



PSGR Krishnammal College for Women



UGC Certified College of Excellence • Autonomous • Affiliated to Bharathiar University • ISO 9001:2015 Certified • Reaccredited with 'A' Grade by NAAC • Ranked 22<sup>nd</sup> in NIRF 2019 by MHRD

## DEPARTMENT OF ZOOLOGY

### CHOICE BASED CREDIT SYSTEM & OUTCOME BASED EDUCATION SYLLABUS

**BACHELOR OF ZOOLOGY (B.Sc Zoology)**

**2019 - 2022**



## PROGRAMME OUTCOMES

After completion of the programme, the student will be able to

- PO1:** Impart quality life science education to women students and to develop young women as outstanding scholars/ teachers/ career women/ entrepreneurs and responsible citizens.
- PO2:** Appreciate the complexities of biological organisation and address scientifically controversial issues in a rational way.
- PO3:** Assess the scope of animal biology and select particular areas for further study.
- PO4:** Inculcate transformational impact on the quality of education and to inspire the students to adopt scientific temper and live with scientific values.
- PO5:** Make the students aware of applications of Zoology and to highlight the potential of various branches to become an entrepreneur.

## PROGRAMME SPECIFIC OUTCOME

The students at the time of graduation will

- PSO1:** Gain the knowledge of Zoology through theory and practicals.
- PSO2:** Analyse the relationships among animals with their ecosystems.
- PSO3:** Learn to classify the major groups of organisms under different phyla, understanding the functioning of organisms, compare and contrast anatomical and physiological characteristics of animals.
- PSO4:** Understand good laboratory practices as per laboratory standards, handling the sophisticated instruments/equipment to develop technical skills, research oriented skills about research methodologies, effective communication and skills of problem solving methods.
- PSO5:** Understand the applications of zoological knowledge in Agriculture, Medical and daily life and apply the knowledge for employment- Indian Forest Service, Sericulture, Fisheries, Veterinary, Clinical Laboratory, Museum Curator, departments and Entrepreneurship. They can go for Indian Forest Service and other competitive examinations.

**DEPARTMENT OF ZOOLOGY****CHOICE BASED CREDIT SYSTEM & OUTCOME BASED EDUCATION  
SYLLABUS & SCHEME OF EXAMINATION  
2019- 2022**

	Part	Subject code	Title of the Paper	Instruction Hours/Week	Contact Hours	Tutorial	Duration of Examination	Examination Marks			Credits
								CA	ESE	Total	
I	I	TAM1701/ HIN1701/ FRE1701	Language T/H/F Paper I	6	86	4	3	40	60	100	3
	II	ENG1701/ ENG17F1	English Paper-I/ Functional English Paper -I	6	86	4	3	40	60	100	3
	III A	AS17C01	Invertebrata Paper I	6	86	4	3	40	60	100	5
	III A	AS16CP1	Zoology Practical I	3	45		-	-	-	-	-
	III A	CE17A01	Allied Chemistry Paper I	4	56	4	3	20	55	75	4
	III A	CE17AP1	Allied Chemistry Practical	3	45		-	-	-	-	-
	IV	NME16B1/ NME16A1/ NME12W/ NME12AS/ NME12GS/ NME18ES	Basic Tamil / Advanced Tamil / Women Studies/ Ambedhkar Studies/ Gandhian Studies/ Entrepreneurship	2/2/ 2	28/26 / 26	2/4/4	-/2/-	50/ 50/ 100	50/ 50/-	100/ 100/ 100	2
II	II	TAM1702/ HIN1702/ FRE1702	Language T/H/F Paper - II	6	86	4	3	40	60	100	3
	II	ENG1702/ ENG17F2	English Paper-II / Functional English Paper - II	6	86	4	3	40	60	100	3
	III A	AS17C02	Chordata Paper II	5	71	4	3	40	60	100	5
	III A	AS16CP1	Zoology Practical I	3	45		3	40	60	100	4
	III A	CE17A02	Allied Chemistry Paper II	5	71	4	3	20	55	75	4

	III A	CE17AP1	Allied Chemistry Practical I	3	45		3	20	30	50	2	
	IV		Open Course - Self Study Online Courses	-	-	-	-	-	-	-	-	
	IV	NME16B2/A2	Basic Tamil/Advanced Tamil**	-	-	-	-	-	-	-	-	
	VI		Personality Development Programme	-	-					-	-	
	III B	NM12GAW	Foundation Course –1 (General Awareness)	Self study (Online)								Grade
	V	REG16EE	Effective English Communication	2	27	3		50	50	100	2	
III	I	TAM1903/ HIN1903/ FRE1903	Language T/H/F Paper III	6	86	4	3	40	60	100	3	
	II	ENG1903/ ENG19F3	English Paper III / Functional English Paper III	5	71	4	3	40	60	100	3	
	III A	AS19C03	Ecology and Embryology Paper III	4	56	4	3	40	60	100	4	
	III A	AS16CP2	Zoology Practical II	3	45		-	-	-	-	-	
	III A	AS19A01 PL19A01	Invertebrata and Chordata Allied Botany Paper I	5	71	4	3	20	55	75	4	
	III A	AS19AP1 PL17AP1	Allied Zoology Practical Allied Botany Practical I	2	30		-	-	-	-	-	
	III	AS19SB01	Skill Based - Sericulture I	3	29	1	2	-	-	-	-	
	III	AS19SBP1	Skill Based Subject Practical-Sericulture Practical-I		15	-	-	-	-	-	-	
	III B	NM10EVS	Foundation Course-II (Environmental Studies)	Self study	-	-	-	-	-	-	-	
	III B	NM14VHR	Foundation Course-III (Value Education and Human Rights)	2	26	4	-	-	-	100	2	
	VI	JOB1993	Job Oriented Course Apiculture		After 12.30 PM 60 h		GRADE **					
IV	I	TAM1904/ HIN1904/ FRE1904	Language T/H/F Paper – IV	5	71	4	3	40	60	100	3	
	II	ENG1904/ ENG19F4	English Paper IV/ Functional English Paper IV	6	86	4	3	40	60	100	3	
	IIIA	AS19C04	Cell Biology and Biochemistry Paper IV	4	56	4	3	40	60	100	4	

	III A	AS16CP2	Zoology Practical II	3	45		3	40	60	100	4
	III A	AS19A02 PL19A02	General Principles in Zoology Allied Botany Paper-II	5	71	4	3	20	55	75	4
	III A	AS19AP1 PL17AP1	Allied Zoology Practical Allied Botany Practical	2	30		3	20	30	50	2
	III	AS19SB01	Skill Based - Sericulture I	3	29	1	2	25	75	100	4
	III	AS19SBP1	Skill Based Subject Practical-Sericulture Practical-I		15	-		40	60	100	2
	III B	NM10EVS	Foundation Course-IV (Environmental Studies)	2	26	4	2	-	-	100	2
			NSS/NCC/YRC/SPORTS & GAMES	-			-	-	100	100	1
V	III A	AS18C05	Paper – V Genetics and Evolution	4	56	4	3	40	60	100	5
	III A	AS18C06	Paper - VI Biophysics, Biostatistics & Bioinformatics	4	56	4	3	40	60	100	4
	III A	AS18C07	Paper - VII Biotechnology	4	56	4	3	40	60	100	4
	III A	AS18E01	AOS – I Pathology and Medical Laboratory technology	4	56	4	3	40	60	100	4
	III A	AS18E02	AOS – II Optional Wild Life Biology								
	III A	AS18AC1	ALC I - Optional Microbiology	Self Study	-	-	3	25	75	100*	5*
	III A	AS16AC2	ALC II - Optional Public Health and Hygiene	Self Study	-	-	3	25	75	100*	5*
	III A	AS16CP3	Zoology Practical III	6	90		-	-	-	-	-
	III A	AS05PR0J	Project	3	75		Viva- voce	50	50	100	5
	VI	NM13IS1	Information Security	2	26	4	-	-	-	Grade	-
	III	AS19SB02	Skill Based - Sericulture II	3	29	1	2	-	-	-	-
	III	AS19SBP2	Skill Based Subject Practical-Sericulture Practical-II		15	-	-	-	-	-	-
	III A		Comprehensive Examination	-	-	-	1	-	-	-	Grade
	VI		Supportive Course	After 3 pm							
	VI		Personality Development	-	-	-	-	-	-	-	Grade
	VI		Field Training	-	-	2 wee ks			100	100	2
VI	III A	AS18C08	Paper- VIII Physiology and Endocrinology	6	86	4	3	40	60	100	5

	III A	AS18C09	Paper - IX Immunology	5	71	4	3	40	60	100	5
	III A	AS18C10	Paper - X Human Genetics and counselling	5	71	4	3	40	60	100	5
	III A	AS18E03	AOS – III Applied Fishery Biology	5	71	4	3	40	60	100	5
	IIIA	AS18E04	AOS – IV Optional Dairy Science								
	IIIA	AS16AC3	ALC III - Optional Industrial Biotechnology	Self Study			3		100	100*	*5
	IIIA	AS16AC4	ALC IV - Optional Applied Zoology								
	III A	AS16CP3	Zoology Practical III	6	90		3	40	60	100	5
	III	AS19SB02	Skill Based - Sericulture II	3 -	-	-	3	25	75**	100	4
	III	AS19SBP2	Skill Based Subject Practical-Sericulture Practical-II		30	-	3	40	60	100	2
										3800	140

\*Not considered for Grand Total and CGPA

\*\*outside regular class hours

**QUESTION PAPER PATTERN****CORE & ALLIED PAPERS****Continuous Internal Assessment: 50 Marks**

SECTION	MARKS	TOTAL
A – 5 × 2 Marks	10	50
B – 4 × 5 Marks	20	
C - 2/3 × 10 Marks	20	

**End Semester Examination: 100 Marks**

SECTION	WORD LIMIT	MARKS	TOTAL
A-12/15 × 2 Marks	One or two sentences	24	100
B - 6/8 × 6 Marks	250	36	
C - 4/6 × 10 Marks	500	40	

**SKILL BASED SUBJECT****Continuous Internal Assessment: 25 Marks**

SECTION	MARKS	TOTAL
A – 4 / 6 × 4 Marks	16	25
B – 1 / 2 × 9 Marks	9	

**End Semester Examination: 50 Marks**

SECTION	MARKS	TOTAL
A- 4 / 6 × 5 Marks	20	50
B – 2 / 3 × 15 Marks	30	

**ADVANCED LEARNERS COURSE (ALC)**

**Continuous Internal Assessment: 25 Marks**

<b>SECTION</b>	<b>MARKS</b>	<b>TOTAL</b>
A – 4 / 6 × 4 Marks	16	25
B – 1 / 2 × 9 Marks	9	

**End Semester Examination: 75 Marks**

<b>SECTION</b>	<b>MARKS</b>	<b>TOTAL</b>
A- 5/8 × 5=25 Marks	25	75
B – 5/8 × 10=50 Marks	50	



**VALUE EDUCATION AND HUMAN RIGHTS / WOMEN STUDIES / AMBEDKAR  
STUDIES / GANDHIAN STUDIES / ENTREPRENEURSHIP / ENVIRONMENTAL  
STUDIES**

**Continuous Internal Assessment: 50 Marks**

SECTION	MARKS	TOTAL
A – 4 / 6 × 5 Marks	20	50
B – 2 / 3 × 15 Marks	30	

Value Education and Human Rights & Environmental Studies two internal tests will be conducted for 50 marks each and the total marks secured will be equated to a maximum of 75 marks and 25 marks is allotted for project / group discussion / presentation of a report.

**INFORMATION SECURITY**

**Continuous Internal Assessment: 40 Marks**

SECTION	MARKS	TOTAL
A – 5 / 8 × 2 Marks	10	40
B – 6 / 8 × 5 Marks	30	

**FIELD TRAINING: 100 Marks**

The students have the option to select any organization – Government / private like industry, R & D organizations, scientific companies, etc., in consultation with the staff co-ordinator & HoD. The students are to undergo training for a period of two weeks at the end of semester IV during vacation. The students must maintain a work diary and prepare report of the training undergone and submit the same to the HoD. On a stipulated date, there will be a viva-voce with internal examiners at the beginning of the semester V

MODE OF EVALUATION	MARKS	TOTAL
Attendance	10	100
Work Diary	15	
Report	50	
Viva-voce	25	

## **PROJECT**

### **Group Project and Viva Voce**

Each faculty will be allotted 5 students. A specific problem will be assigned to the students. The topic/area of work will be finalized at the end of IV semester, allowing scope for the students to gather relevant literature during the vacation. The research work will be carried out based on the objective of the project and viva voce/presentation will be conducted by a panel comprising of HOD, internal examiners. A power point presentation by the student group will be evaluated on the basis of students' response to the questions.

### **Area of Work**

Limnology, Pollution studies, Clinical studies, Molecular Biology, Fish Toxicology, Microbiology, Entomology, Environmental Science.

### **Methodology**

Each project should contain the following details:

- Brief introduction on the topic
- Review of Literature
- Materials and Methods
- Results and Discussions – evidences in the form of figures, tables and photographs
- Conclusion / Summary
- Bibliography

The above contents should not exceed 50 pages

### **Internal Assessment: 20 Marks**

<b>Review</b>	<b>Mode of Evaluation</b>	<b>Marks</b>	<b>Total</b>
I	Selection of the field of study, Topic & Literature Collection	5	20
II	Research Design and Data Collection	10	
III	Analysis & Conclusion, Preparation of rough draft	5	

### External Assessment: 80 Marks

<b>Mode of Evaluation</b>	<b>Marks</b>	<b>Total</b>
<b>Project Report</b>		
Relevance of the topic to academic / society	10	60
Objectives	10	
Experimental Design	20	
Expression of Results and Discussion	20	
<b>Viva Voce</b>		
Presentation	10	20
Discussion	10	

**WEIGHTAGE ASSIGNED TO VARIOUS COMPONENTS OF  
CONTINUOUS INTERNAL ASSESSMENT**

**Theory**

	CI A I	CI A II	Mode l Exam	Assignmen t/ Class Notes	Semina r	Qui z	Class Participatio n	Librar y Usage	Attendanc e	Max. Mark s
Core / Allied	5	5	6	4	5	4	5	3	3	40
SBS	5	5	15	-	-	-	-	-	-	25
ALC		10	15	-	-	-	-	-	-	25
Informatio n Security	40	40		10		10				100

**Practical**

	<b>Model Exam</b>	<b>Lab Performance</b>	<b>Regularity in Record Submission</b>	<b>Attendance</b>	<b>Maximum Marks</b>
Core / Allied / SBS	12	20	5	3	40

## RUBRICS

### Assignment/ Seminar

Maximum - 20 Marks (converted to 4 marks)

<b>Criteria</b>	<b>4 Marks</b>	<b>3 Marks</b>	<b>2 Marks</b>	<b>1 Mark</b>
<b>Focus Purpose</b>	Clear	Shows awareness	Shows little awareness	No awareness
<b>Main idea</b>	Clearly presents a main idea.	Main idea supported throughout	Vague sense	No main idea
<b>Organisation: Overall</b>	Well planned	Good overall organization	There is a sense of organization	No sense of organization
<b>Content</b>	Exceptionally well presented	Well presented	Content is sound	Not good
<b>Style: Details and Examples</b>	Large amounts of specific examples and detailed description	Some use of examples and detailed descriptions	Little use of specific examples and details	No use of examples

## CLASS PARTICIPATION

Maximum - 20 Marks (converted to 5 marks)

Criteria	5 Marks	4 Marks	3 Marks	2 Marks	1 Mark
<b>Level of Engagement in Class</b>	Student proactively contributes to class by offering ideas and asks questions more than once per class.	Student proactively contributes to class by offering ideas and asks questions once per class	Student contributes to class and asks questions occasionally	Student rarely contributes to class by offering ideas and asking no questions	Student never contributes to class by offering ideas
<b>Listening Skills</b>	Student listens when others talk, both in groups and in class. Student incorporates or builds off of the ideas of others.	Student listens when others talk, both in groups and in class.	Student listens when others talk in groups and in class occasionally	Student does not listen when others talk, both in groups and in class.	Student does not listen when others talk, both in groups and in class. Student often interrupts when others speak.
<b>Behavior</b>	Student almost never displays disruptive behavior during class	Student rarely displays disruptive behavior during class	Student occasionally displays disruptive behavior during class	Student often displays disruptive behavior during class	Student almost always displays disruptive behavior during class
<b>Preparation</b>	Student is almost always prepared for class with required class materials	Student is usually prepared for class with required class materials	Student is occasionally prepared for class with required class materials	Student is rarely prepared for class with required class materials	Student is almost never prepared for class.

