group discussion. Quiz, Collection of Material, Video preparation etc.

A.P. State Council of Higher Education
Semester-wise Revised Syllabus under CBCS, 2020-21

Course Code:

Four – year B.Sc. (Hons)
Domain Subject: ZOOLOGY
IV Year B. Sc.(Hons)–Semester –V

Max. Marks: 100

Course6 C: POULTRY MANAGEMENT- I (POULTRY FARMING)

(Skill Enhancement Course (Elective). - Credits: 05 (3+2))

I. Learning Outcomes:

Students at the successful completion of the course will be able to

- Evaluate the status of Indian Poultry Industry
- Explain the Scientific Poultry keeping
- Compare the diversified Poultry practices
- Inspect the different breeds of chicken

II. **Syllabus**: (*Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.*)

Unit 1 Indian poultry Industry
1.1 Importance of poultry farming and poultry development in India.
1.2 Present status and future prospectus of poultry Industry
1.3 Classification of poultry based on genetics Utility
Unit -2Scientific Poultry Keeping
2.1 Modern breeds of Chicken
2.2 Present day egg production lines- meat production lines
2.3 Mini breeds- dwarfism in mini-Leghorns
Unit-3Diversified Poultry
3.1 Ducks and Geese-classification- rearing system-classification-advantages
3.2 Guinea fouls - guinea fowl farming in India-Production-varieties
3.3 Emu-rearing- Economical aspects-commercial products
Unit-4Desi Chickens:
4.1 Indigenous breeds and economical aspects of desi chicken
4.2 Indigenous breeds-Aseel-Chittagong-Kadaknath-Bursa
4.3 Improved varieties in India – Giriraja-Vanaraja-Girirani-Kalinga brown, Gramapriya, Swarnandhra
Unit -5 Breeds from Central Avian Research Institute – Izatnagar
5.1 CARI Nirbheek - CARI- Shyama-HITCARI (Naked Neck Cross)
5.2 CARI- Priya Layer, CARI- Sonali Layer,
5.3 CARIBRO-VISHAL, CARI-RAINBRO,
5.4 Nandanam chicken-I, Nandanam Chicken-II, Nandanm-Quail

III. References:

1. Text Book of Poultry Science, P V Sreenivasaiah, Write and Print Publications, ISBN No. 9788192970592, 8192970590
2. Poultry Science Practices, Nilothpal Ghosh, CBS Publication & Distributions, 2015
3. Principles of Poultry Science, 1996, CAB Publishers, ISBN 9780851991221
4. A Text Book of Animal Husbandry, C. C. Banerjee, Oxford and IBH, Publish Co, ISBN: 9788120412606

Web sources

1. https://www.drvet.in/p/e-books.html

2. https://byjus.com/biology/animal-husbandry-poultry-farming/
3. https://www.helpforag.app/2018/02/livestock-production-and-management-lesn_14.html?m=1

Course6 C: POULTRY MANAGEMENT- I (POULTRY FARMING)
PRACTICAL SYLLABUS

IV. Learning Outcomes: On successful completion of this practical course, student shall be able to:

- Identify different types of Poultry rearing practices
- Evaluate the efficacy of different types of poultry practices in maximizing yield
- Understand the importance of different hybrid breeds in poultry

V. Practical(Laboratory) Syllabus:(30hrs) (Max.50Marks)

1. Different types of Poultry rearing (Students has to observe and draw the different types of poultry rearing systems)
2. Different types of poultry Housing - Models / Images/charts
3. Different layer breeds images/charts/ Models (Observation of characters)
4. Types of broilers images/charts/ Models (Identification of important Characters)
5. CARI breeds characters –images/charts
6. Nandanam breeds- images/charts (Identification of characters)

*** (This practical is 70 % (Web based /virtual) 30% physical: student and teachers must browse the web for the specimens models – write down the important characters based on the web resources)

VI. Lab references

1. A Text Book of Animal Husbandry, C. C. Banerjee, Oxford and IBH, Publish Co. ISBN: 9788120412606

Web resources suggested by the teacher concerned and the college librarian including reading material

VII. **Co-Curricular Activities**:

a) **Mandatory**:*(Student training by teacher in field skills: total15hours (lab:10, field 05))*

