KUNTHAVAI NAACCHIYAAR GOVERNMENT ARTS COLLEGE FOR WOMEN
An Autonomous College Affiliated to Bharathidasan University
(Re-Accredited by NAAC with 'B' Grade by NAAC)
Thanjavur -613 007, Tamil Nadu, India.

PG & RESEARCH DEPARTMENT OF ZOOLOGY

CBCS & OBE

Scheme of Instruction and Syllabus for

B.Sc., ZOOLOGY

(I to VI Semester)

(Effective from 2022 - 2023 and onwards)

PG & RESEARCH DEPARTMENT OF ZOOLOGY
KUNTHAVAI NAACCHIYAAR GOVERNMENT ARTS COLLEGE FOR WOMEN (AUTONOMOUS)
THANJAVUR – 613 007, TAMIL NADU, INDIA

I. Vision

- To ingrain the values of life, Science and Nature in young female students by excellent academic and non-academic avenues and to transform them into technically adept human resources.

II. Mission

- To inculcate the respect and concern for ethical values of life, education and environment
- To create awareness and responsibility towards the conservation of biodiversity and natural resources
- To promote comprehensive educational practices that enhances employability and triggers entrepreneurship among young women graduates
- To promote interdisciplinary and collaborative research at post graduate level
- To produce responsible women graduates to transform the society through their empowerment.

III. PROGRAM OUTCOME (PO)

After completing the B.Sc programme the students will be able to: PO

PO 1 : Recognized the relationship between structure and functions at different levels (e.g. molecular, cells, organ, Organism, population and species) of biological organization.

PO 2 : Acquire knowledge and understanding about the fundamental concepts on the diversity, complex interaction existing among the organisms.

PO 3 : Understand the domain knowledge and skills to identity the animals and investigate their nature of relationship, connecting link, complex evolutionary process and behavior.

PO 4 : Correlate the structure of cell organelles and its function to control various metabolic activities of animals.

PO 5 : Analyze the complex interaction among the organisms and their distribution and the relationship with their environmental.

PO 6 : Understand the environmental issues, conservation processes and its importance, Biodiversity and protection of endangered species.

PO 7 : Gained knowledge and skills to mitigate the economic potential of animal science (Poultry, Vermiculture, Aquaculture, etc.) to become successful bio entrepreneurs.

PO 8 : Expertise in conducting experiment in the areas of basic and applied zoology and correlation the physiological process of animals and relationship of organ system.

PO 9 : Understand how organisms function at the level of gene, genome and concepts of genetics and its importance in human health and inculcating the knowledge on research attitude and aptitude among students.

PO 10 : Develop empathy and loves towards the animals and apply the knowledge and understanding of Zoology to own life and work.

IV. Programme Structure

Kunthavai Naacchiyaar Govt. Arts College for Women (Autonomous), Thanjavur - 7.
B.Sc. ZOOLOGY Course Structure under CBCS
(For the candidates admitted from the academic year 2022 - 2023 onwards)

Semester	Part	Course	Subject Code	Title of the Paper	Inst. Hrs.	Credit	Exam. Hrs	Marks		Total
								Int.	Ext.	
I	I	LC 1	22K1T1	செய்யுள்(இக்காலஇலக்கியம்),சிறுகதை,பயன்முறைத்தமிழ்,தமிழ் இலக்கிய வரலாறு.	6	3	3	25	75	100
	II	ELC 1	22K1E1	English for Effective communication-I	6	3	3	25	75	100
	III	CC 1	22K1Z01	Invertebrata	6	6	3	25	75	100
		CC 2 (P)		Practical I Invertebrata and Chordata	3	–	-	-	-	-
		AC 1	22KIZAB1	Fundamentals of Botany -I	4	3	3	25	75	100
		AC 2 (P)		Allied Practical	3		-	-	-	-
	IV	VE	22K1VE	Value Education	2	2	3	25	75	100
	Total				**30**	**17**				**500**
II	I	LC 2	22K2T2	செய்யுள்(இடைக்காலஇலக்கியம்),புதினம், தமிழில் தொடரிலக்கணம்,தமிழ் இலக்கியவரலாறு.	6	3	3	25	75	100
	II	ELC 2	22K2E2	English for Effective communication-II	6	3	3	25	75	100
	III	CC 2 (P)	22K2Z02P	Practical I Invertebrata and Chordata	(3)+3	3	3	40	60	100
		CC 3	22K2Z03	Chordata	6	6	3	25	75	100
		AC 2 (P)	22K2ZAB2P	Fundamentals of Botany -I&II	3+3	3	3	40	60	100
		AC 3	22K2ZAB3	Fundamentals of Botany -II	4	3	3	25	75	100
	IV	ES	22K2ES	Environmental Studies	2	2	3	25	75	100
	Total				**30**	**23**				**700**
III	I	LC 3	22K3T3	செய்யுள்(காப்பியங்கள்), உரைநடை, அலுவல்முறை மடல்கள்,தமிழ் இலக்கியவரலாறு.	6	3	3	25	75	100
	II	ELC 3	22K3E3	English for Effective communication-III	6	3	3	25	75	100
	III	CC 4	22K3Z04	Cell And Molecular Biology	6	6	3	25	75	100
		CC 5 (P)		Practical -II Cell and Molecular Biology, Genetics and Evolution & Biological Techniques	3		-	-	-	-
		AC 4	22K3B/P/ZACHI	Allied Chemistry -I	4	4 3	3	25	75	100
		AC 5 (P)		Allied Chemistry II Practical	3		-	-	-	-
	IV	NME 1	22K3ZELO1	Poultry Science	2	2	3	25	75	100
		ECC1	22K3ECCZ1:1	Economic Entomology	-	3	3	-	100	100
			22K3ECCZ1:2	MOOC (Value Added)						
		ECC2	22K3ECCZ2	Add on Course	-	4	-	-	-	-
	Total				**30**	**18 7**				**500**

CONTROLLER OF EXAMINATIONS
01 AUG 2022
K.N.Govt. Arts College for Women (A), Thanjavur

IV	I	LC 4	22K4T4	செய்யுள்(பண்டைய இலக்கியம்),நாடகம், பொதுக்கட்டுரை,தமிழ் இலக்கிய வரலாறு.	6	3	3	25	75	100
	II	ELC 4	22K4E4	English for Effective communication-IV	6	3	3	25	75	100
	III	CC 5 (P)	22K4Z05P	Practical -II Cell and Molecular Biology & Genetics and Evolution	(3)+3	3	3	40	60	100
		CC 6	22K4Z06	Genetics and Evolution	5	5	3	25	75	100
		AC 5 (P)		Allied Chemistry II Practical	3+3	3	3	40	60	100
		AC 6	22K4B/P/ZACH3	Allied Chemistry - III	3	2 3	3	25	75	100
	IV	NME 2	22K4ZEL02	Vermiculture	2	2	3	25	75	100
		SBEC 1	22K4SBEC1	Life Skills	2	2	3	25	75	100
		ECC3	22K4ECCZ3:1	Medical Zoology	-	3	3	-	100	100
			22K4ECCZ3:2	MOOC (Value Added)						
	Total				**30**	**23**				**800**
V	III	CC 7	22K5Z07	Biological Techniques	6	6	3	25	75	100
		CC 8	22K5Z08	Animal Physiology and Biochemistry	6	5	3	25	75	100
		CC 9	22K5Z09	Developmental Biology	6	5	3	25	75	100
		CC 10 (P)	22K5Z10P	Practical III Biological Techniques, Animal Physiology and Biochemistry, Developmental Biology & Microbiology	3	3	3	40	60	100
		MBE 1	22K5ZELZ1:1	Microbiology	5	5	3	25	75	100
			22K5ZELZ1:2	Wild life biology						
	IV	SBEC 2	22K5SBEC2:1	Avian Biology	2	2	3	25	75	100
			22K5SBEC2:2	Ornamental fish Culture						
		SBEC 3	22K5SBEC3:1	External Internship	-	2	-	50	50	100
			22K5SBEC3:2	Internal Internship						
			22K5SBEC3:3	Field work						
		SSD	22K5SSD	Soft Skills Development	2	2	3	25	75	100
	Total				**30**	**30**				**800**
VI	III	CC 11	22K6Z11	Immunology	7	7	3	25	75	100
		CC 12	22K6Z12	Environmental Biology	7	7	3	25	75	100
		CC 13 (P)	22K6Z13P	Practical IV - Immunology,Environmental Biology, Biotechnology & Sericulture	3	3	3	40	60	100
		MBE 2	22K6ZELZ2:1	Biotechnology	6	5	3	25	75	100
			22K6ZELZ2:2	Biodiversity						
		MBE 3	22K6ZELZ3:1	Sericulture	6	5	3	25	75	100
			22K6ZELZ3:2	Applied Zoology						
	V	GS	22K6GS	Gender Studies	1	1	3	25	75	100
		Extn. Act.	22K6EA	Extension and Extra Curricular Activities	-	1	-	-	-	-
				Total	**30**	**29**				**600**
				Grand Total	**180**	**140**				**3900**

ECC - Extra Credit Course1,2,3 : Total credits 10

CONTROLLER OF EXAMINATIONS
01 AUG 2022
K.N. Govt. Arts College for Women (Autonomous), Thanjavur

Head of the Department
Department of Zoology
K.N.Govt.Arts College for Women (Autonomous)
Thanjavur - 613 007.