**MAPPING OF POs WITH COs**

COURSE	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
<b>COURSE - AS17C01</b>					
CO1	S	S	M	M	M
CO2	L	S	M	M	S
CO3	L	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	M	S
<b>COURSE - AS17C02</b>					
CO1	L	S	M	M	M
CO2	L	S	M	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S
<b>COURSE - AS16CP1</b>					
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
<b>COURSE - AS19C03</b>					
CO1	S	S	S	M	M
CO2	S	S	S	M	M
CO3	S	S	S	S	S
CO4	L	S	S	S	S
CO5	S	S	S	S	S
<b>COURSE - AS19A01</b>					
CO1	L	L	L	M	M
CO2	S	S	M	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	M	S
<b>COURSE - AS19C04</b>					
CO1	S	S	S	M	M
CO2	S	S	S	M	M
CO3	S	S	S	S	S
CO4	L	S	S	S	S
CO5	S	S	S	S	S

<b>COURSE - AS19A02</b>					
CO1	L	L	L	M	M
CO2	S	S	M	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	M	S
<b>COURSE - AS16CP2</b>					
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S
<b>COURSE - AS19AP1</b>					
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	M	M
CO4	S	S	S	M	M
CO5	S	S	S	S	M
<b>COURSE - AS19SB01</b>					
CO1	S	S	S	M	M
CO2	S	S	S	M	M
CO3	S	S	S	S	S
CO4	L	S	S	S	S
CO5	S	S	S	S	S
<b>COURSE - AS19SBP1</b>					
CO1	S	S	S	M	M
CO2	S	S	S	M	M
CO3	S	S	S	S	S
CO4	L	S	S	S	S
CO5	S	S	S	S	S
<b>COURSE - AS16CO5</b>					
CO1	L	S	M	M	M
CO2	S	S	M	M	S
CO3	L	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	M	S
<b>COURSE - AS18C06</b>					
CO1	S	S	M	M	L
CO2	S	S	M	M	M



CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	S	S	S	M
<b>COURSE- AS18C07</b>					
CO1	L	L	S	S	S
CO2	M	S	S	S	S
CO3	M	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S
<b>COURSE - AS18E01</b>					
CO1	S	S	S	M	M
CO2	S	S	S	M	M
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S
<b>COURSE - AS18E02</b>					
CO1	L	S	M	M	M
CO2	S	S	M	M	S
CO3	L	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	M	S
<b>COURSE - AS18C08</b>					
CO1	S	S	M	M	L
CO2	S	S	M	M	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	S	S	M	M
<b>COURSE - AS18C09</b>					
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	M	M
<b>COURSE - AS18C10</b>					
CO1	S	S	L	S	S
CO2	L	S	S	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	M
CO5	S	S	S	S	M
<b>COURSE - AS18E03</b>					
CO1	S	S	L	M	M

CO2	S	S	S	M	M
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S
<b>COURSE- AS18E04</b>					
CO1	S	L	L	S	M
CO2	S	S	S	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	S
CO5	S	S	S	S	S
<b>COURSE - AS16CP3</b>					
CO1	L	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	M	M
CO4	S	S	S	M	M
CO5	S	S	S	S	M
<b>COURSE- AS19SB01</b>					
CO1	L	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	M	M
CO4	S	S	S	M	M
CO5	S	S	S	S	M
<b>COURSE - AS19SBP1</b>					
CO1	L	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	M	M
CO4	S	S	S	M	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Course Number	Course Name	Category	L	T	P	Credit
AS17CO1	INVERTEBRATA	Core	86	4	-	5

### Preamble

To understand the basic classification, structure and functional details of invertebrates and to appreciate the diversity of life on earth with respect to invertebrates.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Describe the distinguishing characteristics of the major taxa Explain the basic aspects of classification details of invertebrates Understand biodiversity, habitat, adaptation organization and taxonomic status of invertebrates	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO2.	Recall certain morphological attributes and physiological processes that are distinct and significant to each Phyla	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO3.	Understand the systemic and functional morphology of various groups of invertebrates. Explain the basic aspects of structural and functional details of Invertebrates	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO4.	To compare and understand the general and specific characteristics within each Phyla	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO5.	Interpret the affinities, evolutionary relationships and adaptation of the major taxa and to explain their economic importance with respect to Non-Chordates	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1.	S	S	M	M	L
CO2.	S	S	M	M	M
CO3.	S	S	S	S	M
CO4.	S	S	S	S	M
CO5.	S	S	S	M	M

S- Strong; M-Medium; L-Low

**INVERTEBRATA - AS17CO1**  
**Syllabus**

**(86 Hrs)**

**UNIT I**

**(18 Hrs)**

**Phylum Protozoa**

**Type Study:** *Paramecium caudatum* –External features, Nutrition, Locomotion- effective stroke, recovery stroke, Metachronal rhythm, Reproduction-Asexual- Binary fission, Sexual reproduction – Conjugation, Autogamy, Endomixis, Hemimixis and Cytogamy.

**General Essays:** Locomotion in Protozoa, Protozoan human diseases

**Phylum Porifera**

**Type Study:** *Leucosolenia botryoides*- External features, Body wall, Spicules, Canal System, Nutrition, Reproduction.

**General Essays:** Canal System in sponges, Economic importance of sponges

**UNIT II**

**(17 Hrs)**

**Phylum Coelenterata**

**Type Study:** *Obelia geniculata* - External features, Histology of the colony, Cnidoblast and its functions, Life History of Obelia, Metagenesis.

**General Essays:** Corals & coral reefs, Polymorphism in Coelenterates

**Phylum Helminthes**

**Type Study:** *Taenia solium*- External features, Body wall, Feeding, Respiratory system, Excretory system-flame cells, Nervous system, Reproductive system, Life cycle- Onchosphere and Cysticercus larvae.

**General Essays:** Brief account on a) *Wuchereria bancrofti* b) *Dracunculus medinensis*, c) *Ancylostoma duodenale*.  
Parasitic adaptation in Helminthes.

**UNIT III**

**(17 Hrs)**

**Phylum Annelida**

**Type Study:** *Megascolex mauritii* - External features, Body wall, Coelom, Locomotion, Digestive system, Respiratory system, Excretory system-Meganephridia, Micronephridia, Pharyngeal nephridia, Nervous system, Reproductive system.

**General Essays:** Metamerism in annelids, A Brief Account on vermiculture.

**UNIT IV****(17 Hrs)****Phylum Arthropoda**

**Type study:** *Periplaneta americana* - External features, Body wall, Mouthparts, Digestive system, Respiratory system, Circulatory system, Nervous system, Sense organs, Excretory system, Reproductive system.

**General Essays:** Peripatus- Affinities as a living fossil.

A Brief Account on Apiculture.

**UNIT V****(17 Hrs)****Phylum Mollusca**

**Type Study:** *Pila globosa* - External features, Shell, Digestive system, Respiratory system, Circulatory system, Nervous system, Sense organs- Eyes, Osphradium, Statocyst, Tentacles, Excretory system, Reproductive system.

**General Essays:** Torsion in Mollusca, A Brief Account on Pearl Culture.

**Phylum Echinodermata**

**Type Study:** *Asterias rubens*- External features, Pedicellaria-Structure and Function, Digestive system, Respiratory system, Water vascular system-Structure and Function, Circulatory system-Perihaemal and Haemal system, Nervous system, Sense organs, Excretory system, Reproductive system.

**General Essays:** Larval forms of Echinoderms and their evolutionary significance, Economic importance in Echinoderms.

**TEXT BOOKS**

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Jordan.E.L and Verma.P.S	Invertebrate Zoology	S.Chand and Co	2014
2	N. C. Nair, N. Soundara Pandian, S. Leelavathy, T. Murugan	A Text Book of Invertebrates	Saras Publications	2013

## REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Jan A. Pechenik	Biology of the Invertebrates	Hill McGraw-Hill Companies	2014, 7 <sup>th</sup> Revised Edition
2	Dhami P.S. and Dhami J.K	Invertebrate Zoology	S. Chand & Co	2012, 5 <sup>th</sup> edition
3	Ekambaranatha Ayyar,M. & Ananthakrishnan,T.N	Manual of Zoology Vol-I (Invertebrata) Part I & II	Vishwanathan (p) Ltd.Chennai	2010
4	Fatik Baran Mandal	Invertebrate Zoology	Eastern Economy Edition	2012, 1 <sup>st</sup> edition
5	Kotpal R.L., Agarwal S.K and Ketarpal R.P.R	Modern Text Book of Zoology Invertebrates	Rastogi Publications	2011
6	Rober D. Barnes	Invertebrate Zoology	Brooks W.B.Saunders Company	1994, 6 <sup>th</sup> edition
7	Barrington EJW	Invertebrate Structure and Function	ELBS and Nelson	1979, 2 <sup>nd</sup> edition

### Pedagogy

- Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, peer learning, seminar.

### Course Designers:

1. Dr. P.B. Harathi
2. Dr. M. Sheeba

Course Number	Course Name	Category	L	T	P	Credit
AS17CO2	CHORDATA	Core	71	4	-	5

### Preamble

To understand basic classification, structural and functional details of chordates and to interpret the evolutionary relationships among the major taxa

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Identify the general and specific characteristics of the different classes and the organization of the representative types.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO2	Recognize and describe the major groups of chordates	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO3	Understand the diversity of Chordates and its outline systematic. Discuss their affinities and adaptations to different modes of life.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO4	Understand the unique features, taxonomy and functional morphology of different classes of chordates	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO5	To infer the affinities, evolutionary relationships and adaptation of the major taxa and to explain their economic importance with respect to Chordates.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	L	S	M	M	M
CO2	L	S	M	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

## **CHORDATA - AS17CO2**

**(71 Hrs)**

### **Syllabus**

#### **UNIT I**

**(15 Hrs)**

##### **Phylum Chordata**

Introduction, Three fundamental Chordate characters, Advancements of Chordates over other phyla. Brief classification of chordate with characters.

##### **PROTOCHORDATA- General Characters**

**Type study: Amphioxus-** Affinities and Systematic Position, Habits and Habitat, External features, Body wall, Coelom, Atrium, Digestive System, Respiratory mechanism, Circulatory system, excretory system and Reproductive system.

**General Essays:** Dipnoi- lung fishes-affinities and systematic Position

##### **PISCES- General Characters**

**Type study: Shark -** Systematic Position, Habits and Habitat, External features, Exoskeleton-Placoid Scales, Digestive System, Respiratory system & Mechanism of respiration, Circulatory system -Blood, Heart and pericardium, Arterial system, Venous system, Nervous system-Brain, Spinal cord, cranial nerves and spinal nerves. Sense organs-Olfactory organs, Eyes, Internal ears, Neuromast or lateral line system, Ampullae of Lorenzini. Urinogenital system.

**General Essays:** Accessory respiratory organs in fishes, General account of a) *Oreochromis mossambicus* b) *Labeo rohita* c) *Catla catla*

#### **UNIT II**

**(14 Hrs)**

##### **AMPHIBIA-General Characters**

**Type study: Frog-** Systematic Position, Habits and Habitat, External features, Endoskeleton-Axial skeleton- Skull, Ribs, Sternum Appendicular skeleton-Girdles and Limbs, Sexual dimorphism, Digestive System, Respiratory system- Cutaneous respiration, Buccal respiration and Pulmonary respiration. Respiratory mechanism-inspiration and expiration. Circulatory system-Blood, Heart-Internal structure, Arterial system, Venous system.Nervous system-Brain, Spinal cord, cranial nerves and spinal nerves.Sense organs- Tangoreceptors, Tastebuds, Olfactory organs, Internal structure and functions of Eye and Ear, Urinogenital system

**General Essays:** Parental care in Amphibia, Neoteny in Amphibia



### UNIT III

(14 Hrs)

#### REPTILIA - General Characters

**Type study:** *Calotes* - Systematic Position, Habits and Habitat, External features, Digestive System, Respiratory system- Respiratory mechanism, Circulatory system -Blood, Heart-Internal structure, Arterial system, Venous system. Nervous system- Brain, Spinal cord, cranial nerves and spinal nerves. Sense organs, Jacobson's organs, Internal structure and functions of Eye and Ear, Urinogenital system

**General Essays:** Poison apparatus, Biting mechanism, First aid treatment for snake bite, Common poisonous and non – poisonous snakes in India.

### UNIT IV

(14 Hrs)

#### AVES- General Characters

**Type study: Pigeon** -Systematic Position, Habits and Habitat, External features, Feathers- Structure of a typical feather in Pigeon, Types of feathers in pigeon. Muscular System- Flight muscles, Digestive System, Respiratory system- Syrinx and voice production, Air sacs and functions. Respiratory mechanism, Circulatory system -Blood, Heart-Internal structure, Arterial system, Venous system. Nervous system-Brain, Spinal cord, cranial nerves and spinal nerves, Structure and function of Eye and Ear, Urinogenital system.

**General Essays:** Flightless birds, Migration in birds.

### UNIT V

(14 Hrs)

#### MAMMALIA - General Characters

**Type study: Rabbit-** Systematic Position, Habits and Habitat, External features, Digestive System, Respiratory system, Circulatory system-Blood, Heart-Internal structure, Arterial system, Venous system. Nervous system-Brain, Spinal cord, cranial nerves and spinal nerves. Structure and function of Eye and Ear, Excretory system, Reproductive system.

**General Essays:** An account on Prototheria, Metatheria and Eutheria, Aquatic adaptations in mammals.

## TEXT BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Jordan.E.L and Verma.P.S	Chordate Zoology	S.Chand & Co	2014
2	A. Thangamani S. Prasanna kumar L.M. Narayanan N. Arumugam,	A Text Book of Chordates	Saras Publications	2013

## REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Ekambaranatha Ayyar. M & Ananthkrishnan.T.N	A Manual of Zoology Vol.II- Part I & II	S.Vishwanathan Pvt.Ltd	2010
2	Kotpal R.L	Modern Text Book of Zoology – Vertebrates	Global Media Publications	2012
3	B Waterman, Allyn J	Chordate Structure and Function	Mac Milan & Co	1971

## Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, power point presentation.

## Course Designers:

1. Dr. G. Sasikala
2. Dr. P.B. Harathi

Course Number	Course Name	Category	L	T	P	Credit
AS16CP1	CORE PRACTICAL I	Practical	-	-	90	4

### Preamble

- To enable the students to expose practically
- To learn the taxonomy of invertebrates and Chordates.
- To understand the relationships between invertebrates, Chordates and their environment.
- To learn the location and appearance of internal organs in a typical insect.
- To understand the structure and functional organization of animals.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts of zoological classification, the diversity and relationships between major groups of invertebrates and Chordates. Dissection helps to distinguish among different types of tissues within an insect's body.	K2
CO2	Analyse invertebrates and Chordates in laboratory and field conditions, and use taxonomic keys for identification.	K4
CO3	Application of the skills necessary for self-employment in adopting Field observations of sericulture and Apiary farm.	K3
CO4	To compare and contrasts the life processes in different phyla.	K5

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	S	S	S
CO2	S	S	S	S	S	S
CO3	S	S	S	S	S	S
CO4	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

## CORE PRACTICAL - I AS16CPI

(90 Hrs)

### Syllabus

#### Dissections

1. Cockroach Digestive system, Nervous system, Male & Female Reproductive systems
2. Fish (*Tilapia*)- Viscera, Digestive system, Reproductive system
3. Digital Dissection (15 Hrs)

#### Mounting:

1. Mounting of scales of a marketable fish.
2. Mounting of gill arch.
3. Mounting of earthworm setae (2 Hrs)
4. Mounting of mouth parts of cockroach .

#### Spotters:

**Classify giving reasons:-**Paramecium, Leucosolenia, Obelia colony, Prawn, Octopus, Star fish, Ascidian, Shark, Salamander, Pigeon, Bat (8 Hrs)

**Draw labelled sketches:-**T.S. of Tape worm, Leech, Amphioxus, Frog – Skull, Vertebrae - typical, VIII, IX, X, Pectoral girdle, Pelvic girdle, Fore limb and Hind limb (8 Hrs)

**Relate structure and function:** - Gemmule, Scolex of tapeworm, Nereis -parapodium, Heteronereis, Prawn - Appendages, Honey bee-Queen, Drone, Worker; Quill feather, Tortoise – Carapace and plastron, Narcine – Electric organ, Placoid scale, Snake poison apparatus. (8 Hrs)

**Write descriptive notes:-** Nauplius larva , Pila, Bipinnaria larva, Balanoglossus, Echeneis - Sucker fish, Draco - Flying lizard, Rat snake, Cobra, Hyla (7 Hrs)

**Give biological significance:-** Tape worm entire, Chaetopterus, Peripatus, Limulus, Scorpion, Pearl oyster, Hippocampus male and female, Exocetus – Flying fish, Chameleon (6Hrs)

Observations on the Metamorphosis of silkworm (1Hr)

### **Field observations combined with photography and/or videography**

- 1) Study of live water specimens in nearby water bodies (5 Hrs)
- 2) Study of insect fauna in the college campus (5 Hrs)
- 3) Visit to a sericulture farm (5 Hrs)
- 4) Visit to an Apiary (5 Hrs)
- 5) Visit to a Museum (5 Hrs)
- 6) Study of pond ecosystem (5 Hrs)

### **Culture Methods**

- 1) Culture of unicellular organisms (Amoeba, Paramecium, and Euglena)
- 2) Culture of multicellular organisms (Earthworm) (5 Hrs)

### **REFERENCE BOOKS**

<b>S. No.</b>	<b>Author</b>	<b>Title of the Book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	Sinha. J, Chatterjee. A. K, Chattopadhyay. P	Advanced Zoology Practical	Arunabha Sen Books and Allied (P) Ltd	2011
2	Lal S. S., A	Textbook of Practical Zoology Vertebrate	Rastogi Publication	2004
3	Lal S. S., A	Textbook of Practical Zoology Invertebrate	Rastogi Publication	2004

### **Pedagogy**

- Demonstration, practical, dissection, slides, spotters, field visit, culture methods, power point presentation, e-content, group discussion.