1. For Teacher: Training of students by the teacher in laboratory and field for notlessthan15hours on the techniques of identification of layers, broilers and management practices in poultry.
2. For Student: Students shall Individually visit a Poultry farm, make observations and report on the Rearing, Housing, Brooding, Feeding and water management activities. The student shall submit a handwritten Fieldwork/Project work Report on the observations along with pictures in the given format not exceeding 10 pages to teacher.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations made, findings and acknowledgements.*
5. Unit tests. (IE)

b) Suggested Co-Curricular Activities

1. Web resources – visiting the web sites of CARI-IZATNAGAR-https://cari.icar.gov.inprocuring additional information on the poultry breeds
2. Web resources- visiting the web site of NANADANAM http://www.tanuvas.ac.in/ippmmadhavaram_tech.html
3. Collection of additional data on different types of Poultry breeds
4. Seminar, Assignment, Group discussion, Quiz, Collection of Material, Invited Lecture, Video preparation etc.

A.P. State Council of Higher Education
Semester-wise Revised Syllabus under CBCS, 2020-21

Course Code:

Four – year B.Sc. (Hons)
Domain Subject: ZOOLOGY
IV Year B. Sc–Semester –VY

Max. Marks: 100+50

Course 7 C: **POULTRY MANAGEMENT -II**
(POULTRY PRODUCTION AND MANGEMENT)
(Skill Enhancement Course (Elective), - Credits: 05)

I. Learning Outcomes:

Students at the successful completion of the course will be able to

- Suggest measure for Health care in Poultry
- Evaluate the economics of poultry production
- Elaborate the poultry Breeder flock management
- Differentiate the poultry hatchery practices

II. **Syllabus:** (*Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.*)

Unit-1 HEALTH CARE

1.1 Common poultry diseases: bacterial, viral, fungal, parasitic and nutritional deficiencies.

1.2 Vaccination schedule for commercial layers and broilers: factors that govern vaccination schedule; vaccination principles type, methods, pre and post vaccination care.

1.3 Disinfection: Types of disinfectants; mode of action; recommended procedure; precaution and handling.

Unit-2 ECONOMICS

2.1 Economics of layer and broiler production

2.2 Projects reports in different systems of rearing for layer & broilers.

2.3 Feasibility studies on poultry rearing- in context of small units and their profitability.

2.4 Export/import of poultry and poultry products.

Unit-3 BREEDER FLOCK MANAGEMENT

3.1 Layer and broiler breeder flock management housing & space requirements.

3.2 Different stage of management during life cycle; Light management during growing and laying period, Artificial insemination.

3.3 Feeding: Feed restriction, separate male feeding. Nutrient requirement of layer and broiler breeders of different age groups.

Unit-4 BREEDER HEALTHCARE

4.1 Vaccination of breeder flock; difference between vaccination schedule of broilers and commercial birds.

4.2 Common diseases of breeders (Infectious and metabolic disorders)-prevention.

4.3 Fertility disorder- etiology, diagnosis and corrective measures. Selection and culling of breeder flocks

Unit-5 HATCHERY PRACTICES

5.1 Management principles of incubation.

5.2Factors affecting fertility and hatchability. Selection, care and incubation of hatching eggs. Fumigation; sanitation and hatchery hygiene.

5.3 Importance of hatchery records, break even analysis of unhatched eggs.

5.4 Computer applications for hatchery management

III. References:

1. HVS Chauhan, S. Roy, Poultry Diseases, Diagnosis and Treatment, New Age International

Publishers-2018
3. https://www.dryet.in/p/e-books.html
4. https://byjus.com/biology/animal-husbandry-poultry-farming/
5. https://www.helpforag.app/2018/02/livestock-production-and-management-htm_14.html?m=1

Course 7C: POULTRY MANAGEMENT –II- PRACTICAL SYLLLABUS (POULTRY PRODUCTION AND MANGEMENT)

IV. Learning Outcomes:

On successful completion of this practical course, student shall be able to:

- Identify Poultry diseases by observation
- Analyze Poultry establishment feasibility
- Understand the Poultry Records

V. Practical(Laboratory) Syllabus:(30hrs) (Max.50Marks)

1. Poultry Viral diseases – Observation of histopathological slides
2. Poultry Fungal Diseases- Observation of histopathological slides
3. Poultry Bacterial Diseases-Observation of histopathological slides
4. Feasibility study of Poultry establishment: (Preparation of feasibility study report with given parameters)
5. Rearing of Layers – (Preparation of Flow chart
6. Rearing of broiler- Flow chart
7. Hatchery records- Model study/analysis- Report with modified data