V. Electives

B.Sc Zoology - List of Elective Courses 2022-2023

Semester V	**Major Based Elective I**	**Code**	*Semester IV*	**Skill Based Elective I**	**Code**
MBE1:1	Microbiology	22K5ZELZ1:1	SBEC 1:1	Life Skills	22K4SBEC1:1
MBE1:2	Wild life Biology	22K5ZELZ1:2	SBEC 1:2	Team Skills	22K4SBEC1:2
Semester VI	**Major Based Elective II**	**Code**	*Semester V*	**Skill Based Elective II**	**Code**
MBE2:1	Biotechnology	22K5ZELZ2:1	SBEC 2:1	Avian Biology	22K5SBEC2:1
MBE2:2	Biodiversity	22K5ZEL2:2	SBEC 2:1	Ornamental fish culture	22K5SBEC2:1
Semester VI	**Major Based Elective III**	**Code**	*Semester V*	**Skill Based Elective III**	**Code**
MBE3:1	Sericulture	22K5ZEL3:1	SBEC 3:1	Internship-Exterfnal	22K5SBEC3:1
MBE3:2	Applied Zoology	22K5ZEL3:2	SBEC 3:2	Internship- Internal	22K5SBEC3:2
			SBEC 3:3	Field work	22K5SBEC3:3

Non Major Elective - Semester III

Sl.NO	Course Title	Code	Department
1	□□□□□□□□□□□□□□□□□□	22K3TEL01	Tamil
2	English for Enhanced Competence-I	22K3EEL01	English
3	History of freedom, movement	22KHEL01	History
4	Basics of Indian ecomonics	22K3ECE	Economics
5	Operations Research-I	22K3MEL01	Mathematics
6	Laser Physics	22K3PEL01	Physics
7	Agro chemistry	22K3CHEL01	Chemistry
8	Mushroom Technology	22K3BEL02	Botany
9	Poultry science	22K3ZEL01	Zoology
10	Geography for Competitive Examinations I	22K3GEL01	Geography
11	Statistical Methods	22K3SEL01	Statistics
12	Introduction to IT	22K3CSEL01	Computer Science
13	Basics of Insurance	22K3COEL01	Commerce
14	An Introduction to Principles of Management	22K3BBEL01	Business Administration

Non Major Elective - Semester IV

Sl.NO	Course Title	Code	Department
1	□□□□□□□□□□□□□□□	22K4TEL02	Tamil
2	English for Enhanced Competence-II	22K4EEL02	English
3	Panchayat Raj with special references to Tamil Nadu	22K4EEL02	History
4	Economics for competitive examinations	22K4ECL02	Economics
5	Operations Research- II	22K4MEL02	Mathematics
6	Solar Energy	22K4PEL02	Physics
7	Hydro Chemistry	22K4CHEL02	Chemistry
8	Horticultural Practices and Gardening.	22K4BELO2	Botany
9	Vermiculture	22K4ZEL02	Zoology
10	Geography for Competitive Examinations II	22K4GEL02	Geography
11	Bio Statistics	22K4SEL02	Statistics
12	Fundamentals of Web designing	22K4CSEL02	Computer Science
13	General Commercial Knowledge	22K4COEL02	Commerce
14	An Introduction to Organizational behavior	22K4BBEL02	Business Administration

Add-on Course: Semester III: 1) Aquarium maintenance
2) Vermicomposting

VI. Details on the number of courses, Instruction hours and credits

Course	Course Title	No. of Courses	Instruction Hours	Credits
Part I	Tamil	4	24	12
Part II	English	4	24	12
Part III	Core Course (Theory 9 & Practical 4)	13	77	65
Part III	Allied Course (Theory 4 & Practical2)	6	24	18
Part III	Major Based Elective	3	16	15
Part IV	Skill Based Elective	3	4	6
	Non Major Elective Course (NME)	2	4	4
	Value Education	1	2	2
	Environmental Studies	1	2	2
	SSD	1	2	2
Part V	Extension Activities	-	-	1
	Gender Studies	1	1	1
	Total	**39**	**180**	**140**
	ECC 1,2,3	**3**	**-**	**10**

VII. SEMESTER – WISE COURSE STRUCTURE

Semester	Course	Total Courses	Ins. Hr/ week	Credit
I	LC1, ELC1, CC1, AC1, VE	5	30	18
II	LC2, ELC2, CC2P, CC3, AC3, AC2P, ES,	7	30	22
III	LC3, ELC3, CC4, CC5, AC1, NME1	6	30	22
IV	LC4, ELC4, CC6, CC7 P, AC5 P, AC6, NME2, SBEC1	8	30	22
V	CC8,CC9,MBE1,SBEC2, SBEC3,SSD	6	30	29
VI	CC10,CC11,CC12P,CC13P,MBE2,MBE3,GS (+Ext Act)	7	30	27
	TOTAL	**39**	**180**	**140**

SEM I	CCI	INVERTEBRATA	22K1Z01	Inst.Hrs.6	Credit 6

Course Objectives: *The course is a walk for the Bachelors' entrant through the amazing diversity of living forms from simple to complex. It highlights how the organisms evolve and establish themselves and adapt their environment. These also compares with the basis of morphology and functional aspects of invertebrates.*

CO	STATEMENT
1	Define the structural organization and classification of invertebrates
2	Summarize the diversity of invertebrates
3	Point out the lifecycle of pathogenic nematodes
4	Analyze the different larval forms and its significance
5	Hypothesis the cephalopods as advanced mollusks
6	Awareness' about the Zoonotic diseases

UNIT I: General characters and classification of Phyla up to class level giving examples Phylum Protozoa - Detailed study: *Plasmodium* – Structure, life history, and pathology and control measures. General Topic: Diseases, Locomotion, Nutrition and reproduction in protozoa.

UNIT II: General Characteristics of Phylum: Porifera and Coelenterata– Detailed study – Ascon sponge and obelia. General Topics: Canal system in sponges and Polymorphism in Hydrozoa.

UNIT III: General Characteristics of Phylum: Platyhelminthes and Ashelminthus: Detailed study: *Taenia solium* and *Ascaris lumbricoidas*. General Topic: Parasitic adaptations in nematodes.

UNIT IV: General Characteristics of Phylum: Annelida and Arthropoda - Detailed study: Nereis and Prawn. General Topics: Adaptive radiation among annelids, Mouth parts of insects and Peripatus – Characters and affinities.

UNIT V: General Characteristics of Phylum: Mollusca and Echinodermata. Detailed study: Pila and Star fish. General topics: Foot in mollusc, Ink gland in Sepia, Cephalopods are advanced mollusks and larval forms of Echinoderms.

UNIT VI: (Not for Semester Examination)- Instintive behaviour in invertebrates - Zoonotic diseases - Helminth infection in humans (Blood Fluke).

Text Books:

1. Ayyar E.K. and T.N. Anathakrishnan (1992) A. Manual of Zoology. Vol.1 (Invertebrata) parts I &II Viswanathan Pvt. Ltd.,
2. Jordon E.L and P.S Verma (1995). Invertebrate Zoology 12th edn. S. Chand & Co.,
3. Arumugam.N. (2013). Invertebrata. Saras Publications.

Reference:

1. Anderson, Donald Thomas (2006). Invertebrate zoology, Oxford Univ.Press.
2. Branes.R.D (1982). Invertebrate zoology, VI Edn.Holt Saunders International Edn.
3. Moore, Janet (2006). An introduction to the Invertebrates. Cambridge Univ.Press.

SEM I	CCI	KJnfOk;G mw;wit	22K1Z01	Inst.Hrs.6	Credit 6

myF1: njhFjp: GNuhl;NlhNrhthtpd; nghJgz;;Gfs;; kw;Wk; tifghLfs;; thpir tiu jFe;j cjhuzj;Jld; tpsf;fk; - tphpthd gbg;G : gpsh];Nkhbak; mikg;G> tho;f;if tuyhW kw;Wk; Nehapay; kw;Wk; fl;Lghl;L eltbf;iffs;> nghJthd jiyg;Gfs; :GNuhl;NlhNrhthtpd; ,dngUf;fk;> czTl;lk;> ,lngah;r;rp kw;Wk; Neha;fs;.

myF2: njhFjp: nghp/nguh ; kw;Wk; FopAlypfspd; nghJgz;Gfs; - tphpthd gbg;G: M];fhd;];ghQ;r; kw;Wk; xgpypah nghJthd jiyg;Gfs;:];ghQ;Rfspd;; fhy;tha; kz;lyk; kw;Wk;; i`l;uhtpd; gy cUt jd;ik .; ;

myF3: njhFjp: jl;ilGOf;fs; kw;Wk; cUisGOf;fspd;; nghJgz;Gfs; - tphpthd gbg;G:- ehlhGO kw;Wk; fy;yPuy; GO. nghJthd jiyg;Gfs;: cUisg; GKf;fspd; xl;Lz;zpjOty;.

myF4: njhFjp: tisjirg;GOf;fs; kw;Wk; fZf;fhypfs; nghJgz;Gfs; - tphpthd gbg;G: ePhp]; kw;Wk; ,why; nghJthd jiyg;Gfs;: ;tisj; jirg; GOf;fspd; jOtpg;guty; kw;Wk; G+r;rpfspd; thAWg;Gfs;. nghpNgl;l]pd; gz;Gfs; kw;Wk; ,dcwTfs;.