### **Course Designers:**

1. Dr. P.B. Harathi
2. Dr. M. Sheeba

Course Number	Course Name	Category	L	T	P	Credit
AS19CO3	ECOLOGY AND EMBRYOLOGY	Core	56	4	-	4

### Preamble

To understand the basic concepts of ecology & Embryology and to understand the functional details of environments and embryo & its stages.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the basic aspects of classification details of ecology Understand biodiversity, habitat, adaptation organization and flora & fauna of soil & water. effect of light and temperature on living things	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO2	Recall certain morphological attributes and physiological processes that are distinct and significant to each chapter	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO3	Understand the systemic and functional morphology of various concepts of ecology and embryology Explain the basic aspects of structural and functional details of environments and embryo & its stages.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO4	To compare and understand the general and specific characteristics within and other environments in relation to abiotic & biotic factors and stages and development of an embryo	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO5	Interpret the major environments and to explain their ecological importance with respect to abiotic & biotic, with animal relationships and different changes in stages of embryo in its development.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>

### Mapping with Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	M	M	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	S	S	M	M

S- Strong; M-Medium; L-Low

## **ECOLOGY AND EMBRYOLOGY - AS19CO3**

**(56 Hrs)**

### **Syllabus**

#### **UNIT I**

**(12 Hrs)**

Scope of Environmental Biology, Abiotic factors – Soil, Water, Light, Temperature. Biotic factors, Animal Relationships: Symbiosis, Mutualism, Commensalism, Antagonism, Parasitism, Predation, Competition, Population attributes: natality, mortality, population growth, population density, growth curves, Age pyramids, Biotic potential, Population regulation.

\*Biogeochemical cycles–Carbon, Oxygen, Nitrogen, Phosphorus and Sulphur cycles.

#### **UNIT II**

**(11 Hrs)**

Community ecology – Definition, Types and Characteristics of community, Ecotone and Edge Effect, Ecological niche, Concepts of community, Ecological succession- sere and climax, Significance of succession. Habitat ecology – Marine Habitat-Definition, Stratification, Pelagic region – communities, plankton, Pelagic adaptations; Intertidal seashore – rocky, muddy, sandy – biota and adaptations.

\*Mangroves –Definition, Mangrove fauna and flora, Ecological conditions of mangroves.

#### **UNIT III**

**(11 Hrs)**

Scope of Developmental Biology-definition, sub-divisions (Descriptive, Comparative, Experimental and Chemical). Early history of embryology. (Preformation and Epigenesis, Recapitulation theory or Biogenetic law, Germplasm theory (Weisman). Gametogenesis-Spermatogenesis –Spermiogenesis, Structure and types of sperms; Oogenesis- Growth of oocyte, vitellogenesis, organization of egg cytoplasm, Polarity and Symmetry, Maturation of egg, egg envelopes, Structure of Ovum; Fertilization-Definition, External and internal fertilization, Mechanism of fertilization. Cleavage- Patterns of cleavage-radial, spiral and bilateral; Types of cleavage - meroblastic and holoblastic. Blastulation-Types of Blastula; Fate map of frog, Gastrulation in frog. Morphogenetic movements- epiboly and emboly.

\*Types of eggs.

#### **UNIT IV**

**(11 Hrs)**

Organogenesis in frog – Development of eye, ear, brain & heart. Organizer concept: Embryonic Induction, Role of organizers in development- Transplantation experiments of Spemann and Mangold. Chemistry of organizers. Extra-embryonic membranes in chick. Placentation in mammals-

Classification of placenta based on Nature of contact, Mode of implantation, Histological intimacy of foetal and maternal tissue. Functions of placenta.

\*Metamorphosis in frog

## UNIT V

(11 Hrs)

Human Reproduction: Puberty, Menstrual cycle, Reproductive Hormones Menopause, Pregnancy, Parturition, Lactation, Infertility, Artificial insemination, Cryopreservation, Embryo transfer, Amniocentesis, Artificial Reproductive Technology-. ZIFT, GIFT and IVF. Birds eye view of stem cells

\*Test-tube baby and its Merits & Demerits.

\*Denotes self study

### TEXT BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Arumugam, N	A Text Book of Embryology	Saras Publication	2003
2	Verma P.S., Agarwal., V.K	Environmental Biology	S. Chand & Company	2000

### REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Balinsky, B.I	Introduction to Embryology	Saunders College Publishing	1981
2	Berrill, N.J	Developmental Biology	Tata Mc Graw Hill Publication Co.Ltd	1986
3	Clarke,G.L.	Elements of Ecology	John Wiley & Son Inc. New York & London	1954
4	Kotpal,R.L. and Bali,N.P.	Concepts of Ecology	Vishal Publication, Delhi	1986
5	Odum, E.P.	Basic Ecology	Saunders College Publishing , New York	1983
6	Scott F. Gilbert,	Developmental Biology	Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts	1997



7	Vijayaraghavan Nair K & P.V. George	A Manual of Developmental Biology	Academica	-
8	Vincent Terrence Robello, John P.C. and Prema A K	Developmental Biology	Zoological Society Study Material Series, Zoological Society of Kerala, Kottayam	2012

### **Pedagogy**

- Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, peer learning, seminar

### **Course Designers**

1. Dr. N. Ezhili
2. Dr. M. Sheeba

Course Number	Course Name	Category	L	T	P	Credit
AS19C04	CELL BIOLOGY AND BIOCHEMISTRY	Core	56	4	-	4

### Preamble

To enable the students to explore the intricacies of cell architecture and their complex biochemical interactions.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	To impart knowledge about the prokaryotic and eukaryotic cell, its complex organization, biosynthesis of cellular membranes and organelles and the unified role it plays for the ultimate sustainability of the organisms	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO2	Rigorous foundation in the principles of molecular and cellular biology give insights into the mechanisms involved in the synthesis and function of macromolecules such as DNA, RNA, and proteins	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO3	Ability to make connections between the molecular mechanisms, holistic understanding of biological organisation and function from the molecules to cells, tissues, organs and entire organism	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO4	Studying biochemistry and molecular cell biology trains the students to think logically, critically and quantitatively	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO5	Learn to interpret statements made in the scientific literature, as well as in non-science areas, based on evidence, not anecdotes	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	S	S	M	M
CO3	S	S	S	S	S
CO4	L	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M- Medium; L-Low

## **CELL BIOLOGY AND BIOCHEMISTRY - AS19C04**

**(56 Hrs)**

### **Syllabus**

#### **UNIT I**

**(12 Hrs)**

Scope of Cell Biology; Cell theory, General Characteristics of Prokaryotes, Structure of a Typical Animal Cell and its Organelles, Plasma Membrane - Structure, Fluid Mosaic Model, Unit Membrane Model – Functions- Active Transport, Passive Transport - Cytoskeleton

\*Microscopes – Principle and Uses of Optical, Phase Contrast and Electron Microscope

#### **UNIT II**

**(11 Hrs)**

Golgi Bodies – Ultra Structure and Functions, Endoplasmic Reticulum - Ultrastructure, Types and Functions, Lysosomes - Ultrastructure and Functions, Polymorphism in Lysosomes, Ribosomes – Structure and Functions Cell centre - Structure and Functions

\*Cancer – Types and Properties of Cancer Cells; Theories on Carcinogenesis

#### **UNIT III**

**(11 Hrs)**

Mitochondria – Ultrastructure, mDNA and functions, Mitochondrial enzymes, Oxidative phosphorylation, Krebs's cycle, Fatty acid oxidation, ATP production. Ultrastructure of Interphase Nucleus and Nucleolus; Chromosome – structure, organization, types and functions.

\*Giant chromosomes – polytene, lamp brush chromosomes.

#### **UNIT IV**

**(11 Hrs)**

DNA – Structure, Chemical Composition, Watson and Crick, Replication; RNA - Structure, Chemical Composition, Types – mRNA, tRNA, rRNA; DNA Repair Mechanism – Enzymatic Photo reactivation, Excision Repair, Recombination Repair; cell cycle.

\*Cell Cycle and Cell Division

#### **UNIT V**

**(11 Hrs)**

Scope of Biochemistry–Classification–Aldoses, Ketoses, Monosaccharide, Disaccharides, Polysaccharides (homo, hetero). Proteins–Types of Amino acids, Primary, Secondary, Tertiary Structure of Proteins. Lipids – Simple lipids, Complex lipids, Phospholipids, Glycolipids, Lipoproteins. Enzymes– Michaelis–Menten Equation

\*Enzyme action – Factors Affecting Enzyme Action, Mechanism of Enzyme Action

\*Denotes self study.

### TEXT BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Ambika Shanmugam	Fundamentals of Biochemistry for Medical Students	Wolters Kluwer (India) Pvt Ltd, New Delhi	2012
2	Verma P.S., Agarwal., V.K	Cytology	S. Chand & Company	2012
3	Veer Bala Rastogi	Introduction to Cytology	Introduction to Cytology	2003

### REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Albert L Lehninger	Biochemistry, Second Edition	Kalyani Publishers, New Delhi	2 <sup>nd</sup> Edition
2	De Robertis, E.D.P. and De Robertis, E.M.F	Cell and Molecular Biology	Lippincott Williams and Wilkins, Philadelphia	8 <sup>th</sup> Edition
3	Satyanarayana U and Chakrapani U	Essentials of Biochemistry	Book and Allied (P) Ltd.	2009
4	Karp, G	Cell and Molecular Biology: Concepts and Experiments	John Wiley & Sons. Inc.	6 <sup>th</sup> Edition, 2010

### Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

### Course Designers

1. Dr. P.B. Harathi
2. Dr. M. Sheeba

Course Number	Course Name	Category	L	T	P	Credit
AS16CP2	CORE PRACTICAL II	Practical	-	-	90	4

### Preamble

To provide practical knowledge on cell biology, environmental and developmental biology and to develop practical biological skills.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts biology-based knowledge on the life of animal forms and the environment. To understand the concepts of natural habitats and the effects of ecological parameters. To understand the process by which organisms grow and develop.	K2
CO2	Analyse basic components of the ecosystem and their interactions and inter-relationships to sustain life on earth. Analyse the different ecological parameters and to analyse the mechanisms that intervene in developmental alterations.	K4
CO3	Application of the acquired skills and adopting it for future research.	K3
CO4	To compare the practical knowledge on cell biology, environmental and developmental biology and develop practical biological skills.	K4

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S

S- Strong; M-Medium; L-Low

## **CORE PRACTICAL II - AS16CP2**

**(90 Hrs)**

### **Syllabus**

## **CELL BIOLOGY**

**(12 Hrs)**

1. Squash preparation of onion root tip.
2. Squash preparation of Grasshopper Testis/ Tradescantia anther.
3. Mounting of giant chromosomes in Drosophila larva.

## **BIOCHEMISTRY**

**(6Hrs)**

1. Qualitative analysis of carbohydrates, proteins and lipids.

## **ENVIRONMENTAL BIOLOGY**

**(42Hrs)**

1. Estimation of dissolved oxygen in water samples by Winkler's method.
2. Estimation of salinity, pH and temperature in water samples.
3. Estimation of free carbon dioxide in water samples.
4. Mounting and identification of Marine and Fresh water plankton.
5. Identification and study of inter tidal, rocky sandy and muddy shore fauna.
6. Estimation of total alkalinity of water and soil.
7. Estimation of total hardness of water.
8. Trip to a terrestrial ecosystem

## **DEVELOPMENTAL BIOLOGY**

**(30 Hrs)**

### **Spotters**

1. Observation of different types of eggs – Amphioxus, frog, hen's egg, ovum of mammal
2. Observation of different types of sperms- Sperm of frog, sperm of man.
3. Embryology of Frog – Cleavage, Blastula, Gastrula, Yolk plug.
4. Chick embryo whole mount – 24, 48, 72 & 96 hours.
5. Metamorphosis in frog.
6. Placenta of mammals - pig, sheep and man.

## REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Sinha. J, Chatterjee. A. K, Chattopadhyay. P	Advanced Zoology Practical	Arunabha Sen Books and Allied (P) Ltd	2011
2	Lal S. S., A	Textbook of Practical Zoology Vertebrate	Rastogi Publication	2004
3	Lal S. S., A	Textbook of Practical Zoology Invertebrate	Rastogi Publication	2004

## Pedagogy

- Demonstration, practical, dissection, slides, spotters, field visit, culture methods, power point presentation, e-content, group discussion.

## Course Designers

1. Dr. G. Sasikala
2. Dr. M. Sheeba

Course No	Course Name	Category	L	T	P	Credit
AS19SB01	SERICULTURE I	Core	43	2	-	3

### Preamble

This course aims to understand the fundamental concepts of Sericulture and to impart scientific & entrepreneurial principles and techniques involved in silkworm production etc.

CO Number	CO Statement	Knowledge Level
CO1	To recall the historical perspective of sericulture, concepts of its origin, scope and significance. To understand the economic advantages of sericulture and its role towards rural development and employment.	K <sub>1</sub> , K <sub>2</sub>
CO2	To acquaint the general aspects of sericulture industry. To study the biodiversity of silkworms in India and worldwide and importance of sericulture byproducts.	K <sub>1</sub> , K <sub>2</sub>
CO3	To understand the classification of biology of silkworm <i>Bombyx mori</i> . To study the morphology of silkworm and its anatomical features.	K <sub>1</sub> , K <sub>2</sub>
CO4	To understand the biology and rearing of non-mulberry silkworms. To gain knowledge on silkworm rearing techniques	K <sub>1</sub> , K <sub>2</sub>
CO5	To familiarize with the common diseases and pests of non-mulberry silkworms and their management.	K <sub>2</sub> , K <sub>3</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	S	S	M	M
CO3	S	S	S	S	S
CO4	L	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M- Medium; L-Low



## **SERICULTURE I - AS19SB01**

**(43 Hrs)**

### **Syllabus**

#### **UNIT I**

**(8 Hrs)**

Introduction to sericulture – Origin and history of Sericulture – Silk Road, spread of Sericulture to Europe, South Korea, Japan, India and other countries. Sericulture map of India and World: Components of Sericulture. Employment generation in sericulture-Role of women in sericulture. Role of silk fibers amongst natural fibers

#### **UNIT II**

**(8 Hrs)**

Classification and Taxonomic characters: Phylum, class, order, family, genus and Species-Distribution and varieties of silkworms – Mulberry & non-mulberry – Tasar, Eri, Muga worms. Distribution and Races: Geographical distribution in the world and India and Exotic and indigenous races.

#### **UNIT III**

**(9 Hrs)**

Egg: External and internal morphology and colour change. Larvae: Mouth parts, legs, prolegs, spiracles, eyes, claspers and integumentary hair and sexual markings. Pupa: Male and Female Morphology and sexual dimorphism Adult: Mouth parts, antenna, wings, external genitalia. Digestive system: Alimentary canal and physiology of digestion. Silk glands: Structure, development and mechanism of silk synthesis. Circulatory system: Dorsal vessel, haemolymph and haemocytes.

#### **UNIT IV**

**(9 Hrs)**

Reproductive system: Male and female systems, mechanism of egg development. Life cycle of *Bombyx mori* – Reproductive system, Morphology of egg, larva, pupa and adult life span and bionomics, circadian rhythm, and behavior and growth rate of *Bombyx mori*. Exocrine glands: Structure, morphology and secretion of exocrine glands. Pheromone: sex attractants and their role in mating.

**UNIT V****(9 Hrs)**

Diseases of silkworms – Viral, bacterial, fungal, and protozoan: pathogens –Flacherie, Grasserie, Muscardine, Pebrine. Causes of various diseases, precaution Measures, control of diseases – disinfection methods. Disinfection and maintenance of hygiene during silkworm rearing

**REFERENCE BOOKS**

<b>S. No.</b>	<b>Author</b>	<b>Title of the Book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	Ganga, G and Sulochana Chetty	An Introduction to Sericulture	Oxford and IBH Publishing Co., Pvt., Ltd., New Delhi	1991
2	Venkata Narasiah	Sericulture in India	Ashesh Publishing House, New Delhi	2003
3	Dr. N. G. Djha and Dr.Priyan Panday	Silk Production	APH publishing Corporation, New Delhi	2004

**Pedagogy**

- Lecture by chalk and talk, power point presentation, demonstration, field visit, e-content, doing experiments, group discussion, assignment, peer learning, seminar.

**Course Designer**

1. Mrs. Susheela.P

Course Number	Course Name	Category	L	T	P	Credit
AS19SBP1	SERICULTURE PRACTICAL - I	Practical	-	-	45	2

### Preamble

To enable the students to understand the life cycle and morphological features of different types of silkworms, types of silk, pests of silkworm, learn the anatomical features of *Bombyx mori* and its rearing and various diseases that affect the silkworms and their management.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	To learn the history and distribution of sericulture in India and world.	K <sub>1</sub>
CO2	To distinguish between the properties of different types of silk	K <sub>2</sub> , K <sub>3</sub>
CO3	To understand the characteristic features of young age and late age silkworms	K <sub>2</sub> , K <sub>3</sub>
CO4	To correlate the production of silk and other fibres in India and other countries of the world	K <sub>2</sub> , K <sub>3</sub>
CO5	To give scientific knowledge about silkworm rearing techniques so as to enable entrepreneurship skill.	K <sub>2</sub> , K <sub>3</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	S	S	M	M
CO3	S	S	S	S	S
CO4	L	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M- Medium; L-Low

## SERICULTURE PRACTICAL I - AS19SBP1

(43 Hrs)

### Spotters:

1. Morphology and Life cycle of the mulberry silkworm - *Bombyx mori*.
2. Identification of different types of silk.
3. Pests and diseases of silkworm.
4. Microscopic and physical properties of natural fibres-cotton, silk.
5. Morphology and life cycle of Eri silkworm.
6. Morphology and life cycle of Tasar silkworm.
7. Morphology and life cycle of Muga silkworm.