VI. Lab references :

1. HVS Chauhan, S. Roy, Poultry Diseases, Diagnosis and Treatment, New Age International Publishers-2018
2. Flow chart hatchery : http://lms.tanuvas.ac.in/mod/resource/view.php?id=45106
3. Feasibility report: https://www.manage.gov.in/stry&fcac/content/19.%20Project%20Report%20on%20Layer%20Poultry.pdf

Web resources suggested by the teacher concerned and the college librarian including reading material

VII. **Co-Curricular Activities**

a) **Mandatory**:*(Lab/filed training of students by teacher: (lab10+ field 05)*

1. For Teacher: Training of students by the teacher laboratory and field fornotlessthan15hourson skills in different practices employed in poultry with regard to the disease management – analysis of poultry project- preparation of flow chart – Observation of Poultry records – computerization activities
2. For Student: students shall (individually) visit a Layer/ Broiler Poultry farming places (small scale/corporate), make observations on practices- resources – management and marketing - analysis and submit a handwritten Fieldwork/Project work Report of 10 pages with necessary images.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations made, findings and acknowledgements.*
6. (IE): Unit tests.

b) **Suggested Co-Curricular Activities**

1. Preparation of Poultry diseases charts
2. Preparation of feasibility report poultry establishment with different variables
3. Seminar, Assignment, Group discussion, Quiz, Collection of Material, Invited Lecture, Video preparation etc.

A.P. State Council of Higher Education
Semester-wise Revised Syllabus under CBCS, 2020-21

Course Code:

Four – year B.Sc. (Hons)
Domain Subject: ZOOLOGY
IV Year B. Sc.(Hons)–Semester –VY

Max. Marks: 100+50

Course6 D: **SERI CULTURE -I***
(BIOLOGY AND CULTIVATION OF MULBERRY)
(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:

- Students at the successful completion of this course will be able to
- Evaluate the general status of Sericulture in India
- Understand the development of sericulture Botany
- Evaluate the use of Silk worm breeds
- Differentiate among various silkworm breeds
- Apprise the economics of silk rearing

II. Syllabus: (*Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.*)

Unit-1A general introduction to Sericulture
1.1 Sericulture map of India: Components of Sericulture.
1.2 Textile fibers: Types- natural and synthetic fibers- types of silk produced in India: Importance of mulberry silk:
1.3 Sericulture organization in India; role of state departments of Sericulture, Central Silk Board and NGOs in Sericulture development
Unit-2Sericultural Botany.
2.1Taxonomy of mulberry and food plants of silkworms: Study of salient features of the family Marceau.
2.2 Morphology of mulberry: different varieties of mulberry.
2.3 Anatomy of mulberry: internal structure of stem, root and leaf; secondary growth in root and stem.
Unit 3Floral biology of mulberry
3.1 Floral biology of mulberry: Sexual behavior, different types of anthers and ovule in mulberry, micro- and megaspore genesis.
3.2 Development of male and female gametophytes; pollination, fertilization
3.3 Development of endosperm, embryo and seed; polyembryony and parthenocarpy in mulberry
Unit-4 Silkworm Biology.
4.1 Characteristic features of the order Lepidoptera; detailed study of the families- Saturnidae and Bombycid. Classification of sericigenous insects.
4.2 Classification of silkworms based on moultinism, voltinism and geographical distribution, popular silkworm breeds and hybrids of Karnataka; their economic traits
Unit-5 Morphology and anatomy of reproductive systems of silk moth.
5.1 Life cycle of *Bombyx Mori:* morphology of egg, larva, pupa and adult.

** This course shall be completely taught by Zoology faculty.*

III. References:

1. Hortmann and Kesler (1993) Plant Propagation, principles and practices. Prentice Hall. Hemel Nemstead.
2. Krishna Murthy, N.(1981)Plant growth substances including application in Agriculture. Tata McGraw Hill Pub. Co. Ltd. New Delhi.
3. Shankar, M.A (1998) Handbook on mulberry Nutrition, Multiplex, Bangalore.
4. Subbarao, N.S (1998) Bio fertilizers in Agriculture, Oxford & IBH Pub. Co. Pvt. Ltd, New Delhi.
5. A text Book on Mulberry Crop Protection, Govindaiah, V.P Gupta, D.D Sharma, S. Rajadurai and V. Nishitha Naik, Published by Central Silk Board, Bangalore-68, India.2005.
6. Rajanna L.Das P.K, Ravindra S, Bhogesha K , Mishra R.K,Singhvi N.R, Katigar R.S and Jayaram H. Mulberry Cultivation and Physiology Central Silk Board, Bangalore,Dec.2005