myF5: njhFjp: nky;Ylypfs; kw;Wk; Kl;Njhypfspd; nghJgz;Gfs; - tphpthd gbg;G: ej;ij kw;Wk; el;rj;jpu kPd;. Tphpthd jiyg;Gf;fs;: nky;Ylypfspd; ghjk;> nrg;gpahtpd; gr;irRug;gp > jiyf;fhypfspd; Nkk;gLj;jg;gl;;l nky;Ylypfs; kw;Wk; Kl;Njhypfspd; ,sk;caphpfs;.

myF6: KJnfYk;gw;witfspd; cs;Szh;T elj;ij – tpyq;fpay; Neha;fs; - kdpjdpy; ;GOf;fspd; njhw;W

CO-PO Mapping with Programme Outcomes: Invertebrates Code: 22K1Z01

CO/PO	1	2	3	4	5	6	7	8	9	10
1	3	3	3				2	1		
2			1				1			1
3	1		1		1		1		1	
4				1				2		
5	1			1		1		1		1

1.Low, 2-Moderate, 3-High Correlation

SEM I & II	CC2(P)	PRACTICAL I INVERTEBRATA AND CHORDATA	22K2Z02P	Ins.Hrs.6	Credit 3

Course Objectives: *To enable students to understand different levels of biological diversity through the systematic classification: by familiarizing with the taxa level identification of animals and equipping the students with the technical knowledge and do how on basic techniques of animal behaviour, physiology and anatomy and also on animal rearing, collection and preservation.*

CO	STATEMENT
1	Ensures intrest in protiston diversity and imparknowledge on parasitic forms of lower invertebrates.
2	Create appreciation on diversity of life on earth and enable the students to understand the evolutionary significance of invertebrate and chordate fauna.
3	Enriching the knowledge of students on the taxa level identification of animals.
4	Familiarize the learner the basic concept of scientific methods in research process.
5	Impart knowledge on various research designs and to develop skill in research communication and scientific documentation.

Spotters:

1. Classify giving reasons:

Protozoa : Amoeba, Euglena, Paramecium
Porifera : Sycon
Coelenterata : *Obelia geniculata*, Physalia, Aurelia, Sea Anemone, Fungia.
Platyhelminthes : Planaria, *Fasciola hepatica*, ***T****aenia sollium.*
Aschelminthes : *Ascaris lumbricoides*-Male, *Ascaris lumbricoides*-Female,Filarial Worm.
Annelida : Nereis, Leech, Sabella.
Arthropoda : Prawn, Lepas, Balanus, Crab, Limulus.
Mollusca : Chiton, Pila, Dentalium, Sepia.
Echinodermata : Star Fish, Sea Urchin.
Chordata : Balanoglossus, Amphioxus, Ascidian, Shark, Alytus, Hyla, Naja naja, Russel Viper, Chelonemydas, Pigeon, Bat.

2. Comment on Biological Significance:

Paramacium Conjugation, Paramaecium Binary Fission, Sponge gemmule, Heteronereis, Trochopore larva, Nauplius larva, Zoea larva, Mysis larva, *Bombyx mori*, Honey bee, Lac insect, Pearl oyster, Limulus, Bipinnaria larva, Salamander

3. Draw a Labelled Sketch:

Pigeon: Synsacrum,
Rabbit: Pectoral girdle, Pelvic girdle, Fore limb, Hind limb.

4. Relate Structure And Function:

Sponge- Spicules, Tape worm- Scolex, Neries - Parapodium, Earth worm - Body setae, Pineal setae, Pila - Radula, Star fish - Pedicellaria, Aristotle's Lantern, Chaeopterus, Hippocampus, Echines, Clarius, Exocoetus, Pigeon - Quill feather, Draco.

5. Dentition:

Man, Rabbit, Dog.

Dissections (Virtual Dissection using Pro Dissector tools):

Earth worm - digestive system, nervous system. Prawn - Nervous system.

Mountings

Earth worm- Body Setae, Pineal Setae. Shark - Placoid Scale. Fish - Ctenoid Scales, Cycloid Scales. Prawn - Appendages.

Spotters:

Prochordata : Balanoglossus, Amphioxus and Ascidian.

Pisces : Shark, Clarius, Echeneis, Hippocampus and Exocetus.

Amphibian : Alytes, Axolotly larva, Hyla and Salamander.

Reptilia : Naja naja, Viper, Draco and Chelone mydos.

Aves : Pigeon and Quill feather.

Mammalia : Bat, Platypus and Kangaroo.

Dentition : Rabbit, Dog and Man.

Osteology : Pigeon – Synsacrum, Rabbit – Pectoral, Pelvic girdle, fore limb and Hind limb.

CO-PO Mapping with Programme Outcomes: Practical I Invertebrata and Chordata Code:22K1Z01

CO/PO	1	2	3	4	5	6	7	8	9	10
1	3	3	3				2	1		
2			1							
3	1				1					
4				1				2		
5	1									

1.Low, 2-Moderate, 3-High Correlation

SEM II	CC 3	CHORDATA	22K2Z03	Inst.Hrs.6	Credit 6

Course Objectives: *The course is a walk for the Bachelors' entrant through the amazing diversity of living forms from simple to complex. It highlights how the organisms evolve and establish themselves and adapt their environment. These also compares with the basis of morphology and functional aspects of Chordates.*

CO	STATEMENT
1	To develop understanding on the diversity of chordates
2	To group amphibians on the basis their characteristics
3	Compare the functions of various organs
4	Develop the critical understanding of migratory and non migratory birds
5	Examine the diversity of Prototherians and metatherians.
6	To understand the adaptations of various kinds of Animals

UNIT I: PROCHORDATA, AGNATHA & PISCES- General Characteristics and Classifications of Prochordata, Agnatha up to order level and Pisces up to class level. Prochordata: Detail study:- Balanoglossus .Pisces :Detail study:- Scoliodon. Accessory respiratory organs in fishes- Migration of fishes- Anadromous - Catadromous.

UNIT II: AMPHIBIA- General Characteristics and Classification of Amphibia up to order level. Detail study: – Frog-Parental care in amphibians. Biological significance of Gymnophiona.

UNIT III: REPTILIA- General Characteristics and classification of Reptilia up to order level. Detail study: - Calotes - Mesozoic reptiles. Biological significances of Sphenodon. Identification of Poisonous and non - poisonous snakes; Poisonous snakes of South India; Poison apparatus and biting mechanism.

UNIT IV: AVES- General Characteristics and Classifications of Aves up to order level: Detail study: - Pigeon. Flight adaptation in birds. Migration of birds, Flightless birds.

UNIT V: MAMMALIA- Classification of mammalia up to order level. Detail study: - Rabbit. Structure and Affinities of Prototheria and metatheria. Dentition in Mammals and adaptations of Aquatic mammals

UNIIT VI: (Not for Semester Examination)- Learning in birds - social behaviour in primates, Zoonotic diseases.

Text Books:

1. Ayyer E.K. and T.N. Anathakrishnan (1995). A Manual of Zoology. Vol.2 (parts I &II) Viswanatan Pvt. Ltd.,
2. Jordon E.L and P.S Verma (2000). Chordate Zoology 12th edn. S. Chand & Co.,
3. Arumugam,(2008). Chordate Zoology, Vol.2, Saras Publications.

Reference Books:

1. Kotpal, R.L.(2000). Modern Text Book of Zoology, Vertebrates, Rastogi Publications, Meerut.
2. Sandhu G.S. Bhaskar H (2004). Text Book of Chordate Zoology, Campus Books.
3. Sumithra Saxena and R.K. Saxena. Comparative anatomy of Vertebrates

SEM II	CC 3	KJnfYk;G cs;sit	22K2Z03	Inst.Hrs.6	Credit 6

myF1: KJFjz;Lilad - jhilaw;wit kw;Wk; kPd;fs; ;- nghJgz;Gfs; kw;Wk; tifghLfs;: Kd; KJFjz;Lilad kw;Wk; jhilaw;wit – thpirtiu. ; kPd;fs; - tFg;G tiu . KJFjz;Lilad:- tphpthd gbg;G - /ngyNdhfpshr];. kPd;fs; :- tphpthd gbg;G];NfhypNahlhd;. kPd;fspd;; Jiz Rthr cWg;;Gfs;; -kPd;;fspd; tyirNghjy;;- mdhl;;Nuhk];;- Nfll;;Nuhk];;.

myF2: ,Utho;;tpfs; - nghJgz;;Gfs;; kw;Wk; tifghLfs;; thpir tiu tphpthd gbg;G;;- jtis-; ,Utho;tpfspd; ngw;Nwhh; Ngzy;; [pk;NdhgpNahdh: mikg;G ;kw;Wk; caphpapay;; Kf;;fpaj;Jtk;;.

myF3: Ch;td - nghJgz;;Gfs;; kw;Wk;; Ch;tdtw;wpd; tifghLfs;; thpir tiu- tphpthd gbg;G :- Xzhd;,];gpNdhlhd; : caphpapay;; Kf;;fpaj;Jtk; er;R> er;rw;w ghk;Gfspd; ,dk; fhZjy;> njd; ,e;jpa er;R ghk;Gfs;> er;R cWg;Gfs; kw;Wk; fbf;Fk; nray; Kiw kPNrhNrhapf; Ch;td.

myF4: gwitfs; - nghJgz;;Gfs;; kw;Wk;; gwitfspd; tifghLfs;; thpir tiu- tphpthd gbg;G :- Gwh >gwitfspd; gwf;Fk; jftikg;Gfs;> gwitfs;pd; tyirNghjy;> gwf;f ,ayhj gwitfs;;.

myF5: ghY}l;bfs; ;- nghJgz;;Gfs;; kw;Wk;; ghY}l;bfspd; tifghLfs;; thpir tiu tphpthd gbg;G :- Kay.; GNuhl;NlhjPhpah kw;Wk; nkl;lhjPhpah:- mikg;G kw;Wk; ,dcwT kw;Wk; ghY}l;bfspd; gy;yikT kw;Wk; ePh; tho; ghY}l;bfspd; jftikg;Gfs;.

myF6: (Not for Semester Examination)- gwitfspd; fw;wy;-tpyq;Ffspd; rKf elj;ij –tpyq;fpay; Neha;fs;.