### Dissection:

8. Dissection of the digestive systems in silkworm
9. Dissection of nervous system and silk glands in silkworm
10. Dissection of male and female reproductive systems of silk moths

### Sericulture maps:

11. World maps and Silk Road.
12. Sericulture map of India and Tamil Nadu.

### Preparation of histograms and pie charts on:

13. Production of textile fibers in India.
14. World silk production.
15. Pie chart on mulberry and non-mulberry silk production in India

### Field visit:

16. Visit to a Sericulture unit and submission of report

Course Number	Course Name	Category	L	T	P	Credit
AS18CO5	GENETICS AND EVOLUTION	Core	56	4	-	5

### Preamble

To understand the fundamental concepts of genetics, the principles and mechanism of inheritance and the origin and evolutionary process of organisms

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the core principles of genetics, the historical background, genetic crosses, basic laws governing the pattern of qualitative characters, linkage and crossing over.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO2	Apply knowledge about transcription, translation and the genetic code to understand the flow of genetic information from DNA to proteins	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO3	Understanding the applications of genetics for the welfare of health and treatment of disease, and the impact of selective advantage and natural selection on human genetic disorders.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO4	To understand the evolutionary events those has occurred throughout Earth's geological history starting with the hypotheses on the origin of life and identify the key events in human evolution. Know how to obtain current information about scientific and clinical applications of genetics, particularly from specialized genetics services.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO5	Analyze the processes in population genetics and describe how they affect the genetic diversity within a species Compare and contrast the various theories on formation of new species and identify the factors that play a role in the process of evolution and understand the genetic basis of evolutionary change.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	L	S	M	M	M
CO2	S	S	M	M	S
CO3	L	S	S	S	S
CO4	S	S	S	S	S
CO4	S	S	S	M	S

S- Strong; M-Medium; L-Low

## **GENETICS AND EVOLUTION- AS18CO5**

**(56 Hrs)**

### **Syllabus**

#### **UNIT I**

**(12 Hrs)**

Mendelian Principles- Monohybrid cross and Dihybrid cross, Interaction of genes- Supplementary genes, Complementary genes, Epistasis, Atavism, Linkage in Drosophila – Complete and Incomplete Linkage, Theories of linkage, factors affecting linkage; Crossing over- types of crossing over, mechanism of crossing over, Cytological basis of crossing over – Stern's experiment, Significance and factors affecting crossing over.

\*Sex Linked Inheritance- Inheritance of eye colour in Drosophila; Inheritance of colour blindness and Haemophilia in man; Y linked inheritance- hypertrichosis, Sex limited inheritance

#### **UNIT II**

**(11 Hrs)**

Fine structure of a gene -Cistron, Recon, Muton, Operon Concept, Genetic Code. Gene mutation -Molecular basis- tautomerism, base analogues, Spontaneous and induced mutations. Detection of mutation by CLB method. Chromosomal aberrations: Types- Intra chromosomal aberrations: deficiencies, duplication, inversions, shifts & isochromosomes. Inter chromosomal aberrations: translocation. Ploidy – Euploidy, aneuploidy.

\*Mutagens- physical and chemical

#### **UNIT III**

**(11 Hrs)**

Animal breeding, inbreeding, out breeding-heterosis / hybrid vigour, Eugenics Positive and Negative Eugenics; Euphenics and Euthenics; Inborn errors of metabolism- Phenyl Ketonuria, Galactosemia, Genetic disorders in man – Klinefelter's syndrome, Turner's syndrome, Down's syndrome, Cri – du – chat, Inherited single gene disorder- Sickle cell anaemia, Cystic fibrosis, Thalassaemia; Sex determination – Heterogametic male and Homogametic female. Geneic balance theory of Bridges

\*Gene Therapy.

#### **UNIT IV**

**(11 Hrs)**

Origin of life - Abiogenesis and Biogenesis. Concept of Oparin - Haldane, Miller-Urey Experiments, Theories of evolution – Lamarckism and Neo-Lamarckism, Darwinism and Neo-

Darwinism, Modern synthetic theory. Geological time scale - eras, periods and epochs, Fossils – fossilization and its significance, dating of fossils, Causes and Role of Extinction in Evolution.

\*Evolution of Man- *Ramapithecus*, *Australopithecus*, Java man, Peking man, Neanderthal man, Cro- Magnon man and Modern man

## UNIT V

(11 Hrs)

Population Genetics - Gene pool, gene frequency, Factors affecting Hardy-Weinberg Law; Forces of Evolution – mutation, gene flow, genetic drift, and natural selection. Isolation – Pre-mating and post mating isolating mechanisms; Micro and Macro evolution, Co-evolution.

Speciation-Methods of speciation – Allopatric, sympatric, Parapatric, and Quantum Speciation; Continental Drift – distribution of animals.

\*Origin of India and its Mega diversity

\*Denotes self study

## TEXT BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Verma,P.S and Agarwal,V.K	Genetics	S.Chand & Co	1995, 8 <sup>th</sup> Edn.
2	Verma,P.S and Agarwal,V.K	Concept of Evolution	S.Chand &Co	2002

## REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Dodson, E.O	Evolution: Process & Product	East West Press Co	1968
2	Gardner E.J.	Principles of Genetics, ,	Wiley Eastern Pvt. Ltd	1972
3	Robert H.Tamarin	Principles of Genetics	Tata McGraw Hill	2002
4	Sinnott. E.W. Dunn. L.C and Dobzhansky. T.	Principles of Genetics	Tata McGraw Hill	1973. 4 <sup>th</sup> Edn.
5	Gangane, S. D.	Human Genetics	Churchill Livingstone	2000

6	Hall, B. K. and Hallgrimsson, B.	Evolution	Jones and Bartlett	2008, 4 <sup>th</sup> Edn.
7	Dobzansky, T.	Genetics and the origin of species	Oxford and IBH Co	1976
8	Savage, J.M.	Evolution	Amerind Publishing Co	1976

### **Pedagogy**

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

### **Course Designer**

1. Mrs.Susheela.P



Course Number	Course Name	Category	L	T	P	Credit
AS18C06	<b>BIOPHYSICS, BIOSTATISTICS &amp; BIOINFORMATICS</b>	Core	56	4	-	4

### Preamble

Develop a fundamental understanding of basic concepts and tools in biophysics, biostatistics and bioinformatics

### Course Outcome

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	To determine the physical phenomena which influence living organisms. Fundamental statistical concepts and some of their basic applications in science and society. Develop a fundamental understanding of basic concepts of biophysics and bioinformatics	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO2.	Develop a thorough grounding in fundamental analytical approaches for quantitative study of living systems and life processes. Shall know how to organize, manage, and present data. Describe the contents and properties of the most important bioinformatics databases, perform text- and sequence-based searches	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO3.	Application of physics to the study of biological molecules, living systems and life processes. Carrying out exercises or small projects that incorporate data presentation.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO4.	Obtain and analyze information and data relating to specific genes using a number of specific databases, bioinformatics principles and tools	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO5.	To educate the interdisciplinary nature of advances in biophysics, bioinformatics and computational biology	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	M	L	H
CO2	S	S	M	M	M	H
CO3	S	S	S	S	M	H
CO4	S	S	S	S	M	M
CO5	S	S	S	S	M	M

S- Strong; M-Medium; L-Low

**BIOPHYSICS, BIOSTATISTICS & BIOINFORMATICS – AS18C06 (56 Hrs)**

**Syllabus**

**UNIT I (12 Hrs)**

**Biophysics**

Light- components – its effect on living organisms – Vision, Pigmentation, Bioluminescence. Laws (First and Second law) of Thermodynamics - Living systems and Entropy changes – Free Energy - Living systems and Equilibrium State. Radioactivity: Isotopes – General properties of radioactive reactions – Alpha, Beta and Gamma radiation – Half-life, Unit of radioactivity.

\*Uses of Radioactivity

**UNIT II – Biophysics (11 Hrs)**

PH meter: Digital, Analog - Colorimetry and Spectrophotometry: Principle, Instrument description and Application - Chromatography: Paper, Thin Layer chromatography, Ion exchange chromatography and Applications - Electrophoresis: Paper and Gel electrophoresis - Principle and Applications. Centrifuge - Basic Principle of Centrifugation, Instrumentation of Ultracentrifuge

\*Colloids-description, types, properties and separation.

**UNIT III – Biostatistics (11 Hrs)**

Organization of Statistical investigation- object and scope - Data: Sources, primary and secondary methods of collection, tabulation - Types of variables: Continuous and discontinuous variables, Qualitative and quantitative-variables. Diagrammatic representation: line, bar, pie, pictogram, cartogram – Graphic representation: Histogram, Frequency polygon, Frequency curve, Ogive Frequency distribution. (Direct Method)

\*Frequency graphs.

**UNIT IV – Biostatistics (11 Hrs)**

Arithmetic mean - Standard deviation - Standard error - Chi – square test - Students ‘t’ test - Regression – Correlation – ANOVA one way (Direct Method).

\*Basics of Research Methodology.

**UNIT V – Bioinformatics (11 Hrs)**

Introduction to bioinformatics – Biological Databases, Comparison of sequences: pair wise and multiple alignments – popular search methods – FASTA, BLAST & CLUSTAL – GENBANK, EMBL. Molecular visualization tools: RasMol.

\*Applications of Bioinformatics in the field of Biology; Medical Transcription.

\* Denotes self study

## TEXT BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Daniel, M	Basic Biophysics and Biologists	Wiley International, New Delhi	1992
2	Das, D	Biophysics and Biological Chemistry	Academic Publishers, Calcutta	1996
3	Mani K and Vijayaraj . N	Bioinformatics for Beginners	Kalaikathir Achchagam, Tamilnadu	2002
4	Palanichamy S and M. Manoharan	Statistical methods for Biologists	Paramount Publications	2009
5	Pranab Kumar Banerjee	Introduction to Biostatistics	S. Chand Publishers	2011
6	Roy R N	A Textbook Of Biophysics	Publisher, New Central Book Agency	2001
7	Snedecor, G.W. and W.G. Cochran	Statistical Methods	Oxford & IBH Publishing, New Delhi	2001

## REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Arthur. M. Lesk	Introduction to Bioinformatics	Oxford University Press	2003
2	Gupta S P	Statistical Methods	S. Chand & Sons	2008
3	Zar, J.H	Biostatistical analysis	Prentice Hall Inc., New Jersey, USA	1974

### Pedagogy

- Lecture by chalk and talk, power point presentation, e-content, Numerical exercise, group discussion, assignment, quiz, peer learning, seminar, On- line learning

### Course Designer

1. Dr. P. B. Harathi

Course Number	Course Name	Category	L	T	P	Credit
AS18C07	BIOTECHNOLOGY	Core	56	4	-	4

### Preamble

Upon successful completion of this course the students recognize the foundation of modern biotechnology, principles and the different applications of biotechnology. Though Biotechnology has ancient roots, recent developments in genetic engineering has made this subject more attractive.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	To impart comprehensive understanding of the principles and practices of biotechnology.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO2	Understanding the principles and practices of biotechnology give insights into the DNA Technology, Technique of genetic engineering, DNA Finger printing, Methods of DNA profiling and animal tissue culture.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO3	Application of genetic engineering in prevention and diagnosis of diseases and discuss the different applications of biotechnology	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO4	Understanding the application of genetic engineering, DNA Finger printing, DNA profiling and animal tissue culture in Life Sciences Research trains the students to think logically.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO5	Interpretation will empower students to think and solve problems in the field of biotechnology.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	L	L	S	S	S
CO2	M	S	S	S	S
CO3	M	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

## **BIOTECHNOLOGY - AS18C07**

**(56 Hrs)**

### **Syllabus**

#### **UNIT I**

**(12 Hrs)**

Definition and landmarks in the history of Biotechnology. Global impact of Biotechnology- Biotechnology in India - Prevention of misuse of Biotechnology - Microorganisms important in Biotechnology – Virus, Bacteria and Fungi. Applications of genetic engineering in industry- Alcoholic fermentation: Ethanol - Medicine: Insulin, Antibiotic production: Penicillin- Agriculture: Nitrogen fixation by symbiotic and non-symbiotic bacteria nodule formation, Cloning of nif genes - Vaccines for Polio virus, Hepatitis B virus, Rabies virus, Small pox virus, Malaria vaccines.

\*Major areas of Biotechnology.

#### **UNIT II**

**(11 Hrs)**

Basics of genetic engineering (DNA Technology). Enzymes: Exonucleases, Endonucleases, Restriction enzymes, DNA Ligase, DNA Polymerase - Vectors : Plasmid vectors, Vectors based on the lambda Bacteriophage, Cosmids, M13 vectors, Expression vectors, Vectors for cloning and expression in Eukaryotic cells, Insertion vector, Replacement vector.

\*Genomic library

#### **UNIT III**

**(11 Hrs)**

Technique of genetic engineering – cDNA library - Gene transfer – Introduction of rDNA into host cells - Microinjection, Electroporation, Microprojectile, Shot Gun method, Ultrasonication, Liposome fusion, Microlaser - Application of the cloned genes in diagnosis of diseases through DNA probe, Prevention of diseases.

\*Polymerase chain reaction

#### **UNIT IV**

**(11 Hrs)**

DNA Finger printing, Methods of DNA profiling - Applications of DNA finger printing– Hurdles of DNA profiling – Satellite DNA, Biosensors – Types of biosensors, Biochips - Principles of Biochips - Applications of biochips. Antisense RNA technology – Cancer and Treatment.

\*Human genome project.

**UNIT V****(11 Hrs)**

Principles and techniques of animal tissue culture: Requirements for animal cell, tissue and organ culture – Cultivation of animal cell in bioreactor – Somatic cell culture, Organ culture - Insect culture, Production of commercial products from insect culture-Transgenic Technology- Manipulation of reproduction in animals – Invitro fertilization and gene transfer in Humans- Transgenic Fish, Sheep - Antenatal diagnosis. Monoclonal antibodies production and application – Cryobiology.

\*Transgenic Pig – Molecular Pharming.

\*Denotes self study

**TEXT BOOKS**

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Ignachimuthu, S.	Basic Biotechnology	Tata McGraw Hill Publishing Company Ltd., New Delhi	1998
2	Dubey R.C.	A Text Book of Biotechnology	S. Chand & Co., Ltd., New Delhi	2005
3	Kumaresan, V.	Biotechnology	Saras Publications, Nagercoil	2004
4	Bhatia, S.C.	Textbook of Biotechnology	Atlantic	2006

**REFERENCE BOOKS**

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Alexander, N. Glazer and Hiroshi Nikado	Microbial Biotechnology: Fundamentals of Applied Microbiology	Cambridge University Press	1995
2	Glick, B.R., Pasternak, J.J.	Molecular Biotechnology	ASM Publisher	2003
3	Jogdand, S.N.	Environmental Biotechnology	Himalaya Publishing House, Bombay	1995
4	Old, R.W. and Primrose, S.B.	Principles of Gene manipulation	Blackwell Scientific Publications	1994

5	Das, H.K.	Textbook of Biotechnology, Second Edition	Wiley-India Publications	2010
6	Sangita Malvee	Biotechnology-An Introduction	SBS Publishers and Distributors	2007
7	Prakash, M.	Textbook of Biotechnology	Sonali Publication	2009

### **Pedagogy**

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

### **Course Designer**

Dr. G. Sasikala

Course Number	Course Name	Category	L	T	P	Credit
AS18E01	<b>PATHOLOGY &amp; MEDICAL LABORATORY TECHNOLOGY</b>	Elective	56	4	-	4

### Preamble

Upon successful completion of this course the student will be able to

- Collect and prepare human samples for analysis.
- Operate and calibrate clinical laboratory instruments, recognize and correct basic instrument malfunctions
- Understand the technical and procedural aspects of laboratory testing for gastric juice, urine and faecal matter and perform various staining techniques for bacterial pathogens.
- Interpret body fluid tests, detect abnormalities, assign a diagnosis.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand fundamental analytical principles and processes used in clinical laboratory testing for gastric juice, urine and faecal matter. Understand the concepts and safety measures of clinical laboratory instruments.	K1
CO2	Acquired technical skills will help the students for collecting and processing biological specimens for analysis.	K1
CO3	Application of medical laboratory procedures will enable the students to distinguish normal and abnormal microscopic pathogens.	K2
CO4	Students enable their critical and analytical thinking in the detection of diseases.	K2
CO5	Interpretation will empower students to compare and contrast clinical laboratory procedures, interpret data and predict diagnosis.	K3

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	S	S	M	M
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M- Medium



**PATHOLOGY & MEDICAL LABORATORY TECHNOLOGY - AS18E01 (56 Hrs)**

**Syllabus**

**Unit I (12 Hrs)**

**Essential pre – requisites of a medical laboratory**

Introduction, Scope of CLT, Collection of specimens-Collection of blood, CSF & other fluids and Urine. Use of preservatives. Anticoagulants. Maintenance of Laboratory records and preparation of reports. Cleaning, maintenance and care of glassware-Definitions and types of sterilization, disinfection, antisepsis. Different methods of sterilization: Heat, radiation, filtration, chemical methods. Disposal of specimens and infected materials, Safety precautions against infection by microbiological specimens.