Web resources:

1. http://www.fao.org/3/ad108e/ad108e0a.htm
2. https://onlinecourses.swayam2.ac.in/cec19_bt05/preview
3. https://www.skuastkashmir.ac.in/DisplaySInformation.aspx?id=16&pid=20592
4. http://www.fao.org/3/x9895E/x9895e04.htm
5. https://www.notesonzoology.com/sericulture/moriculture/common-indian-mulberry-plants-and-their-morphological-characteristics/347

Web resources suggested by the teacher concerned and the college librarian including reading material

Course6 D: SERI CULTURE -I – **PRACTICAL SYLLABUS**

IV. Learning Outcomes:

On successful completion of this practical course, student shall be able to:

- Develop sericulture map of India
- Develop charts on production of silk
- Examine the popular varieties of mulberry
- Display the silk glands of silk worm

V. Practical(Laboratory) Syllabus:(30hrs) (Max.50Marks)

1. Sericulture map of India and Karnataka.
2. Preparation of histograms and pie charts on:
3. Production of textile fibers in India.
4. Pie chart on mulberry and non-mulberry silk production in India.
5. Life cycle of *Bombyx mori*- Morphology of egg, larva, pupa and adult of *Bombyx mori*.
6. Sex separation in larva, pupa and adult of the silkworm *Bombyx mori*.
7. Dissection and display of: Digestive system of larva. Silk glands.

VI. Lab References :

1. Rajanna L.Das P.K. Ravindra S. Bhogesha K . Mishra R.K.Singhvi N.R. Katigar R.S and Jayaram H. Mulberry Cultivation and Physiology Central Silk Board. Bangalore Dec 2005

Web sources suggested by the teacher concerned and the college librarian including reading material

VII. **Co-Curricular Activities** :

a) **Mandatory**: *(Student training by teacher in field skills: total15hrs, Lab: 10+ filed 05):*

1. For Teacher: Training of students by the teacher in the laboratory and field for notlessthan15hourson the skills of preparation of Sericulture Map of India – identification of Mulberry plants – plantation- observation of Silk worm reproductive biology- observation of silk glands

2. **For Student:** Students shall (individually) visit any local Mulberry Plantation area and Silk worm Rearing center – make observations on plants, procedures and yield. Observations and outcomes shall be submitted as Fieldwork/Project work Report not exceeding 10 pages to teacher in the given format.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations made, findings and acknowledgements.*
5. (IE)Unit tests.

6. **b) Suggested Co-Curricular Activities**

1. Webbased : Collection of additional information of mulberry plants
2. Charts /Models preparation of silkworm developmental stages

7. Seminar, Invited lecture, .Assignment, Group discussion, Quiz, Collection of Material, Video preparation etc.

A.P. State Council of Higher Education
Semester-wise Revised Syllabus under CBCS, 2020-21

Four – year B.Sc.(Hons) Course Code:
Domain Subject: ZOOLOGY
IV Year B. Sc.(Hons)–Semester –VY

Max Marks: 100+50

Course 7 -D: SERICULTURE -II (BIOLOGY AND REARING OF SILKWORM)

(Skill Enhancement Course (Elective), - Credits: 05)

I. Learning Outcomes:

Students at the successful completion of this course will be able to

- Design low cost rearing house preparation for silk worm rearing
- Formulate procedure of sanitation of rearing house
- Make use of Chawki rearing practice
- Decide and suggest the correct time for harvest
- Develop and Maintain the records related to sericulture

II. Syllabus: *(Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)*

Unit-1

1.1 Rearing house: Location, orientation, plan and utilities; model rearing house; low-cost rearing house.

1.2 Rearing appliances-shelf and shoot rearing; requirements of rearing appliances (per unit rearing of 100dfls).

Unit-2

2.1 Disinfection of rearing house and rearing appliances; (disinfectants formalin, bleaching powder, chlorine dioxide, slaked lime and iodine compounds);

2.2 Rearing and personal hygiene.

Unit-3

3.1 Incubation- definition, requirement of environmental conditions, incubation devices; identification of stages of development; black boxing and its importance.

3.2 Chawki rearing: Preparation; brushing and its methods; types of chawki rearing - traditional and improved method; optimum environmental conditions; methods and frequency of feeding; methods of bed cleaning; spacing; moulting and care during moult.