CO-PO Mapping with Programme Outcomes: Chordata Code: 22K2Z03

CO/PO	1	2	3	4	5	6	7	8	9	10
1	1		1		1		1			
2	2	1				2		1		
3				1			2			
4	1				2	1			1	
5			1				1			

1.Low, 2-Moderate, 3-High Correlation

SEM III	CC4	CELL AND MOLECULAR BIOLOGY	22K3Z04	Inst.Hrs.6	Credit 6

***Course Objectives**: This course aims to develop skills of students by providing fundamentals of cell and difference between Prokaryotic and Eukaryotic cell and successful completion of this course students also recognize and understand the Chromes, Molecular structure of DNA,RNA and Mechanism of Protein synthesis.*

CO	STATEMENT
1	Understand the different structure and functions of cell organelles.
2	Explain the concepts behind Cell cycle, Cell division.
3	Acquired knowledge about the different Central Dogma of Protein synthesis and Regulation of Gene expression.
4	Learn the basic concepts in Mitotic and meiotic cell divisions.
5	Gain the knowledge on Salient features of cell theory.

UNIT I: Eukaryotic cell: UltraStructure and function. Plasma membrane – ultra structure – unit membrane model–fluid mosaic model–functions. Cytoplasm – Physical and biological properties

UNIT II: Cytoplasmic Organelles: Structure and functions of Golgi body, Endoplasmic reticulum, Ribosome, Lysosomes, Mitochondria, Nucleus and nucleolus. Centrosome.

UNIT III: Chromosomes – structure and organization in Eukaryotes, Giant **C**hromosomes polytene and Lamp brush **C**hromosomes. Cell cycle, Cell division: amitosis, mitosis and meiosis –Cancer: Causes, types and characteristics. Cell death and ageing.

UNIT IV: Nucleic acids: DNA and RNA–structure, types, properties, and functions.Replication of DNA and RNA.

UNIT V: Protein synthesis: Eukaryotes, Central Dogma, Mechanism of Protein synthesis. Regulation of Gene expression- Lac operan.

UNIT VI: (Not for Semester Examination)- Salient features of cell theory, Cell excretory materials, significance of Mitotic and meiotic cell divisions, Components of Nucleic acids. New investigations in cell and molecular level.

Text Books:

1. E.D.P.DeRobertis and E.M.F. DeRobertis: Cell and Molecular Biology (W.B. Saunders)
2. P.S. Verma and V.K. Agarwal: Cytology (S. Chand & Co)
3. C.B. Powar: Cell Biology (Himalaya Publishing Co)

Reference books:

1. A.L. Giese: Cell Physiology (W.B. Saunders)
2. Harvey Lodish and james E darnell. Molecular cell Biology.

SEM III	CC4	nry; kw;Wk; %yf;$W capupay;	22K3Z04	Inst.Hrs.6	Credit 6

;

myF1:; A+Nfhpahbf; nry;: gpsh];kh rt;tpd; – □□z;ikg;G kw;Wk; gzpfs;– myFrt;Tkhjphp – jputnkhirf;khjphp;. irl;;Nlhgpshrj;jpd; ,aw;gpay; ; kw;Wk; capupay;gz;Gfs;.

myF2;: nry;cs;SWg;Gfs;: Nfhy;ifcWg;G ; mikg;G kw;Wk; gzpfs;> vz;Nlhgpsh];kpf;nul;bf;Fyk;. iuNghNrhk;> iyNrhNrhk;> ikl;Nlhf;fhd;bhpah>epA+f;fpspa]; > epA+f;spNahy]; kwWk; nrd;l;NuhNrhk;;.

myF3:FNuhNkhNrhk;fs;- mikg;G kw;Wk cUthf;fk -;A+Nfhpahl; nry;;> uhl;r;rj ghypBd; kw;Wk; tpsf;FJ}hpif FNuhNkhNrhk;fspd; mikg;G. nry;Row;rp> nry;gphpT> Vikl;lhrp];> ikl;lhrp]; kw;Wk; kpah]p]; - Gw;WNeha;: tiffs; -fhuzq;fs; kw;Wk; fhh;rpNdhn[dp]p]; - nry;,wg;G kw;Wk; Kjph;T.

myF4: epA+f;spf; mkpyq;fs; : b.vd;.V kw;Wk; Mu.vd;.V –njhFg;G> fl;likg;G> gz;Gfs; > tiffs; kw;Wk; nray;ghLfs;> b.vd;.V> kw;Wk; Mu.vd;.Vtpd; gpujp.

myF5: Guj cw;gj;jp- A+Nfhpahl; nry; ;> ;ikaf;Nfhl;ghL > Guj cw;gj;jpapd; nray;ghL. kugZ ntspg;ghl;ilf; ;xOq;FgLj;Jjy;- Nyf;- xgg;guhz; .

myF6(Not for Semester Examination)-: nry;Nfhl;ghl;bd; Kf;fpa mk;rq;fs;> nry;fopTg; nghUl;fs;> ikl;lhbf; kw;Wk; kpahl;bf; nry;gphpTfspd; Kf;fpaj;Jtk;> epA+f;spf;mkpyq;fspd; $Wfs;. ;;; nry; kw;Wk; %yf;$W mstpy; Gjpa Ma;Tfs;.

CO-PO Mapping with Programme Outcomes: Cell and Molecular Biology Code: 22K3Z04

CO/PO	1	2	3	4	5	6	7	8	9	10
1	2	1			1				1	
2		1					1	1		
3	1			2	1				1	
4	2						2	1		
5					1					1

1.Low, 2-Moderate, 3-High Correlation

SEM III&IV	CC5(P)	PRACTICAL II CELL AND MOLECULAR BIOLOGY & GENETICS AND EVOLUTION	22K4Z05P	Ins.Hrs.6	Credit 3

***Course Objectives**: To enable students to observe different stages of chromosomal divisions ; by femilirizing the structure of various tissues and equipping the students with the technical knowledge on blood grouping and DNA, RNA models .*

CO	STATEMENT
1	Ensures interest in mounting of chromosomal mitotic and meiotic stages
2	Enable the students to understand the genetical importance of pedigree analysis
3	Enriching the knowledge of students on the normal and malignant cells
4	Femiliarize the evolutionary significance of forelimb and wings of birds
5	Impart knowledge on various productive colouration of insects

CELL AND MOLECULAR BIOLOGY:

1. Chironomous : Mounting of polytene chromosomes
2. Grasshopper : Testis squash preparation to observe meiotic stage
3. Onion : Root tip squash preparation to observe mitotic stage

SPOTTERS : Dissection and compound microscope
Epithelial, muscular, vascular and supporting tissues, (Bone, Cartilage and Connective tissues).

GENETICS:

1. Blood grouping
2. Drosophila - Male, female Identification, Culture, Life cycle Mutant analysis.
3. Pedigree analysis
4. Models of DNA, RNA and tRNA
5. Observation of normal and malignant cells.

EVOLUTION:

Spotters **:** Homologous (fore limbs of frog and pigeon) and analogous organs (wings of birds and insects

Protective colorations : Leaf insects, stick insects, chameleon, hippocampus, pepper moth, mimicry, monarch and viceroy butterfly.

Quantum evolution : Evolutionary significance of Achaeopteryx and Peripatus. Bat and Pteropus

CO-PO Mapping with Programme Outcomes: Practical II Cell and Molecular Biology, Genetics and Evolution Code: 22K4Z05P

CO/PO	1	2	3	4	5	6	7	8	9	10
1	2	1			1				1	
2		1					1	1		
3	1			2	1				1	

4	2						2	1		
5					1					1

SEM III	**NMEI**	**POULTRY SCIENCE**	**22K3ZEL01**	**Ins.Hrs.2**	**Credit 2**

Course Objectives: *On completion of this course student learn knowledge about the concept of types of poultry, management of poultry, Nutrition, Disease, Economic importance of Poultry and self Employment Venture.*

CO	**STATEMENT**
1	Discover the knowledge about poultry
2	Distinguish the management of poultry
3	Illustrate the Poultry nutrition
4	Summarize the diseases of poultry
5	Construct the farm records of Poultry
6	Summarize the self employment venture.

UNIT I: Introduction – Scope and Progress of Poultry industry in South India. Some common types of poultry Plymouth rock, Light Sussex, Minorca , Rhode island Red and White leghorn, their advantageous features – choosing commercial laying stock – Poultry housing – the deep litter system – laying cages – poultry manure.

UNIT II: Management – practical aspects of chick rearing – Management of growers, layers and broilers – Lighting and temperature – summer and winter management – Debeaking.

UNIT III: Poultry Nutrition – requirements – food additives – feed for poultry. Feed ingredients.

UNIT IV: Diseases of poultry: viral, bacterial, fungal and animal diseases. Symptoms and control of diseases - Vaccination programme - Cleaning poultry.