**Laboratory instruments**

Method of measuring liquids and weighing solids, General laboratory equipments-Principle, use and maintenance of the following instruments/apparatus – Balance, centrifuge, cold centrifuge, homogenizer, desiccators, vortex mixer, magnetic stirrer, centrifuges, Albuminometer, Urinometer and Sahli's haemoglobinometer and haemocytometer.

\*Spectrophotometry.

**Unit II (11 Hrs)**

**Clinical haematology**

Blood and its constituents, Collection of blood –capillary and venous blood collection, various anticoagulants and their uses. Total count of RBCs, WBC. Estimation of Haemoglobin – Principles, techniques. Haemoglobin estimation by Sahli's method. Erythrocyte Sedimentation Rate (ESR) (Wintrobe and Westergren method), Clinical significance of ESR and PCV. Bleeding time, clotting time. Principles of blood groups and antigen antibody reactions Blood groups – ABO system, Blood grouping & typing. Blood transfusion – Indication, universal donor and recipient concept. Anticoagulants – Classification, examples and uses. Compatibility test (Coombs test) and its significance, A – B – O Grouping: Tile method, Standard tube technique.

\*Rhesus grouping techniques

\*Total RBC, WBC count and Differential count

### Unit III

(11 Hrs)

#### Gastric & liver function tests

Composition, collection and stimulation of gastric juice secretion. Augmented histamine test; Estimation of titrable free and total acidity and inference. Functions of Liver, Fouchest test, Qualitative test for urine urobilinogen. Scheleringer's test for urine urobilin. Disease of the liver-Jaundice, acute and chronic hepatitis, Cirrhosis, Cholestasis etc.

#### Urine Analysis

Urine composition, volume, appearance, color, collection and preservation. Physical and chemical examination of urine- Heat and acetic acid test, Sulfosalicylic acid test. Microscopic examination of organized and unorganized deposits and blood; Urine test for bile salts. Detection of protein in urine (Bence Jones protein test); Determination of specific gravity using urinometer.

#### Faecal Examination

Collection and preservation, examination of faeces for color, mucus, consistency, ova, amoeba, cysts, parasites, pus cells, RBC and crystals. Detection of occult blood in stool-Benedictine test, Guaiac test, Orthotolidine test. Stool concentration methods- Sodium chloride and formaldehyde methods for concentration of parasites. Staining of faecal smears and blood films. Examination of faeces for adult helminth worms.

\*Examination of faeces ova and cysts of *Entamoeba coli*, *E. histolytica*, *Giardia lamblia*, *Enterobius vermicularis*.

### Unit IV

(11 Hrs)

#### Microbiological Examination

Microscopic examination of bacteria smearing; Hanging drop preparation and wet preparation. Staining *Corynebacterium diphtheriae*. Examination of sputum. Volume, Consistency, Appearance and color. Examination of throat swab. Collection and preparation of smears. Bacteriological examination of urine. VDRL – test. Brief biology and pathology of *Vibrio cholera*, *Corynebacterium diphtheriae*, *Mycobacterium tuberculosis*, *M. leprae*, *Treponema palladium*, *Salmonella typhi* and *Clostridium tetani*.

\*Hanging drop preparation–gram's staining +ve and –ve; Outline biology of fungi

## Unit V

### Microorganisms and pathology

(11 Hrs)

Collection of microbiological specimens and precautionary measures for investigation. Bacterial toxins and their effects Routine mycological methods. Laboratory diagnosis of mycotic infection. Superficial wounds and pathology of Poliomyelitis, Rhinovirus group, Influenza virus, Measles virus (Rubella), Meningitis virus, Serum hepatitis virus (HBV)

\*Indigenous microbial flora of man- Its significance in health and diseases of man.

\*Denotes self study.

### TEXT BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Kanai, L Mukherjee	Medical Laboratory Technology	Tata McGraw Hill Publishing Company Ltd., New Delhi	1998
2	Ramnicks Sood, M.D	Medical Laboratory Technology	Medical Publishers(P)Ltd	1985

### REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Arumugam.N	Microbiology (General & Applied)	Saras Publication	2000
2	Madhavan Kutty, K	Text Book of Medical Laboratory Technology	Medcen Poonthanam	1992
3	Mary Ellen Wedding, Sally A Toenjas	Medical Laboratory Procedures	Jaypee Brothers Medical Publishers	1992
4	Samuel, K.M	Notes on Clinical Lab Techniques	M.K. Gopalan, Chrompet	1999
5	Sathish Gupte	Short Textbook of Medical Laboratory for Technicians	Jaypee Brothers, Medical Publishers	1998

6	Baker F.J. And Silverton R.E	Introduction to Medical Laboratory Technology	Hodder Education Publishers	1998
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### **Pedagogy**

- Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, peer learning, seminar.

### **Course Designers**

1. Dr. N. Ezhili
2. Dr. M. Sheeba

Course Number	Course Name	Category	L	T	P	Credit
AS18E02	WILDLIFE BIOLOGY	Elective	56	4	-	4

### Preamble

To enable the students to understand the introduction of wildlife management, management of vertebrate pest and wildlife utilisation and conservation.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	To understand the main components of wildlife management and wildlife conservation	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO2.	Develop an understanding of how to utilize management techniques to achieve desired management goals.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO3.	Develop an understanding of how animals interact with each other and their natural environment	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO4.	Understand the planning, preparation, techniques, and wildlife surveys.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO5.	Develop an ability to analyze, present and interpret wildlife conservation management information.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1.	L	S	M	M	M
CO2.	S	S	M	M	S
CO3.	L	S	S	S	S
CO4.	S	S	S	S	S
CO5.	S	S	S	M	S

S- Strong; M-Medium; L-Low

**WILDLIFE BIOLOGY - AS18E02**  
**Syllabus**

**(56 Hrs)**

**Unit I**

**(12 Hrs)**

Definition of Wildlife: Causes of wildlife depletion; Economic importance of wildlife; need for wildlife conservation; rare, endangered, threatened and endemic species of fishes, amphibians, reptiles, birds and mammals in India-India as a mega wildlife diversity country.

**Unit II**

**(11 Hrs)**

Forest types in India- identification, dendrology; Deforestation & Impacts; Forest Inventory; Natural and artificial regeneration of forests; nursery techniques-seed-technology- Collection, storage, pretreatment and germination, establishment and tendings.

**Unit III**

**(11 Hrs)**

Harmful Insects and their role in forest economy: Insect pests of important trees of India -Teak, Sal and Bamboo; Beneficial Insects and their role in forest economy: Scavenger insects- dung beetles; Pollinators, Predatory insects, and parasitic insects on insect pests; control of forest insects.

**Unit IV**

**(11 Hrs)**

Vegetative analyses – Point Centered Quadrat, Quadrat, Strip transect; GIS and Remote sensing in wildlife habitat surveys-Habitat manipulation: food, water, shade improvement; impact and removal of invasive alien species.

**Unit V**

**(11 Hrs)**

In-situ and ex-situ conservation: Wildlife Sanctuaries, National Parks, Tiger Reserves and Biosphere reserves: Definition, formation, management and administration; Wildlife Projects: Tiger, Elephant, Lion and Hangul; Zoos and Zoological Parks: Definition- Aims of Zoos- Formation and Management of Zoos and Zoological Parks; Role of Government and Non-Governmental organizations in conservation.

## REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Saharia, V.B.	Wildlife in India	Nataraj Publishers, Dehra Dun	1982
2	Seshadri, B.	India's Wildlife reserves	Sterling Pub'rs Pvt. Ltd., New Delhi	1986
3	Giles, R.H. Jr. (Ed)	Wildlife Management Techniques	The wildlife Society, Washington. D.C. Nataraj Publishers, Dehradun. India	1984 3 <sup>rd</sup> edition.
4	.Dasmann, Rf.	Wildlife Biology	John and Wiley and sons Newyork	1964

### Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

### Course Designer

1. Dr. G. Sasikala

<b>Semester</b>	<b>: V</b>
<b>Advance Level Course</b>	<b>: 1</b>
<b>Paper</b>	<b>: 1</b>
<b>Title</b>	<b>: Microbiology</b>
<b>Sub code</b>	<b>: AS18AC1</b>
<b>Credits</b>	<b>: 5*</b>

Preamble:

Knowledge of different aspects of Microbiology has become crucial and indispensable to everyone in the society.

### **UNIT I**

**Introduction:** History and scope of Microbiology; Classification and biology of virus, bacteria, fungi; Application of microbes in food, industry, genetic engineering, biotechnology, agriculture, environment, medicine, pollution.

### **UNIT II**

**Culture techniques:** Sterilization techniques- physical and chemical agents in control. Nutrient requirements: types of microorganisms, growth factors. Culture media: types, collection of samples, methods of isolation, identification and maintenance of culture. Culture media- Simple and Special nutritional media. Nutrient broth. Microbial growth: pattern, factors, measurement of growth-growth curve.

### **UNIT III**

**Food Microbiology:** Food spoilage-intrinsic and extrinsic factors; food preservation-filtration, low or high temperature, chemicals and radiation; food borne diseases- fermented food products- wine and beer. Botulism

### **UNIT IV**

**Environmental Microbiology:** Microbial Analysis of Water, Sanitary Test for Coliforms- Sewage Treatment, Bioremediation - Petroleum Prospecting and Formation of Oil Spills,



Wastewater Treatment, Chemical Degradation, Heavy Metals – Indicator Microorganism in Polluted Water

## UNIT V

**Medical Microbiology:** Viral diseases Chickenpox, Measles, Influenza, Rubella, Yellow Fever, Rabies, Hepatitis, Poliomyelitis, Aids. Bacterial Diseases- Diphtheria, Tuberculosis, Pertussis, Leprosy, Gonorrhoea, Syphilis, Cholera and Salmonellosis. Fungal Diseases – Superficial, Cutaneous, Sub-Cutaneous, Systemic and Opportunistic Mycoses.

### TEXT BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Dubey, R.C. and Maheswari, D.K.	A Text Book of Microbiology	S. Chand and Company Ltd.,	2006
2	Sundara Rajan, S	College Microbiology – Vol. I to IV	Vardhana Publications, Bangalore	2002

### REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Alcamco, I.D.	Fundamentals of Microbiology	The Benjamin Cummings Publishing Co.,	1997, 5 <sup>th</sup> Edn.
2	Atlas, R.M.	Principles of Microbiology	Mosby-Year Book, Inc., Missouri.,	1995, 1 <sup>st</sup> Edn.
3	Barry L. Batzing	Microbiology-An Introduction	Wadsworth Group	2000, 1 <sup>st</sup> Edn.
4	Lansing M. Prescott, John P. Harley, Donald A. Klein.	Microbiology	McGraw Hill Companies	1999, 4 <sup>th</sup> Edn.
5	Mani, A., Selvaraj, A.M., Narayanan, L.M. and Arumugam, N.	Microbiology – General and Applied	Saras Publications	1999
6	Powar, C.B. and Daginawala, H.F.	General Microbiology	Himalaya Publishing House	2001

<b>Semester</b>	<b>: V</b>
<b>Advance Level Course</b>	<b>: II</b>
<b>Paper</b>	<b>: 2</b>
<b>Title</b>	<b>: Public Health and Hygiene</b>
<b>Sub code</b>	<b>: AS16AC2</b>
<b>Credits</b>	<b>: 5*</b>

Preamble: to train human resources in the science of public health, with a firm understanding of the determinants of health and the public health system in the country, the community context, the determinative influences of globalization, urbanization, global and national policies and a strong foundation in research methodology.

#### **UNIT I**

Determinants of health. Health indicators; Personal hygiene; Public health; health - Dynamics of disease transmission – host, agents, environment.

#### **UNIT II**

Concepts of Health and Disease. Nutrition and Health: Classification of foods – Nutritional deficiencies - Vitamin and Mineral deficiencies - Balanced diet - Nutritional requirements of special groups.

#### **UNIT III**

Environment and Health: Types of Pollution - Air Pollution, Water Pollution, Soil Pollution, Noise Pollution Radiation – effects; Solid waste and excreta disposal. Impact of pollutants on Health.

#### **UNIT IV**

Communicable Diseases: Measles, Cholera, Amoebiasis, Malaria, Filariasis, Japanese encephalitis, Swine flu, STD and AIDS. Non-Communicable Diseases: Coronary Heart Disease. Hypertension Diabetes, Obesity, Stroke, Cancer.

## UNIT V

Health Education: Health care services in India. Health planning in India. Health Programmes in India, WHO, Non-Governmental Voluntary Health organizations. First Aid and Nursing: Methods, Dressing, Care, Duties, Preparations

### TEXT BOOKS

<b>S. No.</b>	<b>Author</b>	<b>Title of the Book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	Park and Park.	Text Book of Preventive and Social Medicine	Banarsidas Bhanot Publishers, Jabalpur	1995
2	Verma, S.	Medical Zoology	Rastogi Publications	1998

Course Number	Course Name	Category	L	T	P	Credit
AS18CO8	PHYSIOLOGY & ENDOCRINOLOGY	Core	86	4	-	5

### Preamble

Physiology is the fountain head of “Natural Sciences” as it deals with the functions of the body of organisms. Emphasis is on interrelationships among systems and regulation of physiological functions involved in maintaining homeostasis. The reactions are vehicled through chemical co – ordination of hormones – hence this combined subject on physiology and endocrinology is prescribed.

### Course Outcomes

CO Number	CO Statement	Knowledge Level
CO1	To understand the basic organization of organisms and subsequent development to an organ system.	K <sub>1</sub>
CO2	To analyze the physiological processes that regulates body functions and the regulation of an organ system from the molecular all the way to the whole animal level.	K <sub>2</sub>
CO3	Recognize the complimentary relationship of structure and function and describe the interactions between different organ systems to maintain homeostasis	K <sub>2</sub> , K <sub>3</sub>
CO4	Able to explain the role of the endocrine glands in maintaining homeostatic mechanisms utilized by each body system in response to internal and external environmental changes.	K <sub>2</sub> , K <sub>3</sub>
CO5	To compare the impact and changes of different and to apply knowledge of a physiological mechanism for further understanding of the cellular and molecular mechanisms of action in health and disease.	K <sub>3</sub>

### Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	L
CO2	S	S	M	M	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	S	S	M	M

S- Strong; M-Medium; L-Low

## **PHYSIOLOGY & ENDOCRINOLOGY - AS18CO8**

**(86 Hrs)**

### **Syllabus**

#### **UNIT I**

**(18 Hrs)**

##### **NUTRITION**

Nutrition in animals, mechanisms of food intake in different animals, Physiology of digestion and absorption; Metabolism of carbohydrates, proteins & lipids; vitamins. Obesity- causes and consequences, Leptin: synthesis, secretion and its role in adipogenesis

\*Balanced diet.

##### **RESPIRATION**

Types of respiration; surfactants; Exchange & transport of gases; Respiratory Quotient and Bohr's effect, Chloride shift/Hamberger's phenomenon; Respiration in unusual environment – foetal and neonatal respiration, high altitude, diving; Metabolic rate : basal metabolic rate and its measurement

\*Structure and functioning of respiratory pigments

#### **UNIT II**

**(17 Hrs)**

##### **CIRCULATION**

Composition and Functions of blood; Types of heart - chambered heart, tubular heart, ampullar heart, lymph heart, neurogenic and myogenic heart, Cardiac Cycle; Cardiac rhythm; Cardiac output; Origin of heart beat and its regulation; ECG and its principle; myocardial infarction, Blood pressure; Blood clotting; Circulatory shock, Circulatory arrest, Abnormal Heart Rhythm- Arrhythmia

\*Human congenital heart diseases

##### **EXCRETION**

Classification of animals based on excretory products- ammonotelic, ureotelic, uricotelic; Vertebrate kidney, Structure of nephron, Physiology and regulation of urine formation; Hormonal regulation of urine formation, Dialysis, artificial kidney, kidney transplantation, kidney disorders.

\*Osmoregulation in fresh water, marine and terrestrial animals.

### **UNIT III**

**(17Hrs)**

#### **NERVE PHYSIOLOGY**

Structure of a neuron; types of neurons, Electrical and chemical transmission. Synaptic transmission of impulse, Modifications of synaptic transmission during fatigue, acidosis, alkalosis, hypoxia and drugs. Neuromuscular Junction: organization and properties of neuromuscular junction, Neurotransmitters, EEG, MRI, memory, neural disorders in man – Alzheimer's, Parkinson's and meningitis, Multiple sclerosis.

\*Autonomic nervous system.

### **UNIT IV**

**(17 Hrs)**

#### **MUSCLE PHYSIOLOGY**

Structure of a muscle; Comparative physiology of skeletal, smooth and cardiac muscles, Skeletal muscle- ultra structure and molecular organization , Red and white muscles,. Mechanism of muscle contraction and relaxation. Energetics of muscle contraction. Effect of exercise on muscles. Catch muscle and fibrillar muscle, simple muscle twitch, latent and refractory periods, tetanus, tonus, fatigue, oxygen debt.

\*Chemistry of muscle proteins.

### **UNIT V**

**(17 Hrs)**

#### **ENDOCRINOLOGY**

Endocrine glands-structure, Neuro-endocrine regulation of hormone action, Secretions and functions of– Pituitary, Thyroid, Pancreas, Adrenal & Gonadal hormones.