Unit -4

4.1 Late age silkworm rearing: Methods; optimum environmental conditions; feeding quantity and frequency; methods of bed cleaning; spacing; moulting and care during moult.

4.2. Identification of spinning larva; spinning; mounting and mounting density; types of mountages, their advantages and disadvantages; environmental requirements during spinning.

Unit -5

5.1 Harvesting: Time of harvesting; sorting, storage/ preservation

5.2 Packaging and transport of cocoons; leaf-cocoon ratio; Maintenance of rearing records.

III. References:

1. Charley, S.R. (1982). Culture and Sericulture. Academic Press Inc., New York, U.S.A
2. Chowdhury, S.N. (1998) Muga Culture, Central Silk Board, Bangalore, India
3. Dokuhon, Z.S. (1998). Illustrated Textbook on Sericulture. Oxford & IBH publishing Co. Pvt. Ltd.Calcutta.
4. Hamamura, Y. (2001). Silkworm rearing on Artificial Diet. Oxford & IBH publishing Co. Pvt. Ltd, New Delhi.
5. Hasao Aruga (1994). Principles of Sericulture (Translated from Japanese) Oxford & IBH publishing Co., Pvt. Ltd. New Delhi.

Web Resources:

1. http://www.fao.org/3/ad108e/ad108e0a.htm
2. https://onlinecourses.swayam2.ac.in/cec19_bt05/preview
3. https://www.skuastkashmir.ac.in/DisplaySInformation.aspx?id=16&pid=20592

Course 7 -D: SERICULTURE –II-PRACTICAL SYLLABUS (BIOLOGY AND REARING OF SILKWORM)

IV. Learning Outcomes:

- On successful completion of this practical course, student shall be able to :
- Appreciate the morphology of silkworm
- Realize the importance of and initiate measures to disinfect the importance of disinfection of rearing houses and rearing appliances
- Differentiate the methods of incubation of silkworm eggs
- Prioritize the records in silkworm rearing

V. **Practical(Laboratory) Syllabus**:(30hrs)(Max.50Marks)

1. Morphology and structure of silkworm egg, fertilization, Diapause development
2. Rearing house: Location, orientation, plan and utilities; model rearing house; low-cost rearing house.
3. Disinfection of rearing house and rearing appliances;
4. Incubation of silkworm eggs- Methods; black boxing; maintenance of temperature and humidity; Brushing: Methods; chawki rearing; use of paraffin paper and blue polythene sheet
5. Bed cleaning: use of bed cleaning net and disposal of bed refuses and silkworm litter
6. Moulting; Identification of moulting larva, care during moulting; mounting and mounting density; harvesting of cocoons; assessment of cocoons; types of mountages;
7. Study the mulberry leaf by graph paper method : (for calculating the leaf area)

VI. Lab References

1. HasaoAruga (1994). Principles of Sericulture (Translated from Japanese) Oxford & IBH publishing Co., Pvt. Ltd. New Delhi.

Web resources suggested by the teacher concerned and the college librarian including reading material

VII. Co-Curricular Activities

a) **Mandatory**: *(Lab/field training of students by teacher (lab10+filed5))*

1. For Teacher: Training of students by the teacher in laboratory and field for notlessthan15hourson the skills/techniques of Rearing of Silk moth
2. For Student: Students shall (individually) visit to Silk worm rearing center and observe all the procedures. He/she shall prepare a Fieldwork/Project work Report on the observations made in the given format not exceeding 10 pages and submit to teacher.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work Report: *Title page, student details, index page, details of place visited, observations made, findings and acknowledgements.*
5. (IE). Unit tests.

b) Suggested Co-Curricular Activities

1. Model Chart preparation of chawki rearing
2. Cocoon collection and observation of characteristics
3. Mountage images / charts preparation
4. Seminar, Invited Lecture, Assignment, Seminar, Group discussion, Quiz, Seminar, Quiz, Collection of Material, Video preparation etc.

Suggested Question Paper Pattern

Semester-wise Revised Syllabus under CBCS, 2020-21

Four – year B.Sc.(Hons)

Course Code:

Domain Subject: ZOOLOGY

IV Year B. Sc.(Hons)–Semester –V

Max.Marks:75

Time:3 hrs

SECTION - A(Total: 10 Marks)

Very Short Answer Questions (10 Marks: 5x2)

1. .....
2. .....
3. .....
4. .....
5. .....