UNITV: Factors affecting egg size: storage and preservation methods. Marketing and grading. Economics of poultry production, maintenance of farm record and accounts.

UNITVI: (Not for Semester Examination)- Management of a modern poultry farms - Progressive plans to promote poultry as a self employment venture.

Text books

1. JayaSurya, N.C.Nair, N.Soundara Pandian ,A.Thangamani, L.M.Narayanan, N.Arumugam, S.Leelavathy,T.Murugan, S.Prasannakumar and J.Johnson Rajeshwar, (2015). Economic zoology,Saras publication,Nagercoil.
2. Arumugam,N,T.Murugan,J,Jhonson Rajeswar and R.Ramprabhu,(2009).Applied zoology, Saras publications, Nagercoil.

Reference books:

1. Rajeshwar Prasad, (2010). Poultry management, Alfa publications, New Delhi.

SEM III	NMEI	Nfhop tsh;g;G	22K3ZEL01	Inst.Hrs.2	Credit 2

myF 1: Kd;Diu- njd;dpe;jpahtpy; Nfhop tsh;g;gpd; Nehf;fk; kw;Wk; nray;Kiw Nfhopapd; nghJthd tiffs; gpisKj;uhf;> ntsph;epw R+nrf;];> kpNdhh;fh> NuhL [yz;L rptg;G kw;Wk; nts;isnyf;`hd;. tPlikg;G.Mo; $sKiw> Kl;ilapLk; $z;Lfs;> Nfhop cuk;.

myF 2: Nkyhz;ik – FQ;R tsh;g;gpd; eilKiw mk;rq;fs; - ,iwr;rpNfhop kw;Wk; Kl;ilapLk; Nfhop tsh;j;jy; kw;Wk; guhkhpj;jy; - xsp kw;Wk; ntg;gepiy Fsph;fhyk; kw;Wk; Nfhilfhy guhkhpg;G – myF ntl;ly;.

myF3: Nfhop Cl;lr;rj;J – Njitfs; - czT Nrh;f;iffs; - Nfhopf;fhd jPtdk; - czT nghUl;fs;.

myF4: Nfhopfspd; Neha;fs; : itu]; ghf;Bhpay; G+Q;ir kw;Wk; tpyq;fpd Neha;fs; - Neha;f;fhd jLg;GKiwfs; kw;Wk; mwpFwpfs; - jLg;G+rpapd; Kiwfs; - Nfhopfis Rj;jk; nra;jy;.

myF5: Kl;ilapd; msit ghjpf;Fk; fhuzpfs; : Nrkpg;G kw;Wk; jLg;G Kiwfs; re;ijg;gLj;jy; kw;Wk; jug;gLj;jy; - gz;izgjpT kw;Wk; fzf;Ffis guhkhpj;jy;.

myF6: (Not for Semester Examination)- etPd Nfhopgz;izfspd; Nkyhz;ik – Nfhoptsh;g;gpy; Ranjhopy; Kaw;r;rpahf Cf;Ftpf;f Kw;Nghf;fhd jpl;lq;fs; .

CO-PO Mapping with Programme Outcomes: Poultry Sciences Code: 22K3ZEL01

CO/PO	1	2	3	4	5	6	7	8	9	10
1	1		1	1	1		1			
2			1	1	1	1		1		1
3	1	1		1		1			1	
4	1	1	1	1	2	1	1	1	1	1
5	1		1	1		1			1	

1.Low, 2-Moderate, 3-High Correlation

SEM III	ECC 1	ECONOMIC ENTOMOLOGY	22K3ECCZ1:1	Inst.Hrs. Nil	Credit 3

***Course Objectives**: On completion of this course students learn knowledge about the concept of Insects and their metamorphosis, Pest of various crops, methods of pest control insect associated with public health and beneficial insects.*

CO	STATEMENT
1	To develop understanding of various class of insects
2	To group the important pests of Agriculture
3	To understand the mode of action of Pesticides
4	To explain about insects associated with public health
5	To understand the economics of beneficial insects and their products
6	Awareness about the disease causing vectors and their control measures

UNIT I: Scope of Entomology - Class Insecta-Diagnostic characters. General organization of typical insect. Insect development and metamorphosis (Complete & Incomplete).

UNIT II: Importance of Insects in Agriculture - Pests of rice stink bug (*Oedalus pugnax*), sugarcane(*chilo auricillius Didgeon)* and vegetables Brinjal (*Leucinodes orbonalis*) & Tomato(*Helicoverpa armigera*) Beneficial insects (*Encardia Folrmosa*) & (*Reduviidae*).

UNIT III: Methods and principles of pest control – physical, chemical, mechanical, biological and integrated pest management.

UNIT IV: Insects in relation to public health

a) Insects associated with human beings (*Pediculus sp*.,-Vagabonds disease)

b) Insects associated with household environment (Housefly and diseases-Cholera, typhoid, tuberculosis and dysentry).

UNIT V: Beneficial Insects - lifecycle and byproducts-Honeybees and Lac insects - soil builders (termite) and scavengers(dung insect).

UNIT VI: **(Not for Semester Examination)-** Insect as pest control management - History - Agriculture - Horticulture and forestry - and cities**.**

Text Books:

1. Mani M.S., (1973). General entomology Oxford & TEM.
2. Nayar K.K., Ananthakrishnan T.N., and David V.D .(1990). General and applied entomology. Tata McGrow Hill .New Delhi.
3. B.Vasanthararaj David and T.kumaraswami (1982). Elements of Economic entomology popular book dept, Chennai.

Reference Books:

1. Chapman R.F., (1993). The Insects. Structure and functions.ELBS.London
2. David B.V., Muralirangan N.C., and Meera Muralirangan.(1992). Harmful and Beneficial Insects. Popular book depot
3. David B.V., (1992). Pest management and pesticides: Indian Scenario.Namrutha publications.

SEM III	ECC 1	G+r;rpfspd; nghUshjhuhk;	22K3ECCZ1:1	Inst.Hrs.	Credit 3

myF1:; -G+r;rpapaypd; Nehf;fk; - tFg;G – G+r;rp- fz;lwpAk; gz;Gfs; tof;fkhd g+r;rpfspd; nghJ mikg;G G+r;rpfs; tsh;r;rp kw;Wk; tsh;cUkhw;wk; (KOikahdJ kw;Wk; KOikaw;wJ).

myF 2: Ntshz;ikapy; Kf;fpaj;Jtkhd G+r;rpfs; - mhprp(*xgy]; gf;ef;];)* fUk;G (*rp;y;Nyh mhprpy;y]; il[pad*;) kw;Wk; jhtuq;fs; - fj;jhpf;;fha ;(*Y}rpNdhl;]; Mh;ghdhyp];);* kw;Wk;; jf;fhsp – *(`pypfth;gh mh;k;[puh*);. gad;Ds;s G+r;rpfs; (*vd;fhh;rpah /ghh;krh*)> (*nubtPNl)*.

myF3: G+r;rpfis fl;LgLj;Jjypd; jj;Jtk;; kw;Wk; tiffs;- ,aw;gpay;> Ntjpapay; ,ae;jputpay; caphpapay; kw;Wk; xUq;fpize;j G+r;rp Nkyhz;ik.

myF 4: nghJRfhjhuj;jpy; G+r;rpfspd; gq;fspg;G (njhlh;G) kdpjh;fSld; G+r;rpfspd; njhlh;G (ngbFy];-miythpir Neha;) tPl;L Rw;WGw Roypy; G+r;rpfspd; njhlh;G (< kw;Wk; Neha;fs;; - fhyhuh ijgha;L fhrNeha; kw;Wk;; tapw;W Nghf;F).;

myF5: gad;jUk; G+r;rpfs; - NjdP kw;Wk; muf;F G+r;rpapd; tho;f;if Row;rp – ngwgLk; cg nghUl;fs; - kz; fl;blfiyQh; (fiuahd;) kw;Wk; Njhl;lf;fhu;fs; (rhzG+r;rp).

myF 6: (Not for Semester Examination)- G+r;rpfl;Lghl;L Nkyhz;ikapy; G+r;rpfs; - tuyhW tptrhak; Njhl;lfiy kw;Wk; tdtpay; - tPL kw;Wk; efuq;fs;.

CO-PO Mapping with Programme Outcomes: Economic Entomology

Code: 22K3ECCZ1:1

CO/PO	1	2	3	4	5	6	7	8	9	10
1	2		1		1		1			
2		1	1		1	1		1		1
3	1	1		1		1	1		1	
4	1		1			1	1		1	1
5	1		1	1		1		1	1	

1.Low, 2-Moderate, 3-High Correlation

SEM IV	CC 6	GENETICS AND EVOLUTION	22K4Z06	Inst.Hrs.5	Credit.5

***Course Objectives**: This course aims to develop skills of students by providing fundamentals of genetics and evolution, difference between genetic material, chromosomes, inhertiance and successful completion of this course students also recognize and understand the Chromes, Molecular structure of DNA,RNA etc.,*

CO	STATEMENT
1	Understanding knowledge mendelian inheritance.
2	Explain the concepts of genetics and genetic mechanism
3	Comprehensive detailed understanding of the chemical basis of heredity
4	Gain the knowledge, theories of evolution.
5	Explain the course student to gain fundamental knowledge on this area

UNIT I: Classical Genetics: Biography of Johan Gregar Mendel – Mendelian laws, monohybrid and dihybrid inheritance, Gene Interaction, Polygenic Inheridance; Chromosomes, Metabolic Environment. Multiple alleles with reference to blood group antigens. Linkage and crossing over.