\*Diabetes mellitus.

\*Denotes self study

## TEXT BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Verma P.S., Agarwal V.K. and Tyagi, B.S	Animal Physiology	S. Chand & Co	1995
2	Berry,A.K	A Text Book of Animal Physiology with related Biochemistry	Emkay Publications	1993
3	Sarada Subrahmanyam., Madhavan Kutty ,K., & Singh H.D	TextBook of Human Physiology	S. Chand & Co	2012

## REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Lauralee Sherwood, Human	Physiology.6 <sup>th</sup> Edition	Thomson Brooks, United States	2007
2	Hoar. W.S	General and Comparative Physiology	Prentice – Hall of India Pvt., Ltd	1995
3	G.J.Tortora & B.Derrickson	Principles of Anatomy and Physiology	John Wiley and Sons, Inc	2009
4	Guyton, A.C	Text Book of Medical Physiology	Prism Books Pvt.Ltd	1996
5	Ganong, W.F	Review of Medical Physiology	McGraw Hill, New Delhi	2003
6	Prosser, C.L	Comparative Animal Physiology	W.B.Saunders Co	1978
7	Schmidt-Nielson K	Animal Physiology	Prentice Hall India Ltd	2002
	Vander, A.J., Sherman, J.H. and Luciano D.S.	Human Physiology	MacGraw Hill Publishing Co., New Delhi	1998
	Withers P.C	Comparative animal physiology	Saunders College Publishing	1992

### Pedagogy

- Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, peer learning, seminar

### Course Designers:

1 Dr. N. Ezhili

2 Dr. M. Sheeba

Course Number	Course Name	Category	L	T	P	Credit
AS18C09	IMMUNOLOGY	Core	71	4	-	5

### Preamble

To understand the basic immunological principles, structural and functional basis of immunoglobulins, the mechanism and application of antigen-reaction in the immune system.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	The mechanisms and differences between primary and secondary responses and their relevance to immunizations	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO2.	Comprehensive and practical understanding of basic immunological principles and techniques involved in research/clinical/applied science	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO3.	Identify the role of antigen presenting cells, lymphocytes, and phagocytic cells in immune responses	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO4.	Role of immunology in protection against disease and autoimmune disorders	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO5.	Advanced knowledge of the underlying principles of immunology and its application in biological systems.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	M	M

S- Strong; M-Medium



**IMMUNOLOGY - AS18C09****(71 Hrs)****Syllabus****UNIT I****(15 Hrs)**

History & Scope of Immunology, Types of Immunity- Innate, Acquired, Cell Mediated Immunity, Humoral Mediate Immunity. Active & Passive Immunity. Vaccination.

**UNIT II****(14 Hrs)**

Lymphoid Organs – Primary, Secondary & Territory Lymphoid Organs. Cells of the Immune System – Lymphocytes (T&B Cells). Macrophage, Granulocyte, Natural Killer Cells. Cytokines, Lymphokines, Interleukins, Complement System

**UNIT III****(14 Hrs)**

Antigens – Structure And Types. Antibodies – Immunoglobulins Family of Proteins - Structure and Types of Antibodies. Interaction of Antibodies with Antigens. Functions of Antibodies. Agglutination, Precipitation, ELIZA, Blotting Techniques.

**UNIT IV****(14 Hrs)**

Immune Response against disease – Life Cycle, Symptoms, Causative agent: Treatment, Malaria, AIDS, Hepatitis, Meadow Disease, Avian Flu. Immune response to tumor

**UNIT V****(14 Hrs)**

Transplantations. Types Of Grafts, Graft Rejection, Immuno suppressive Drugs. Autoimmune Diseases – Addison’s disease, Rheumatoid Arthritis. Hypersensitivity – I, II, III & IV. Stem Cell and its Applications.

**TEXT BOOKS**

<b>S. No.</b>	<b>Author</b>	<b>Title of the Book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	P. Madhavee Latha	A Text Book of Immunology	S.Chand	2012
2	Dulsy Fatima and Arumugam N	Immunology	Saras Publications	2000

## REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	P. Madhavee Latha	A Text Book of Immunology	S. Chand	2012
2	Kuby, J	Immunology	W.H. Freeman and Company, New York	1997
3	Roitt, I.M.	Essentials of Immunology	ELBS Editors, London	1998
4	Brown, F. and Chamock, R.A.	Vaccines 86 : New Approaches to Immunization	Lerner Colsspring Harbour Lab	1986

### Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

### Course Designer

1. Dr. P.B.Harathi

Course Number	Course Name	Category	L	T	P	Credit
AS18C10	HUMAN GENETICS AND COUNSELLING	Core	71	4	-	5

### Preamble

To make the students understand the central and unifying position of genetics in biological services and to create awareness for a better community

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand the role of genetics as the underlying cause of various disorders of the human body	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO2.	Knowledge of research principles and methods applicable in the discipline of genetic counselling and genetic testing approach taken for specific genetic disorders	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO3.	Principles of the legal and professional duties and the responsibilities of genetic counsellors as health professionals	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO4.	Role of the genetic counsellor in the context of the multidisciplinary approach to clinical genetic health care	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO5.	Integrate knowledge of genetics and genomics, including dysmorphology, inherited and multifactorial disorders, cancer genetics, genetic and genomic testing, and screening including prenatal diagnosis for the purposes of genetic and genomic counselling	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	L	S	S
CO2	L	S	S	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	M
CO5	S	S	S	S	M

S- Strong; M-Medium; L-Low

## **HUMAN GENETICS AND COUNSELLING - AS18C10**

**(71 Hrs)**

### **Syllabus**

#### **UNIT I**

**(15 Hrs)**

Human chromosomes: Karyotyping, Idiogram – Chromosome classification & Nomenclature – Lyon's hypothesis- Barr Body, Chromosomal study based on leukocyte culture – Banding Techniques – C, R, Q and G Banding - Uses of chromosomal analysis.

\*Chromosomal Aberrations (Structural)

#### **UNIT II**

**(14 Hrs)**

Chromosomal Aberrations (Numerical) – Syndromes – Down's, Turner's, Klinefelter's, Cat cry, Ulrich's – Ploidy, Autosome linked genetic disease – Sickle cell anemia, Alkaptonuria, Phenylketonuria - Dermatoglyphics

\*Sex linked genetic diseases : Haemophilia, Color blindness.

#### **UNIT III**

**(14 Hrs)**

Blood groups – ABO group. MN Group, Rh factor – Cancer : Oncogenes and oncogenicity – Population genetics – Gene pool, Panmixis - Hardy Weinberg Law – Definition and factors affecting equilibrium - Calculating gene frequencies in a population – Autosomal gene, Sex linked gene.

\*Twins : Monozygotic, Dizygotic, Siamese twins

#### **UNIT IV**

**(14 hrs)**

Pedigree analysis – pedigree chart for hemophilia – problem solving in pedigree analysis, Genetic Counseling – marriage – consanguineous marriage – disputed parentage – child adoption: legal implication, procedure, and laws.

\*Future of human genetics – Eugenics, Euthenics, Euphenics

#### **UNIT V**

**(14 hrs)**

Diagnosis of genetic diseases -  $\beta$  - Thalassemia, Alkaptonuria, Phenylketonuria, Sickle cell anaemia – Analysis of human genome – Blotting techniques – Southern, Northern, Western and Dot blotting – Prenatal diagnosis: Amniocentesis, Chronic villi sampling, Cordocentesis, and Scanning.

\*Embryonic Stem Cell

\*Denotes self study

### TEXT BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Bhatnagar S M, Kothari Lopa M L.	Essentials of Human Genetics	Orient Longman (P) Ltd.,	1999 (Reprint 2004) 4th Edn.
2	Mandal S	Fundamentals of Human Genetics	New Central Book Agency	2002

### REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Lewin	Genes VIII	Pearson Prentice Hall International	1985
2	Monre. W. Stick Berger	Genetics	Eastern Economy	2003, 3 <sup>rd</sup> Edn.
3	Rickie Lewis	Human genetics – Concept and application	Tata Mc. Graw Hill	2011, 2 <sup>nd</sup> Edn.
4	Robert. H Tamarin	Principles of Genetics	Tata Mc. Graw Hill	2002

### Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

### Course Designer

1. Dr.P.B.Harathi

Course Number	Course Name	Category	L	T	P	Credit
AS18E03	APPLIED FISHERY BIOLOGY	Elective	71	4	-	5

### Preamble

This multidisciplinary course aims to educate the understanding and managing fisheries. It include biology, physiology, nutrition, processing, value addition, by-products, aquatic pollution and technology. After completion of this course, students will have many career opportunities.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	To study, explore various techniques used in fishery and polyculture practices. Understanding the scientific terms, concepts, facts, phenomenon & their interrelationship of fish.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO2	To provide an overview of the application of biotechnological tools in fish breeding, feed, health, processing and other issues in fisheries. Application of knowledge in Fisheries for nutrition, agriculture & live stock	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO3	To gain in depth knowledge and field exposure on sustainable pisciculture practices	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO4	To impart understanding of the nutritional requirements of fish and knowledge on mass culture and enrichment of live food organisms	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO5	To comprehend the taxonomy, morphology, pathology and host-parasite relation of common parasites of aquatic organisms and to understand the significance of parasites in fish health	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	L	M	M
CO2	S	S	S	M	M
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M- Medium; L-Low

## **APPLIED FISHERY BIOLOGY - AS18E03**

**(71 Hrs)**

### **Syllabus**

#### **UNIT I**

**(15 Hrs)**

Introduction: Current status, problems and future prospective for aquaculture and fish farming in the world and India. Economics of different fish farming systems. Aquaculture systems: Extensive, semi-intensive and intensive culture of fish, Pen and cage culture in lentic and lotic water bodies, polyculture, composite fish culture. Fish farming: Nursery and grow-out, pond preparation, stocking, feeding and water quality management in the farming of major and minor carps, magur, singh, murrels, tilapia, pangasius, freshwater turtle, etc. Introduction to commercial pisciculture practices in inland water.

#### **UNIT II**

**(14 Hrs)**

Aquaculture and ecosystem relationship: Ecosystems and productivity, biotic interaction within ecosystems and ecological homeostasis. Impact of environment on aquaculture: Raw water source, physical and chemical characteristics, contaminants and pollutants (algae, pathogens, heavy metals, pesticides) and their effect on productivity. Environmental variables related to fish health; Water quality and sediment characteristics. Biological indicators and indices of water quality. Sanitation in aquaculture systems.

#### **UNIT III**

**(14 Hrs)**

Fish nutrition, feed and feeding: Principles of fish nutrition and terminologies, nutritional requirements of cultivable finfish: larvae, juveniles and adults. Live fish feed: phytoplankton-Spirulina culture techniques and zooplankton –Daphnia culture techniques, Artemia and Rotifer culture techniques and their role in larval nutrition.

#### **UNIT IV**

**(14 Hrs)**

General characteristics, life cycle, diagnosis, prevention and treatment of parasitic, bacterial, fungal and viral diseases of fish. Health management strategies in Aquaculture: Vaccines, Immuno-stimulants, Probiotics, Good and Best management practices.

**UNIT V****(14 Hrs)**

Nutritional biochemistry of fish: Classification, nutrient quality and evaluation of proteins, lipids and carbohydrates. Role of nutrients: amino acids, fatty acids, proteins, lipids, carbohydrates, vitamins and minerals. Types of by-products and Value Added Products. Introduction: Scope of biotechnology in fisheries and aquaculture research. Transgenics: Principles of transgenic technology and its application in fisheries. Feed biotechnology: Probiotics, single cell proteins, Nutraceuticals. Application of nanotechnology in aquaculture. Recent Technological Innovations in Aquaculture- Aquaponics and Biofloc technology.

**TEXT BOOKS**

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Jhingran V.G	Fish and fisheries of India	Hindustan Publishing Corporation, New Delhi.	1982
2	Lannan J.F.H.D. Smitherman and G. Tehobanglous(eds)	Principles and practice of pond culture: A state of the art review	S. Chand & Company	2012
3	Balchandran	Fisheries technology	Introduction to Cytology	2003

**REFERENCE BOOKS**

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Ravi Reddy, Mohan Babare, Ramraopatil	General topics in fishery	Kalyani Publishers, New Delhi	2 <sup>nd</sup> Edition
2	Rounsfell G.A. and W.H	Fisheries-Its methods and applications	Lippincott Williams and Wilkins, Philadelphia	8 <sup>th</sup> Edition
3	Bardach JE.	Sustainable Aquaculture	John Willey & Sons. Bardach JE, Rhyther JH & Mc. Larney WO. 1972	1997
4	Elangovan K.	GIS: Fundamentals, Applications and Implementations	New India Publ. Agency. ESRI.	2005



5	Meaden GJ & Kapetsky JM	Geographical Information System and Remote Sensing in Inland Fisheries and Aquaculture.	FAO Tech.	1991
6	Hart, Paul & Reynolds, John.	Handbook of Fish Biology and Fisheries	Volume 1: Fish Biology. 1 - 11.	2002
7	Reynolds, John & Dulvy, Nicholas & Roberts, Callum.	Handbook of Fish Biology and Fisheries	Volume 2: Fisheries. 319 - 341.	2002

### **Pedagogy**

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

### **Course Designer**

1. Dr. G. Sasikala

Course Number	Course Name	Category	L	T	P	Credit
AS18E04	DAIRY SCIENCE	Elective	71	4	-	4

### Preamble

To train and impart practical knowledge in clean milk production, processing of milk and preparation of milk products. To provide knowledge to give them an opportunity to get employment in Cooperative Milk Producers Union Limited, and in private dairy product factories

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Impart technical knowledge and skills required concerning the selection and breeding of dairy cattle, management of animals of different physiological status, nutrition, health, housing and feeding.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO2	Principles and practices essential in the production of clean milk	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO3	Able to classify feeds according to their nutritive values. Students will know the different types of microbes in milk, their morphology and milk borne diseases	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO4	Analysis the microbial examination of various dairy product bacteriological grading of raw milk and to estimate the Bacteriological problems associated with pasteurization, sterilization processes	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO5	Completion of the programme may seek employment in private dairy farm, milk processing plants and dairy product factories.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	L	L	S	M
CO2	S	S	S	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

**DAIRY SCIENCE - AS18E04**

**(71 Hrs)**

**Syllabus**

**UNIT I**

**(15 Hrs)**

Dairy Farming-Definition, Scope, Dairy breeds of India and its classification. Exotic cow breed- Jersey and Red Sindhi. Buffalo-Murrah and Surti. Goat –Jamunapari and Malapuri.

**UNIT II**

**(14 Hrs)**

Common cattle feed and their nutritive values. Rations-its computational and qualities-Balanced ration. Anatomy and physiology of mammary glands. Milk secretion and importance of Colostrum.

**UNIT III**

**(14 Hrs)**

Milk composition-Nutritive value. Pasteurization of milk –spoilage of milk. Milk products- Butter, Cream, *Khoa* and Ghee. Adulteration of milk.

**UNIT IV**

**(14 Hrs)**

Viral diseases-Cow pox-Foot and mouth disease-Rinder pest. Bacterial diseases –Anthrax- Mastitis- Tuberculosis-Haemorrhagic septicemia. Non-contagious diseases-Milk fever, Parasites of dairy breeds

**UNIT V**

**(14 Hrs)**

Role of Co-operative societies in milk production and marketing. Techniques adopted in cattle breeding – inbreeding, Outbreeding and Artificial insemination. Merits and demerits of Dairy Business

## REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	G. H. Schmidt, L. D. Vivek & N. N. Pathak	Principles of Dairy Science	Prentice Hall	1998
2	C. R. Sane	Reproduction in farm animals	Bombay Varghese Publishing House	1982
3	R. D. Frandson	Anatomy & Physiology of farm animals	Blackwell Publishing	2006
4	K. C. Mahanta	Handbook of Dairy science	Kitalistan, Allahabad	1964

### Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

### Course Designer

1. Mrs. Susheela. P.

<b>Semester</b>	<b>: VI</b>
<b>Advance Level Course</b>	<b>: III</b>
<b>Paper</b>	<b>: Industrial Biotechnology</b>
<b>Sub code</b>	<b>: AS16AC3</b>
<b>Credits</b>	<b>: 5*</b>

## **Syllabus**

### **UNIT I**

Fermentation Technology – Fermenter design and types - Culture of microorganisms: Solid, Semisolid, Batch culture, Continuous culture, Fed-batch culture – Metabolic pathways in microorganisms – microbial products: Primary metabolites- Amylases, Proteases, Ethanol, Citric acid and Lipases, Secondary metabolites - penicillin, Tetracycline, streptomycin, vitamin B12.

\*Biogas production.

### **UNIT II**

Source and production of commercially important enzymes – Cellulase, Amylase, Pectinase. Proteinases. Immobilization of enzymes and its applications -- Biofertilizers – Mass cultivation of *Rhizobium*, *Azotobacter*, *Azolla*, *Azospirillum* - Biopesticides- Biological control of plant pathogens, insects pests and weeds. Genetic engineering of biocontrol agents.

\*Benefits from Biofertilizers.

### **UNIT III**

Application of enzymes in commercial Industries – Food Industries – Detergent Industries – Leather Industries – Pharmaceutical Industries – Enzymes in clinical diagnostics - Enzymes as therapeutic agents.

\*Genomes and its applications to health

## UNIT IV

Production of Single Cell Protein (SCP) - Advantages of producing microbial protein – Microorganisms used as SCP – Substrates used for the production of Bacterial, Algal, Fungal and Yeast biomass - Nutritional value of SCP - Genetic improvements of microbial cells.

\*Mushroom culture

## UNIT V

Bioremediation – *In-situ* and *Ex-situ* bioremediation – Factors affecting bioremediation – Use of genetically engineered bacterial strains – VAM fungi – Bioremediation of heavy metals, Xenobiotics, dyes - Microbial leaching: copper leaching - Biosafety – IPR – Patenting. Biowar, Bioprivacy, Plant Breeder right (PBR)

\*Bacteriology of water and sewage.

\*Denotes self study

## REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Ignachimuthu, S.	Basic Biotechnology	Tata McGraw Hill Publishing Company Ltd., New Delhi	1998
2	Dubey R.C.	A Text Book of Biotechnology	S. Chand & Co., Ltd., New Delhi	2005
3	Kumaresan, V.	Biotechnology	Saras Publications, Nagercoil	2004
4	Alexander, N. Glazer and Hiroshi Nikado	Microbial Biotechnology: Fundamentals of Applied Microbiology	Cambridge University Press	1995
5	Prakash, M.	Textbook of Biotechnology	Sonali Publication	2009

<b>Semester</b>	<b>: VI</b>
<b>Advance Level Course</b>	<b>: IV</b>
<b>Paper</b>	<b>: 4</b>
<b>Title</b>	<b>: Applied Zoology</b>
<b>Sub code</b>	<b>: AS16AC4</b>
<b>Credits</b>	<b>: 5*</b>

**Preamble:** To emphasis entrepreneurial potential and skills by incorporating applied topics in the field of Zoology

### **UNIT I**

Parasites in Man: Protozoan Parasites – *Entamoeba histolytica*, *Giardia lamblia*, *Plasmodium*, *Trypanosoma gambiens*; Helminth Parasite – *Ancylostoma duodenale*, *Ascaris lumbricoides*, *Enterobius vermicularis*, *Wuchereria bancrofti*, *Taenia solium*; Host Parasite Relationship.

### **UNIT II**

Beneficial Insects – Apiculture – Different Species; Social Organization; Equipment connected with bee keeping; Newton hive; Bee products: Honey extraction – Bee wax and their uses; Diseases and enemies of bees. Sericulture: Different types of silkworms used in sericulture; Life history of *Bombyx mori*; Rearing; Silk extraction and reeling; Diseases of silkworm; Economic importance. Lac insect –biology and life cycle

### **UNIT III**

Insect Pests – Salient features, Nature of destruction and control measures of the following - Pests of rice: Rice stem borer, Green rice leaf hopper. Pests of Cotton: Cotton leaf hopper, Pink boll worms. Pests of coconut: Rhinoceros beetle, Black headed caterpillar. Pests of Sugarcane - Indian sugarcane leaf hopper, Sugarcane root borer, Sugarcane top shoot borer.

### **UNIT IV**

Aquaculture: Kinds of aquaculture – Mono, Poly-extensive, Semi intensive, Intensive; Monosex sewage integrated fish farming (brief account). Culture of selected species – Major carps, oysters. Recent developments in aqua culture: Application of hormones – Spawning-Eye stalk

oblation. Preservation and processing of fish, prawns, Chilling, Freezing, Freeze drying, Salting, Smoking, Canning (Briefly). Fish parasites and diseases (any3). Ornamental Fish Culture

## UNIT V

Economic importance of birds and mammals. Different breeds of fowls – Selective breeding; Housing and rearing; Role of nutrition in egg laying; Common diseases. Indirect and direct value of mammals - Dairy, Sheep, and piggery farming; Novel methods of breeding livestock.

## REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Ahsan, J. and Sinha, S.P.	Handbook of Economic Zoology	S. Chand & Co., New Delhi	1985
2	Ayyar, T.V.T.M	Handbook of Economic Entomology for South India	Govt. Press. Madras	1963
3	Banerjee, G.C.	Poultry	Oxford and IBH Publishing Co., Pvt Ltd.	1992
4	Bardach, John E., Ryther, John, H. and McLamey William, O.	Aqua culture	John Wiley and Sons Inc., New Delhi	1972
5	Crofton, H.D.	Nematodes	Hutchinson University Library, London	1966
6	Chaterjee, K.D	Parasitology	Chaterjee Medical Publishers Calcutta	1982
7	Ganga, G. and Sulochana Chetty	An Introduction to Sericulture	Oxford and IBH Publishing Co., Pvt., Ltd.,	1991



Course Number	Course Name	Category	L	T	P	Credit
AS16CP3	Core Practical III	Practical	-	-	180	5

### Preamble

The curriculum will reflect on the current changing needs of the students which includes basic as well as advanced concepts in Zoology to provide hands-on experience of the latest techniques, skill development for continuing higher education, to aspire as an entrepreneur, employability in Industries, Educational and research Institutes.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	To provide thorough knowledge about various animal sciences from primitive to highly evolved animal groups	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub>
CO2	To equip the students with skills related to laboratory as well as field based studies	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub>
CO3	To instill best laboratory practices among the student community and to equip them about scientific handling of important instruments and model organisms, statistical analysis for problem solving	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub>
CO4	To provide an insight to the basic clinical health aspects of human life	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub>
CO5	To nurture and inculcate interest towards life sciences and foundation for further studies	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	L	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	M	M
CO4	S	S	S	M	M
CO5	S	S	S	S	M

S- Strong; M-Medium; L-Low

## **Core Practical III - AS16CP3**

**(180 Hrs)**

### **Syllabus**

#### **GENETICS AND STATISTICS**

**(40 Hrs)**

1. Study of phenotypic characters of drosophila
2. Drosophila handling, culture and experimentation
3. Preparation and identification of salivary gland polytene chromosomes from drosophila/chironomous larva
4. Blood group in man (ABO and Rh)
5. Observation of Barr body in human epithelia
6. Study of frequency of Mendelian traits in a population (tongue rolling and folding, use of hands – left, right)
7. Verification of Monohybrid and Dihybrid cross through chi-square test
8. Pedigree analysis
9. Measures of central tendency
10. Measures of dispersion
11. Correlation analysis,
12. Regression analysis
13. Student t-test

#### **PHYSIOLOGY & ENDOCRINOLOGY, EVOLUTION AND BIOTECHNOLOGY (60 Hrs)**

1. Qualitative analysis of excretory products – Ammonia, Urea, Uric acid
2. Kymograph - Instrument
3. Preparation of blood smear
4. Endocrinology-Pituitary gland, Islets of Langerhans, thyroid, adrenal gland.
5. Homologous organs – Fore and Hind limb skeleton of vertebrates
6. Analogous organs-wings of butterfly, bird, bat.
7. Isolation and estimation of DNA & RNA.
8. Blotting techniques- observation and photographs.
9. Techniques of sterilization dry and wet.
10. Preparation of medium – nutrient agar, nutrient broth.
11. Antibiotic sensitivity

12. Distribution of microbes in soil, air and water.
13. Composition of blood
14. Determination of microbiological quality of milk using MBR test.
15. Preparation of Normal, molar and standard solutions, phosphate buffers, serial dilutions
16. Colorimetric estimation of glucose in the given solution.
17. Quantitative estimation of protein by modified Lowry's colorimetric method
18. Determine the concentration of the unknown sample using the standard curve plotted.
19. Demonstration of antibiotic resistance and interpretation of results
20. *Drosophila*-Study the developmental stages and the life cycle from fruit fly stock culture.
21. Separation of proteins by SDS-PAGE.
22. Visit to a clinical laboratory
23. Visit to a museum
24. Visit to a biotechnological industry – A report to be submitted.

### **SPOTTERS**

**(10 Hrs)**

Spirulina; *Bacillus thuringiensis*- Biopesticide; Mushroom seed; Yeast; Antibiotic Erythromycin/ Streptomycin; Azolla-Biofertiliser; Test kits – Typhoid kit, Syphilis kit, Agarose electrophoresis kit, Instruments used such as autoclave, air filter, centrifuge.

### **MEDICAL LABORATORY TECHNOLOGY**

**(30 Hrs)**

1. RBC Total count
2. Haemoglobin estimation
3. Bleeding time
4. Clotting time
5. Differential count of WBC
6. Preparation of Haemin Crystals in human blood
7. Urine specific gravity
8. Urine albumin
9. Glucose in urine.
10. Motility of bacteria using hanging drop method
11. Gram's staining
12. Identification of urine crystals in urine sample.

## SPOTTERS

*Entamoeba*, malarial parasite, Pin worm (*Enterobious vermicularis*), hook worm, *Ascaris*, *Wuchereria bancrofti*; instruments used such as albuminometer, Hamocytometer, ESR tube, Urinometer, Haemoglobinometer, Sphygmomanometer, glucometer, stethoscope, heart rate monitor, Body Fat Analyzer Digital Monitor.

## APPLIED FISHERY BIOLOGY

(40 Hrs)

1. Setting up and maintenance of a freshwater pond/aquarium tank, Aquarium accessories (Aerator, Under Gravel Filter, Internal Filter, External/Canister Filter, Food dispensers) and equipments.
2. Identification of commercially important cultivable fish species, ornamental fishes.
3. Estimation of Total RBCs and WBCs counts, haemoglobin of fish (Demonstration).
4. Field visit to reservoir/artificial commercial fish culture pond to survey on environmental impact, identification of fish diseases and monitoring fish health, treatment and chemicals/Feed manufacturing units for understanding fish nutrition, feeds, feed formulation, feeding and estimation of growth parameters (length, weight relationships) from feeding trials and report to be submitted/Training on freshwater fish/Ornamental fish hatchery extending a period not less than a week to an aquarium may be attended - a certified report may be submitted.

## REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Sinha J, Chatterjee A K, Chattopadhyay P	Advanced Zoology Practical	Arunabha Sen Books and Allied (P) Ltd	2011
2	Gupta S P	Statistical Methods	S. Chand & Sons	2008
3	Pranab Kumar Banerjee	Introduction to Biostatistics	S. Chand Publishers	2011
4	Kanai, L Mukherjee	Medical Laboratory Technology	Tata McGraw Hill Publishing Company Ltd	1998
5	Ramnack Sood, M.D	Medical Laboratory Technology	Medical Publishers(P)Ltd	1985

6	Sathish Gupte	Short Textbook of Medical Laboratory for Technicians	Jaypee Brothers, Medical Publishers	1998
7	Jhingran V.G	Fish and fisheries of India	Hindustan Publishing	1982

### **Course Designers**

1. Mrs.Susheela.P

2. Dr.G.Sasikala

Course Number	Course Name	Category	L	T	P	Credit
AS19SB02	SERICULTURE II	Core	43	2	-	4

### Preamble

India occupies second position among the silk producing countries in the world besides being the largest silk consumer. In recent years, developing countries focused their attention in the production of natural silk. This course aims to infuse knowledge and skills in the field of sericulture.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	To study the scope & importance of sericulture in India To understand cultivation of mulberry, establishment of mulberry garden	K <sub>1</sub>
CO2	To acquaint with nursery preparation, cultivation of mulberry plantation and rearing house for silkworm culture	K <sub>1</sub> , K <sub>2</sub>
CO3	To understand the role of haemolymph, silk gland and silk synthesis of silkworm To know the importance of silk reeling industry To learn the role of cultural practices in plant and silkworm disease management To acquire knowledge of economics of egg production	K <sub>2</sub>
CO4	To compare and understand the general and specific characteristics of different types of silkworm and its life stages To understand about the young age rearing methods and late age rearing methods, cocoon harvesting, sorting, transporting and marketing of cocoons	K <sub>1</sub>
CO5	To know about the Chawki rearing methods and its importance To Learn Mountages and mounting of worms, spinning care effective rate of rearing, cocoon harvesting and sorting To understand on the pest, parasite, predator, hyperparasite and other types of parasites on pests	K <sub>3</sub> , K <sub>4</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	L	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	M	M
CO4	S	S	S	M	M
CO5	S	S	S	S	M

S- Strong; M-Medium; L-Low

## **SERICULTURE II - AS19SB02**

**(43 Hrs)**

### **Syllabus**

#### **UNIT I**

**(9 Hrs)**

Mulberry cultivation: Definition of soil, different types of soils in India, Importance of soils with reference to mulberry cultivation; soil analysis- soil sampling, soil pH, organic carbon and NPK level, Propagation of mulberry- seedling, sapling, grafting and layering, Raising of commercial nursery, Application of root inducing hormones.

#### **UNIT II**

**(9 Hrs)**

Establishment of mulberry garden under rain-fed and irrigated conditions: Planting season, Selection and preparation of land, Planting systems, Selection and preparation of planting material, Manuring, inter-cultivation and irrigation, Initial harvesting, Chawki garden; importance and maintenance. Mulberry pests - Leaf roller, Bihar hairy caterpillar, scale insect, mealy bug, thrips, beetles, jassids and grasshoppers.

#### **UNIT III**

**(9 Hrs)**

Rearing- rearing house and appliances, types of brushing and rearing, Seed (grainage); rearing by *chawki*/young worms and rearing of late aged worms, Shoot rearing-Care during rearing and cleaning, optimum feeding, bed cleaning, spacing Optimum environmental conditions and selection of ripe worms- mounting-process ripening- process of spinning- Identification of spinning larva; spinning; mounting and mounting density; types of mountages, their advantages and disadvantages; environmental requirements during spinning. Harvesting- storage and transport. Improved rearing methods for young stage and late stage silkworms.

#### **UNIT IV**

**(8 Hrs)**

Cocoon composition-Physical and Commercial characteristics of cocoons- defective cocoons and their pathology. Stifling-Reeling appliances- Process of Reeling – Finishing and testing- By-Products of silk reeling and silk marketing-Economics of sericulture. Selection of Cocoons of silkworm for breeding based on various characters.

**UNIT V****(8 Hrs)**

Sericulture as cottage industry- Farm Management: Training of Farmers- subsidy and loan for farm development. Silkworm as a model animal for biotechnological studies- transgenic and gene expression studies. Sericulture marketing organization – cocoon market and silk exchange.

**REFERENCE BOOKS**

<b>S. No.</b>	<b>Author</b>	<b>Title of the Book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	Ganga, G and Sulochana Chetty	An Introduction to Sericulture	Oxford and IBH Publishing Co., Pvt., Ltd., New Delhi	1991
2	Venkata Narasiah	Sericulture in India	Ashesh Publishing House, New Delhi	2003
3	Dr. N. G. Djha and Dr.Priyan Panday	Silk Production	APH publishing Corporation, New Delhi	2004

**Pedagogy**

- Lecture by chalk and talk, powerpoint presentation, demonstration, field visit, e-content, doing experiments, group discussion, assignment, quiz, peer learning, seminar.

**Course Designer**

1. Dr.G.Sasikala



Course Number	Course Name	Category	L	T	P	Credit
AS19SBP2	SERICULTURE PRACTICAL - II	Practical		2	43	2

### Preamble

To enable the students to

- impart training in mulberry cultivation, silkworm rearing and silk reeling
- be involved in various aspects of silk product science
- establish and cultivate mulberry plantation for silkworm feed
- Construct rearing house for rearing silkworms
- Rear silkworm till the completion stage upto cocoon formation
- Harvest the cocoons
- Undertake Pest & Disease Management

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	define and recognize the external morphology and developmental stages of life of silkworm, Mulberry nursery, farm inputs and improved techniques	K <sub>1</sub>
CO2	examine and discuss on the mulberry cultivation, silkworm rearing, silk reeling and post reeling	K <sub>1</sub> , K <sub>2</sub>
CO3	distinguish the silkworm rearing and silk reeling devices	K <sub>2</sub>
CO4	define and understand the operations of rearing appliances and its uses Machineries in sericulture Economics of rearing house and Benefit cost ratio of silkworm rearing Learn processes of silk winding, doubling, twisting, warping, bleaching, dyeing, printing and weaving	K <sub>1</sub>
CO5	state and apply Pest Management Strategies	K <sub>3</sub> , K <sub>4</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	L	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	M	M
CO4	S	S	S	M	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

## SERICULTURE PRACTICAL II -AS19SBP2

(43 Hrs)

### Spotters:

1. Silkworm rearing equipment and their uses
2. Silk reeling devices and operations
3. Types of disinfectants-Any four
4. Identification of different types of silk waste; floss, cooker, reeler, basin refuse and re-reeling waste, dupion silk.
5. Identification of mulberry pests: Leaf roller, Bihar hairy caterpillar, scale insect, mealy bug, thrips, beetles, jassids and grasshoppers.

### Field Visit:

6. Field observations of popular mulberry cultivars.
7. Visit to field and farmers rearing house to study sericulture technologies adopted.
8. Visit to a Reeling unit/museum/value added products.
9. Study of silk fabric manufacturing unit- Power & handloom and identification of weaving defects.

### Developmental Biology and Physiology of silkworm;

10. Identification of silk, cotton, wool and synthetic fibre (viscose/nylon/polyester) by physical method- flame and microscopic test.
11. Morphology of silkworm egg and mounting of 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup> day old embryos
12. Estimation of proteins in haemolymph/egg, haemolymph glucose level.
13. Morphology of haemocytes in silkworm.

## REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication
1	Ganga, G and Sulochana Chetty	An Introduction to Sericulture	Oxford and IBH Publishing Co., Pvt., Ltd., New Delhi	1991
2	Venkata Narasiah	Sericulture in India	Ashesh Publishing House, New Delhi	2003
3	Dr. N. G. Djha and Dr.Priyan Panday	Silk Production	APH publishing Corporation, New Delhi	2004

### Pedagogy

- Lecture by chalk and talk, powerpoint presentation, demonstration, field visit, practice experiments during practical hours, group discussion, project, peer learning, seminar.

### Course Designer

1. Dr. G. Sasikala

Course Number	Course Name	Category	L	T	P	Credit
AS19A01	INVERTEBRATA AND CHORDATA	Allied	71	4	-	4

### Preamble

An introduction to basic concepts in biology through study of the major lineages of invertebrate and vertebrate animals, with emphasis on the ontogeny, structure, and function of organ systems in an evolutionary context in allied Zoology to understand biodiversity, adaptation, organization and taxonomic position, explaining the basic aspects of classification, structural and functional details of the invertebrates and chordates.

### Course Outcomes

On the successful completion of the course, students will be able to fill up the lacunae in the study of natural sciences.

CO Number	CO Statement	Knowledge Level
CO1	To understand the systematics, morphology, functional, and structural modification in various groups of invertebrates & chordates.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO2	Recollection of certain morphological and physiological processes that are distinctive and important to each Phyla	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO3	To understand the structure and physiology of the types included with special emphasis on the adaptations to their modes of life and environment.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO4	To compare and understand the general and specific characteristics within each Phyla, Develop some of the general principles of zoology as they are encountered in the survey of the animal kingdom.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO5	Develop a general familiarity with all major groups of animals, including specific information about selected representatives of each group, Learning Zoology will lead to discuss the diversity of both invertebrate and vertebrate animal life and the fascinating adaptations that enable animals to inhabit nearly all conceivable ecological niches	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	L	L	L	M	M
CO2	S	S	M	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	M	S

S- Strong; M-Medium; L-Low

## INVERTEBRATA AND CHORDATA - AS19A01

(71 Hrs)

### Syllabus

Outline classification of animal kingdom upto class level with two examples each. Type study under each phylum to deal with structure, organization and life cycle.

#### Unit 1

(14 Hrs)

**Phylum Protozoa :** Structure and life cycle of *Paramecium caudatum* –External features, Nutrition, Locomotion- effective stroke, recovery stroke, Metachronal rhythm, Reproduction- Asexual- Binary fission ,Sexual reproduction –Conjugation, Autogamy, Endomixis, Hemimixis and Cytogamy.

**Phylum Porifera:** Structure and life cycle of *Leucosolenia botryoides*- External features, Body wall, Spicules, Canal System, Nutrition, Reproduction.

**Phylum Coelenterata :** Structure and life cycle of Hydra- External features, Histology of body wall, Cnidoblast and its functions, Nutrition, locomotion, Respiration, Excretion and Osmoregulation, Nervous System, Reproduction – asexual – budding; sexual – testis and spermatogenesis, ovary and oogenesis, fertilization, development, hatching - regeneration in Hydra.

#### Unit II

(14 Hrs)

**Phylum Helminthes:** Structure and life cycle of *Taenia solium* - External features, Body wall, Feeding, Respiratory system, Excretory system-flame cells, Nervous system, Reproductive system, Life cycle- Onchosphere and Cysticercus larvae.

**Phylum Annelida-** Structure and life cycle of *Megascolex mauritii* - External features, Body wall, Coelom, Locomotion, Digestive system, Respiratory system, Excretory system- Meganephridia, Micronephridia, Pharyngeal nephridia, Nervous system, Reproductive system.

**Phylum Arthropoda-** Structure and life cycle of *Periplaneta americana* - External features, Body wall, Mouthparts, Digestive system, Respiratory system, Circulatory system, Nervous system, Sense organs, Excretory system, Reproductive system.

### Unit III

(14 Hrs)

**Phylum Mollusca-** Structure and life cycle of *Pila globosa* - External features, Shell, Digestive system, Respiratory system, Circulatory system, Nervous system, Sense organs- Eyes, Osphradium, Statocyst, Tentacles, Excretory system, Reproductive system..

**Phylum Echinodermata-** Structure and life cycle of *Asterias rubens*.- External features, Pedicellaria-Structure and Function, Digestive system, Respiratory system, Water vascular system-Structure and Function, Circulatory system-Perihaemal and Haemal system, Nervous system, Sense organs, Excretory system, Reproductive system.

### Unit IV

(14 Hrs)

**Phylum Chordata-**Morphology and organ systems of Shark & Frog (Excluding endoskeleton)

**Class Pisces: Shark** - Systematic Position, Habits and Habitat, External features, Exoskeleton-Placoid Scales, Digestive System, Respiratory system & Mechanism of respiration, Circulatory system, Nervous system, Sense organs-Olfactory organs, Eyes, Internal ears, Neuromast or lateral line system, Ampullae of Lorenzini. Urinogenital system.

**Class Amphibia: Frog-** Systematic Position, Habits and Habitat, External features, Sexual dimorphism, Digestive System, Respiratory system, Circulatory system, Nervous system-Sense organs- Tangoreceptors, Tastebuds, Olfactory organs, Internal structure and functions of Eye and Ear, Urinogenital system

**Class Reptilia: Calotes-** Systematic Position, Habits and Habitat, External features, Digestive System, Respiratory system- Respiratory mechanism, Circulatory system-Blood, Heart-Internal structure, Arterial system, Venous system. Nervous system- Brain, Spinal cord, cranial nerves and spinal nerves. Sense organs, Jacobson's organs, Internal structure and functions of Eye and Ear, Urinogenital system

### Unit V

(15 hrs)

**Phylum Chordata** - Morphology and organ systems of Pigeon & rabbit (excluding endoskeleton)

**Class Aves: Pigeon** -Systematic Position, Habits and Habitat, External features, Feathers-Structure of a typical feather in Pigeon, Types of feathers in pigeon .Muscular System- Flight muscles, Digestive System, Respiratory system- Syrinx and voice production, Air sacs and

functions. Respiratory mechanism, Circulatory system-Nervous system, Structure and function of Eye and Ear, Urinogenital system.

**Class Mammalia: Rabbit-** Systematic Position, Habits and Habitat, External features, Digestive System, Respiratory system, Circulatory system, Nervous system. Structure and function of Eye and Ear, Excretory system, Reproductive system.

### TEXT BOOKS

S. No.	Authors	Title of the Book	Publishers	Year of Publication
1	Jordon. E.L & Verma, P.S.	Invertebrate Zoology	S. Chand & Co., New Delhi	1993
2	Jordan. E.L and Verma.P.S.	Chordate Zoology	S. Chand & Co, New Delhi	2014

### REFERENCE BOOKS

S. No.	Authors	Title of the Book	Publishers	Year of Publication
1	Ekambaranatha Ayyar, M.	Outlines of Zoology	Viswanathan Publication	1992
2	Fatik Baran Mandal	Invertebrate Zoology Ist Edn	Eastern Economy Edition	2012
3	Jan A. Pechenik	Biology of the Invertebrates 7th Revised Edition	McGraw-Hill Companies,	2014
4	Barrington EJW,	Invertebrate Structure and Function II Edn	ELBS and Nelson,	1979
5	Waterman, Allyn J.	Structure and Function,	Mac Milan & Co., NewYork	1971

### Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation.

### Course Designers

1. Mrs. Susheela. P
2. Dr. G. Sasikala

Course Number	Course Name	Category	L	T	P	Credit
AS19A02	GENERAL PRINCIPLES IN ZOOLOGY	Allied	71	4	-	4

### Preamble

The course imparts knowledge and understanding of basic cell structure and function, genetics, developmental biology, physiology, and evolution.

### Course Outcomes

On the successful completion of the course, students will be able to understand the structural-functional relationships of living organisms. Students will come to appreciate and enjoy the subject of zoology and be able to place the subject in the larger context of human knowledge and experience on a global scale.

CO Number	CO Statement	Knowledge Level
CO1	Learn that the cells are the basic units of life, which contribute to form tissue, organs, and organ systems and their functions, diversity and evolutionary relationships among animals	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO2	Recognize and understand the fundamentals of cell biology, genetics, animal physiology and evolution	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO3	Understand the diversity of Chordates and its outline systematic. Discuss their affinities and adaptations to different modes of life.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO4	Students will be able to explain how organisms function at the level of the gene, genome, cell, tissue, organ and organ-system. Drawing upon this knowledge, they will be able to give specific examples of the physiological adaptations, development, reproduction and behavior of different forms of life	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>
CO5	Students will be able to use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They will be able to use specific examples to explicate how descent with modification has shaped animal morphology, physiology, life history, and behavior.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub> , K <sub>4</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	L	L	L	M	M
CO2	S	S	M	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	M	S

S- Strong; M-Medium; L-Low



## **GENERAL PRINCIPLES IN ZOOLOGY AS19A02**

**(71 Hrs)**

### **Syllabus**

#### **UNIT I Cell Biology & Genetics**

**(14 Hrs)**

Cell concept-life and living things, cell history, cell theory, cell diversity, internal organization, cell structure and function, Cell types-Prokaryotic, Eukaryotic cell (plant and animal cell), Eukaryotic Animal cell – Structure and functions of Plasma membrane, Golgi apparatus, Mitochondria, Nucleus, Cell cycle - Cell division, Mitosis, Meiosis.

#### **UNIT II Genetics and Physiology**

**(14 Hrs)**

Mendel's Laws of inheritance-Punnett square, Types of genetic cross-Monohybrid and dihybrid cross, Sex determination in man.

Nutrition in man – food types, vitamins and minerals. Digestion and absorption of food in man, balanced diet.

#### **UNIT III Embryology**

**(14 Hrs)**

Gametogenesis – spermatogenesis and oogenesis, Fertilization, cleavage-study of cleavage patterns. Radial and spiral cleavage- Early cleavage in frog- uncleaved egg, two cell stage, morula stage, Blastulation, Gastrulation in Frog - study of different types of eggs- Classification based on amount and distribution of yolk

#### **UNIT IV Endocrinology**

**(14 Hrs)**

Structure, secretions and functions of pituitary- Anterior pituitary and posterior pituitary, thyroid, pancreas and reproductive glands – testes, ovary.

#### **UNIT V Evolution**

**(15 Hrs)**

Origin of life and evolution of cell- Theories on evolution by Lamarck, Charles Darwin & De Vries, living fossils, organic evolution, Evidences of evolution - fossil evidence, morphological, comparative anatomy, embryological, vestigial structures, biochemical and paleontological evidences. Origin of India and its Mega diversity.

## TEXT BOOKS

S. No.	Authors	Title of the Book	Publishers	Year of Publication
1	Verma P.S., Agarwal., V.K.	Cytology Reprint Edition	S. Chand and Company	2012
2	Arumugam, N.	Cell Biology, Genetics, Embryology	S. Chand and Company	2012
3	Arumugam, N	Cell Biology, Genetics & Evolution Volume-3.	Saras Publication	1999
4	Verma P.S. & Tyagi B.S.	Animal Physiology,	S. Chand and Company	2012
5	Verma. P.S. and Agarwal. V.K.	Chordate Embryology	S. Chand and Co. Ltd., New Delhi	1998

## REFERENCE BOOKS

S. No.	Authors	Title of the Book	Publishers	Year of Publication
1	Berry, A.K.	A Text Book of Animal Physiology with related Biochemistry	Emkay Publications	1993
2	Sarada Subrahmanyam., Madhavan Kutty , K., & Singh H.D.	Text Book of Human Physiology, Reprint	S. Chand & Co,	2012
3	De Rebertis EDP & De Robertis EMF	Cell & Molecular Biology. 8 <sup>th</sup> Ed.	BI Wauerly Pvt. Ltd, New Delhi.	1996
4	Berrill, N.J.	Developmental Biology	McGraw Hill, New Delhi.	1986
5	Bodmer, Modern Embryology, Hold Rinefiar & Winston. N.Y. Balinsky	Introduction to Embryology International student edition, 3 <sup>rd</sup> Edition	Saunders Philadelphia.	1981

## Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

## Course Designers

1. Mrs.Susheela.P
2. Dr. G. Sasikala

Course Number	Course Name	Category	L	T	P	Credit
AS19AP1	ALLIED ZOOLOGY PRACTICAL	Practical	-	-	60	2

### Preamble

Topics related to fundamentals of zoology, including exposure to diversity in animal groups based on the zoological areas are covered. The practical course is aimed to equipped the students with skills required for animal identification and classification and also applications of zoology in the various allied fields

### Course Outcome

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand general taxonomic rules on animal classification and general characteristics of animals	K <sub>1</sub>
CO2	Appreciate basic concepts of developmental biology and cell biology	K <sub>1</sub> , K <sub>2</sub>
CO3	Learn fieldwork modalities & Temporary slides are prepared from fresh water culture medium	K <sub>3</sub>
CO4	Dissections of invertebrate animal will aid the students to understand different systems	K <sub>3</sub>
CO5	Prepared slides are studied to understand the structures and arrangement Study of museum specimens which are present in the departmental museum helps the students to have practical knowledge	K <sub>1</sub> , K <sub>2</sub>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	M	M
CO4	S	S	S	M	M
CO5	S	S	S	S	M

S- Strong; M-Medium; L-Low

## **ALLIED ZOOLOGY PRACTICAL - AS19AP1**

**(60 Hrs)**

### **1. Dissections:**

**(30 Hrs)**

1. Cockroach Digestive system, Nervous system, Male & Female Reproductive systems
2. Fish (*Tilapia*) - Digestive system
3. Prawn- Nervous system

### **Mounting:**

1. Mounting of scales of a marketable fish.
2. Mounting of gill arch.
3. Mounting of earthworm setae
4. Mounting of mouth parts of cockroach
5. Mounting of Prawn appendages

### **2. Spotters**

**(12 Hrs)**

- Paramecium – Entire, binary fission, conjugation
- Leucosolenia
- Hydra vulgaris – Entire
- Taenia solium – Entire, T.S
- Ascaris -male,female
- Earth worm
- Pila
- Star fish
- Amphioxus
- Shark
- Frog
- Skeleton of frog- Skull, Vertebrae-Typical, VIII, IX, X, Girdles& Limbs
- Calotes
- Pigeon
- Quill feather
- Rabbit
- Mitosis stages

### **Frog embryology**

- Egg

- Sperm
- Blastula
- Gastrula

**3. Field observations combined with photography and/or videography (4 Hrs)**

Study of insect fauna in the college campus

**4. Culture methods (2 Hrs)**

Culture of unicellular organisms.

**5. Models (12 Hrs)**

- Animal Cell
- Mitochondria
- DNA
- RNA
- Chromosomes
- Alimentary Canal of Man
- Male Reproductive Tract
- Female Reproductive Tract
- Human Placenta
- Protein Structure

**REFERENCE BOOKS**

S. No	Authors	Title of the Book	Publishers	Year of Publication
1	Sinha J, Chatterjee A K, Chattopadhyay P	Advanced Zoology Practical	Arunabha Sen Books and Allied (P) Ltd	2011
2	Lal S S	Textbook of practical Zoology Invertebrate	Rastogi Publication	2004
3	Lal S S	Textbook of practical Zoology Vertebrate	Rastogi Publication	2004

**Pedagogy**

- Observation of slides, specimens and models; field visit, dissection

**Course Designer:**

1. Dr. P. B. Harathi

**Semester : III & IV**

**Paper : Job Oriented Course**

**Title : Apiculture**

**Subject Code : JOB1993**

**Lecture Hours: 40**

**Unit I**

**(6 Hrs)**

Bee keeping down the ages - Present status of Apiculture in India - Classification and Biology of Honey Bees. Embryology and life history - Anatomy and Physiology of honeybee. Social Organization of Bee Colony

**Unit II**

**(6 Hrs)**

Types of beehives - structure - location, care and management - Genetic studies - breeding of stocks - winter broods. Artificial Bee rearing (Apiary), Bee Pasturage. Selection of Bee Species for Apiculture. Bee Keeping Equipment.

**Unit III**

**(6 Hrs)**

Bee foraging: Pollen and nectar yielding plants. Honey extraction, seasonal maintenance, swarming and supersedure - pheromone. Natural enemies and diseases of honey bees and control methods. Bee poisoning and utility of bees in toxicity studies. Apiculture Management

**Unit IV**

**(6 Hrs)**

Uses of honey and beeswax in Indian medicine. Bee Products and Marketing of Bee products. Economics of bee keeping: Economics in small scale and large scale bee keeping. Economic Value of Commercial Beekeeping.

**Unit V****(6 Hrs)**

Preparing bankable bee keeping project: Steps involved in starting a beekeeping project, Prospects of apiculture as self-employment venture. Funding sources for beekeeping projects. Funds mobilization from state and national banks. Grant Resource and utilization.

**FIELD VISIT:** To Apiary unit**(10 Hrs)****REFERENCE BOOKS**

<b>S. No</b>	<b>Authors</b>	<b>Title of the Book</b>	<b>Publishers</b>	<b>Year of Publication</b>
1	Sardar Singh	Bee keeping in India	Indian council of Agricultural Research, New Delhi	1962
2	Sharma P.L. and Singh, S.H.,	Hand book of Bee keeping	Controller Printing and Stationery, Chandigarh	1987
3	Roger, A. Morse,	The ABC and XYZ of Bee culture	A.I. Root & Co., Medina, Ohio	40 <sup>th</sup> Edn, 1990