UNIT II: Sex determination - sex linked inheritance: X-linked recessive (haemophilia), - X Linked diseases(Ichthysics, Hypertrichosis and Phenylketonuria), Pedigree analysis - inborn errors of metabolism-Syndromes

UNIT III: Identification of the DNA as the genetic material, Genetic recombination in bacteria: transformation , conjugation, transduction and sexduction. Mutation-Mutagens - gene mutation. Population genetics - Hardyweinberg law

UNIT IV: Origin of life - Biogenesis and abiogenesis-Theories of evolution - Lamarckism - Neo Lamarckism - Darwinism - Neo Darwinism, De vries theory of evolution and modern synthetic theory.

UNIT V: Mimicry and coloration. Isolation and speciation. Evidences of evolution(Fossils)- Fossilization - Geological time chart - Evolution of Man. Paleontological evidence, Future of Man.

UNIT VI: (Not for Semester Examination)- Chromosomal aberrations: Types, numerical chromosomes abnormalities, Clinical consequence - structural chromosomal abnormalities. Mendelian traits in Man.

Text books:

1. Veer Bala Rastogi (2005). Text book of genetics. Kedar Nath Ram Nath.
2. Arumugam,NandR.P.Meyyan(2016)Vol.I&II Advances in genetics.Saras Publication.
3. Verma,P.S. and V.K. Agarwal(2008). Genetics, 9th Edition. S.Chand & Company Ltd, New Delhi.

Reference Books:

1. William,S. Klug and Michael R. Cummings(1994). Concepts of genetics. 4th edition, Macmillan College publishing company , New York.
2. Jocelyn,E.Krebs, Elliott S.Goldstein and Stephen T.Kilpatrick (2014). Lewin's Genes XI, Jones and Bartlett India pvt.Ltd,New Delhi.

SEM IV	CC 6	kugpay; kw;Wk; ghpzhkk;	22K4Z06	Inst.Hrs.5	Credit.5

myF 1: kugpay; mwpKfk; - [hd; fphpfh; nkz;ly; tho;f;;if tuyhW> nkz;lyprk; - xw;iw gz;G fyg;G kw;Wk ,ul;il gz;G fyg;G tpjpfs; - gytif my;yPy;fs; kw;Wk; ,uj;j tiffs; - ,izg;G kw;Wk; FWf;F khw;wk;

myF 2: ghypd eph;zak; - guk;giu ghypd ,izg;G x;Lq;F epiy ,izg;G (`PNkhgPyPah) - Xq;F epiy guk;giu Ma;T (nul; rpd;Nuhk;) – tsh;rpij khw;wj;jpd; gpwtpgpiofs; ;; kw;Wk; FiwghLfs; - rpd;l;Nuhk;.

myF 3: kugZ -; b.vd;.V fz;lwpjy;; - ghf;Bhpatpy; kugZ khw;W xl;Ljy; - khw;Wjy; - ,izg;G flj;jy; ghY}dh;T – gpwo;T kw;Wk; jpBh; khw;wk; - kugZ ; jpbh; khw;wk; -kf;fs; njhif kugpay; - `hh;bd; nta;d;gh;f; tpjp . **;**

myF 4: caphpa Njhw;wk; - caph; cUthf;fk; - capw;wfhuzpfs; - ghpzhk Nfhl;ghLfs; - ykhh;f;fp]k; - epNah ykhh;f;fp]k; - lhh;tpd;; Nfhl;ghLfs; - epNah lhh;tpdprk; –Btphp]; Nfhl;ghLfs; - epfo;fhy nraw;if ghpzhk Nfhl;ghLfs; .

myF5: Nghyp xg;Gik kw;Wk; tz;zkakhf;fs; - rpwg;gpdj;Njh;T – gbkq;fs; - ghpzkhrhd;Wfs; - gbk kakhf;fs; - Gtpapa fhy ml;ltiz –kdpj ghpzhkk; gbk rhd;Wfs; caphpa gad;ghL kw;Wk; tsh;r;rp.

myF 6: (Not for Semester Examination)- FNuhNkhNrhk;fs; gpwo;T – tiffs; - FNuhNkhNrhk; mrhjuzq;fs; - kUj;Jt tpisTfs; - FNuhNrhk; mikg;gpy; mrhjuzq;fs; - kdpjdpy; nkz;bypd gz;Gfs;.;

CO-PO Mapping with Programme Outcomes: Genetics And Evolution Code: 22K4Z06

CO/PO	1	2	3	4	5	6	7	8	9	10
1	2	1			1				1	
2		1					1	1		
3	1			2	1				1	
4	2						2	1		
5					1					1

1.Low, 2-Moderate, 3-High Correlation

SEM IV	NME2	VERMICULTURE	22K4ZEL02	Inst.Hrs.2	Credit.2

Course Obiectives: *Enriching Students knowledge on waste management, ensuring their understanding on vermicomposting and its agricultureal, environmental and economic importance and enabling them to become a self employed entrepreneur with the enhanced*

CO	STATEMENT
1	Enhances the knowledge on waste management, animal handling and phsico-chemical parameters influencing compost production and its application.
2	Builds entrepreneurial skill, knowledge on commercialization and business potential
3	Inculcate eco-friendly attitude of the student with better understanding on the importance of waste management
4	Minimise waste and maximise its utilization
5	Get knowledge on the significance of earthworms

UNIT I: Scope of Vermitechnology – Habitat based

classification – Morphological identification and Characteristics of Earthworms Viz. *Lampito mauritii, Eisenia foetida, Eudrillus eugeniae*

UNIT II: Composting organic material – Methods of vermicompost production viz. Heap, Pit etc. – Small scale and large scale production

UNIT III: Steps involved in vermiculture – site selection – species selection – Preparation of vermibed – Inoculation of Earth worm – Feeding – Harvesting

UNIT IV: Factors affecting Vermicomposting – pH – Moisture and Temperature – Characteristics of Vermicompost – Nutritive value of Vermicompost

UNIT V:. Economic importance of Earthworm – Uses of Vermicompost viz. waste management, Crop production, Disease control – Economics of Vermiculture

UNIT VI: (Not for Semester Examination)- Advanced method in Vermiculture – Integrated farming – Scope for marketing and Export – Existing Schemes and Support for vermiculture Business

Text books:

1. Seethalekshmy and Santhi R, (2017): Vermitechnology, SARAS Publication, Nagercoil
2. Ramalingam R., (2007): Manpuzhu valarppu (Tamil), TamilNadu State Higher Education Association, Chennai
3. Bhatnagar, R K and Palta, R.K.,(1996). Vermicuture and vermicomposting. Kalyani Publihers, New Delhi

Reference book:

1. Edward C.A, Paul F.Hendrix, Norman Q, Armcon (2018); Biology and Ecology of Earthworm, Springer, US
2. Lee K.E., (1985). 'Earthworms; Their ecology and Relationship with soils and Use". Academic Press, Sydney

3. Satchel, J E (1983). “Earthworm Ecology” Chapman Hall, London

SEM IV	NME2	□□□□□□□□ □□□□□□□□□	22K4ZEL02	Inst.Hrs.2	Credit.2

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□□□□ 6: **(Not for Semester Examination)-** □□□□□□□□ □□□□□□□□□□□□□ □□□□□ □□□□□□□□ – □□□□□□□□ □□□□□□□□□□ □□□□□□□□ □□□□□□□□□ □□□□□□□□ □□□□□-□□□□□□□□ □□ □□□□□□□□□ □□□□□□□□□□□□□□ – □□□□□□□□ □□□□□□□□□ □□□□□□□ □□□□□□□ □□□□□ □□□□□□□□ □□□□□□□□□□□□□□□□□□□ □□□□□□□□.

CO-PO Mapping with Programme Outcomes: VERMICULTURE Code: 22K4ZEL02

CO/PO	1	2	3	4	5	6	7	8	9	10
1	2	1			1				1	
2		1					1	1		
3	1			2	1				1	
4	2						2	1		
5					1					1

1.Low, 2-Moderate, 3-High Correlation

SEM IV	ECC 3	MEDICAL ZOOLOGY	22K4ECCZ3:1	Inst.Hrs. Nil	Credit .3

***Course Objectives**: The course implies the importance of animals human health.It highlight the diseases associated with human their diagnosis and control measures.*

CO	STATEMENT
1	Acquire knowledge about medically important insects.
2	Understand the causes for non infectious.
3	Differentiate the infectious diseases from non infectious diseases.
4	List out the medically important nematodes
5	Apply the techniques for clinical diagnosis

UNIT I: Scope of Medical Zoology- Medical importance and control of pediculus humans carporis Anopheles, culex, Aedes, xenopsylla cheopis.

UNIT II: Causes, types , Symptoms,Complications, diagnosis and prevention. Diabetes (Type-I and Type-II),Hypertension (primary and secondary), Testing of blood glucose using Glucometer/Kit.

UNIT III: Causes, types,symptoms, diagnosis and prevention - Bacteria- Tuberclosis and Thyphoid fever.Virus- HepatitisB, AIDS.Fungi - Dermatophylosis, Candidiasis.Protozoan - Amoebiasis, Malaria.

UNIT IV: Nematode infections -Ascariasis filariasis. Trematode infections - Liver fluke. Zoonotic infections -zoonosis - Nosocomial infections.

UNIT V: Clinical diagnosis: Specimen collection and analysis. Blood - Blood smear examinations and Erythrocytes Sedimentation Rate (ESR).Urine - colour, Appearance, volume and odour.

UNIT VI: (Not for Semester Examination)- Recent emergin diseases - Covid -19,Changes in protein nature of covid - 19virus.Awarness of medical related diseases among human.

Text books:

1.R.C.Sobti., Medical Zoology. Professor and Chairman / Head Department of Biotechnology, Punjab University.Shoban Lal Nagin Chand & Co.,
2.Krishnan N.T., (19930.Economic entomology. J.J. Publications, Madurai.
Mani M.S., (1973).General entomology Oxford & TEM.

Reference book:

1. Park and Park (2005). Text book of Preventive and Social Medicine. M/s. Banarsidas Bha Not Publishers, Jabalpur.

SEM IV	ECC 3	kUj;Jt tpyq;fpay;	22K4ECCZ2:1	Inst.Hrs.	Credit .3

myF-1 kUj;Jt tpyq;fpaypd; Nehf;fk; - kUj;Jt Kf;;fpaj;Jtk; kw;Wk; ngbFy];(Ngd;)> mNdhgpy];> fpA+yf;];> Vb];> kw;Wk; n[Ndhg;gpy;yh rpNahgp]; (Xhpaz;ly; vyp gpNd) fl;Lg;gLj;Jjy;.

myF-2 fhuzq;fs;> tiffs;- mwpFwpfs;> rpf;fy;fs;> Neha;fz;lwpjy; kw;Wk; jLg;G. rh;f;fiu Neha; (tif -1 kw;Wk; tif - 2) cah; ,uj;j mOj;jk; (Kjy; epiy kw;Wk; ,uz;lhk; epiy) FSf;Nfh kPl;liu gad;gLj;jp /,uj;j FSf;Nfh]; Nrhjid fpl.;

myF-3 fhuzq;fs;> tiffs;- mwpFwpfs;> Neha;fz;lwpjy; kw;Wk; jLg;G – ghf;Bhpah – fhrNeha; kw;Wk; ilgha;L fha;r;ry;. itu]; - n`g;ghilb]; gp> va;l;]; G+Q;ir – topj;Njhy;Neha;;> czTFoha;mow;rp;. GNuhl;NlhNrhtd; - mkpgpahrp];> kNyhpah.

myF-4 m];fhhpahrp];> igNyhpahrp]; bhpnkl;NlhL njhw;W – fy;yPuy; GO.tpyq;F Neha;; njhw;W - tpyq;FfsplkpUe;J kdpjDf;F jhTk; Neha;fs;; - kUj;Jtkidapy; Nrh;g;gjhy; Vw;gLk; Neha; njhw;Wfs;.

myF-5 kUj;Jt Nehawpjy; - khjphp Nrfhpg;G kw;Wk; gFg;gha;T . ,uj;jk; ,uj;jg;ghpNrhjid kw;Wk; vhpj;Nuhirl;Lfspd; gbT tpfpjk; (<.v];.Mh;). rpWePhpd; – epwk;> Njhw;wk;> msT kw;Wk; kzk;.

myF-6 (Not for Semester Examination)- rkPgj;jpy; tsh;e;J tUk; Neha;fs;-Nfhtpl;-19> ,aw;ifahf Nfhtpl;-19 itu]py; Guj khw;wk; miljy;. kdpjh;fs; kj;jpapy; Neha;fSk; kUj;Jtj; jPh;TfSila tpopg;Gzh;T Vw;gLj;Jjy;.

CO-PO Mapping with Programme Outcomes: Medical Zoology Code: 22K4ECCZ2:1

CO/PO	1	2	3	4	5	6	7	8	9	10
1	1		1	1	1		1			1
2			1	1	1	1		1		
3	1	1		1		1	2		1	
4	1	1	1	1	2			1	1	1
5		1	1	1		1			1	

1.Low, 2-Moderate, 3-High Correlation

SEM V	CC 7	BIOLOGICAL TECHNIQUES	22K5Z07	Inst.Hrs.6	Credit. 6

Course Objectives: This course aims to develop skills of students by providing fundamentals of different biological techniques used in modern biology and successful completion of this course students also recognize and understand the working principles and applications of different laboratory instruments for biological studies.

CO	STATEMENT
1	Understand the different microscopic techniques and its application on biological Sciences.
2	Explain the basic concepts behind micro-techniques and radioactivity.
3	Acquired technical skills about the different chromatographic methods and centrifugation process.
4	Learn the basic principles and applications of analytical techniques.
5	Gain the knowledge on collection and preservation methods for biological specimen.

UNIT I: Microscopy: Principle and applications of Dissection and Compound microscope, Microscopic measurements - Micrometer and Camera Lucida. Electronmicroscope - TEM and SEM.

UNIT II: Microtechniques: Fixation, Dehydration, Preservation - Block making, embedding, sectioning, staining and mounting process. Radioactivity: Isotopes, autoradiography and Geiger Muller counter.

UNIT III: Chromatography: Principles, types and applications - Paper and TLC. Centrifuge: Principles, types and applications - Ultracentrifugation.

UNIT IV: Analytical techniques: Principles and applications of p^H meter. Electrophoresis - Agarose, SDS - PAGE.

UNIT V: Collection of specimen - Preservation methods: types – wet and dry. Importance of display. Stuffing methods - Skeletal preservations, Taxidermy and Alizarin preparation.

UNIT VI: (Not for Semester Examination)- Spectrometry: Basic principles and applications of Spectrometry. Spectroscopy: NMR – Basic principles and applications, Applications of X-ray crystallography.

Text Books

1. Verma, P. S and Agarwal, V.K. (1978). Cytology, S. Chand & Company Ltd, New Delhi.
2. Arumugam, N. (2014). Cell biology, Molecular biology, Genetics, Evolution and Ecology Vol II, Saras Publications, Nagarcoil.
3. Narayanan, L. M, Dulsy Fatima, N. Arumugam, Meiyan pillai R.P, Nallasingam, K and Prasanakumar, S. (2010). Biochemistry, VI Edn, Saras Publications, Nagarcoil

References

1. Jayaraman. J. (2011). Lab Manuals in Biochemistry, New Age International (P) Ltd., Mumbai.
2. David, (2000). Handbook of Histological and Histochemical techniques – CBS Publishers, New Delhi.
3. Freeman and Lodish, (1990). Molecular cell biology, W.H. & Co, New York.

SEM V	CC 7	caphpay; El;gq;fs;	22K5Z07	Inst.Hrs.6	Credit. 6

myF 1: Ez;Nzhf;fp: vspa kw;Wk; $l;L Ez;Nzhf;fpfspd; jj;Jtk;> gad;fs;. Ez;Nzhf;fpfspd; mstPl;L Kiwfs; - ikf;NuhkPl;lh;> NfkhuhY}rplh. vyf;l;uhd; Ez;Nzhf;fp – buhd;];kp]d;>];Nfdpq; vyf;l;uhd; Ez;Nzhf;fp.

myF 2: Ez;njhopy; El;gq;fs;: epiyg;gLj;Jjy;> ePh; ePf;fk;> gjg;gLj;Jjy; - njhFjp jahhpj;jy;> cl;nghjpj;jy;> nky;ypajhf ntl;Ljy;> rhaNkw;Wjy;> ngUf;fKiw fjphpaf;fk;: INrhNlhg;];> jhdpaq;fp fjphpaf;fk;> nfa;fh; Ky;yh; fTz;lh;.

myF 3: FNuhNkhNlhfpuh/gp: fhfpj kw;Wk; nky;ypa mLf;F FNuhNkhl;Nlhfpuh/gpapd; jj;Jtk;> gad;fs;. ikatpyf;F Kiw jj;Jtk; - tiffs;> gad;fs; - jPtpu ikatpyf;F Kiw.

myF 4: gFg;gha;T El;gq;fs; ;: gp.n`r; mstPl;Lf; fUtp – jj;Jtk; kw;Wk; gad;fs;. vyf;l;NuhNghnu]p]; - mfNuh]; > v];.b.v];.- Ng[.;

myF 5: caphpay; khjphp Nrfhpj;jy; kw;Wk; gjg;gLj;Jjy; Kiwfs;: tiffs; - <ukhd kw;Wk; cyh;e;j epiy. fhl;rpg;gLj;Jjypd; Kf;fpaj;Jtk; - nghjpay; Kiwfs; - vYk;Gfs; gjg;gLj;Jjy;- lhf;]pnlh;kp kw;Wk; myprhpd; jahhpj;jy;.

myF 6: (Not for Semester Examination)- miyf;fw;iw : mbg;gil jj;Jtk; kw;Wk; gad;fs;];ngf;l;uh];Nfhgp: vd;.vk;.Mh; - mbg;gil jj;Jtk; kwWk; gad;fs;. vf;]; fjph;fs; gbftpay; - gad;fs.; ;

CO-PO Mapping with Programme Outcomes: Biological techniques Code: 22K5Z07

CO/PO	1	2	3	4	5	6	7	8	9	10
1	2	1			1				1	
2		1					1	1		
3	1			2	1				1	
4	2						2	1		
5					1					1

1.Low, 2-Moderate, 3-High Correlation

SEM V	CC8	ANIMAL PHYSIOLOGY AND BIOCHEMISTRY	22K5Z08	Inst.Hrs.6	Credit: 5

Course Objectives: *On completion of this course students learn knowledge about the concept of Nutrition, Respiration, Circulation, Nerve physiology, Types of muscles, biological molecules, endocrine glands and common metabolic disorders.*

CO	STATEMENT
1	Understand the absorption of dietary molecules
2	Define the circulation process and its importance
3	Acquire knowledge about neurons and muscles
4	Predict the characteristics of reproductive glands and hormones
5	Able to understand the metabolic disorder diseases

UNIT I: Nutrition: Mechanical process of digestion and absorption of proteins, carbohydrates and lipids in man. Respiration: Respiratory organs and Respiratory pigments, transport of O_2 and CO_2 in man and respiratory quotient.

UNIT II: Circulation: Structure of heart, types and function of circulatory system, composition of blood. Blood pressure, ECG, Pace makers. Excretion: Excretion, Nitrogenous waste, Ammonotelism, Ureotelism and Uricotelism. Excretory organ: Mammalian kidney and Urine formation. Ornithine cycle.

UNIT III: Nerve Physiology: Structure and types of neurons, conduction of nerve impulse, synapse structure, synaptic transmission, reflexes, conditional reflexes. Muscle physiology: Types of muscles, Ultra structure of skeletal muscles, mechanism of muscle contraction and neuromuscular junction, muscles twitch.

UNIT IV: Endocrine glands: Pituitary, Thyroid, Parathyroid, Adrenal and Islets of longarhons. Salient features and types of hormones, Reproductive glands in man. Hormonal control of reproduction. Menstrual cycle.

UNIT V: Biological molecules: Structure and importance of Carbohydrates, Proteins and Lipids.

UNIT VI: (Not for Semester Examination)- Physiological abnormalities in Human-Anaemia, Thrombosis, Ulcer, Diabetes and Heart attack. Factors affecting blood sugar level.

Text books:

Animal Physiology

1. Verma P.S and V.K. Agarwal : Physiology(S. Chand &Co), New Delhi.
2. Nagabushanam R. Animal Physiology (S. Chand &Co), New Delhi.

Biochemistry

1. Sathyanarayana U (2018). Text book of Biotechnology Books& Allied,Ltd,Kolkata.
2. Arumugam.N(2014). Biochemistry,Saras Publications,Nagercoil.

Reference books:

Animal Physiology

1. Prosser C.L and F.A. Brown(1965). Comparative Animal Physiology (W.B. Saunders)
2. Hoar W.S (1965). General and Comparative Physiology (Prentice Hall), Canada.

Biochemistry

1. Stryar.L. (1988) Biochemistry,ACS Publications,New Delhi.
2. Lehnigar. A.L. (1982). The Principles of Biochemistry,Worth Publishers, lnc.,

SEM V	CC8	tpyq;Fclw;r; nraypay; kw;Wk; capu; Ntjpapay;	22K5Z08	Inst.Hrs.6	Credit: 5

myF 1: Cl;lr;rj;J – kdpjdpd; nrhpkhdk; kw;Wk; cwpQ;Rjy; topKiwfs; - Gujk;> fhh;Nghi`l;Nul;Lfs;> nfhOg;Gfs;; - Rthrk; - Rthr cWg;G kw;Wk; Rthr epwkp - kdpjdpd; Mf;]p[d; kw;Wk; fhh;gd;il Mf;i]L Nghf;Ftuj;J – Rthr fl;Lg;ghL – Rthr tpfpjk;.

myF 2: Row;rp – tpyq;Ffspy; ,uj;j Xl;l tiffs; - kdpj ,jaj;jpd; mikg;G kw;Wk; nray;ghL - ,uj;j fyitfs; - ,uj;j mOj;jk; - ,ja kpd;diy> ,ja KLf;fp> ntspNaw;wk; - iel;u[d; fopTfs;> mk;NkhNdhnlyprk;> a+Nuhnlyprk;> A+hpf;Nfhnlyprk; Mh;dpj;ijd; Row;rp>; - ghY}l;b rpWePufk; kw;Wk; rpWePh; cUthf;fk;.

myF 3: euk;G clypay; - euk;gZf;fs; mikg;G> euk;G J}z;Ljypd; flj;jy; - rpdhg;]; mikg;G – rpdhg;bf; flj;Jjy;; - mdpr;ir – epge;jidf;Fl;gl;l mdpr;ir – jir clypay; - jirfspd; tiffs; - vYk;G jirfspd; cs;fl;likg;G – RUf;fj;jpd; topKiw – euk;Gjir re;jpg;G – jir Rtpl;r; tiffs;.

myF 4: ,af;FePh; - ehskpy;yh Rug;gpfspd; mikg;G kw;Wk; nray;ghLfs; (gpl;a+l;lup Rug;G> ijuha;L> ghuhijuha;L> ml;uPd]; kw;Wk; ,dg;ngUf;f Rug;gpfs;) – kdpjdpd; ,dg;ngUf;fk; kw;Wk; khjtplha; Row;rpapy; ,aq;F ePhpd; fl;Lg;ghL.

myF 5: caphpay; %yf;$Wfs; - fhh;Nghi`l;Nul; Gujk;> kw;Wk; nfhOg;Gfs;>; mikg;G kw;Wk; nray;ghLfs;.

myF 6: (Not for Semester Examination)- kdpjdpd; clw;nraypay; FiwghLfs;: ,uj;jNrhif > ,uj;jk; ciwjy; > Fly; Gz;> ePhpopT kw;Wk; khuilg;G .,uj;j rh;f;fiu msit ghjpf;Fk; fhuzpfs;.

CO-PO Mapping with Programme Outcomes:

Animal Physiology and Biochemistry Code: 22K5Z08

CO/PO	1	2	3	4	5	6	7	8	9	10
1	1	1	1	2	1	1		1		
2	2	1		1			1	1		
3	1	1			1			2	1	
4	1		2	1				2		
5	2	1	1		1					**1**

1.Low, 2-Moderate, 3-High Correlation

SEM V	CC 9	DEVELOPMENTAL BIOLOGY	22K5Z09	Inst. Hrs. 6	Credit: 5

Course Objectives: *This course provides detailed insight into history of developmental biology and basic concepts of development theories. It also gives an account of the gametogenesis and fertilization process and better understanding of developmental processes in Frog, chick and Amphioxus.*

CO	STATEMENT
1	Understand the basic concepts of history and different theories of embryology.
2	Acquire detailed knowledge of gametogenesis in mammals and types of egg enabling its symmetry.
3	Demonstrate an overview of the fertilization process in amphioxus, frog and chick.
4	Impart knowledge about features and consequences of organogenesis in chick.
5	Develop an understanding of different types of embryonic induction and nuclear transplantation.

UNIT I: Embryology - Definition and History. Theories of development – Preformation, Epigenesis and Pangenesis theory, Biogenetic law. Germplasm theory - Mosaic and Regulative theory.

UNIT II: Gametogenesis in mammals: Spermatogenesis and Oogenesis - previtellogenesis and vittellogenesis. Types of eggs, organization of egg cytoplasm, Polarity of eggs. Fate maps: Amphioxus and Frog.

UNIT III: Fertilization: Physiological changes, mechanism of fertilization. Parthenogenisis. Cleavage patterns - radial, spiral and bilateral. Types of cleavage - meroblastic and holoblastic . Mechanism of blastulation and gastrulation in Frog and Chick.

UNIT IV: Organogenesis: Development of brain and eye in frog. Foetal membranes in Chick, Placentation in mammals - Types and functions of placenta.

UNIT V: Embryonic induction – types of induction – Nucleo cytoplasmic relationship – Nuclear transplantation.

UNIT VI: (Not for Semester Examination)- Cryopreservation, embryo transfer, artificial reproductive technology – In vitro fertilization, Gamete and zygote intra fallopian transfer.

Text Books

1. Arumugam, N, A (2003). Text Book of Embryology, 14th Edition, Saras Publication, Nagercoil, Tamilnadu.
2. Verma P.S and Agarwal, V.K (2000). Chordate Embryology, R. Chand & Company, New Delhi.
3. Rajni Arora and Anita Grover (2005). Development Biology: Principles and Concepts, R. Chand & Company, New Delhi.

References

1. Scott F. Gilbert (1997). Developmental Biology, Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts, USA.
2. Balinsky, B.I. (1981). Introduction to Embryology, Saunders College Publishing, Philadelphia, USA.

SEM V	CC 9	fUtpay;	22K5Z09	Inst. Hrs. 6	Credit: 5

myF 1: fUtpaypd; - tiuaiu kw;Wk; tuyhW> Nfhl;ghLfs; - vgpn[dprp];> ghd;n[dp];> gNahn[dpbf; - %y ,dg;gpshrf; Nfhl;ghLfs;> nkhirf; kw;Wk; xOq;fikT Nfhl;ghLfs;.

myF 2: ghY}l;bfspd; ,dr;nry; cUthf;fk; - tpe;J nry;> mz;lr;nry; cUthf;fk;> Kd;kQ;rs;fU cUthf;fk;> kQ;rs;fUcUthf;fk;>; Kl;ilfspd; tiffs> Kl;ilapd; irl;Nlhgpshr mikg;G. rkr;rPh; mbg;gilapy; Kl;ilapd; tiffs;> Mk;gpahf;]p]; kw;Wk; jtisapd; tpjp tiug;glk;.

myF 3: fUTWjy; - fUTWjypd; NghJ Vw;gLk; clw;nraypay; khw;wq;fs;> fUTWjy; gw;wpa Nfhl;ghLfs;> fd;dp ,dg;ngUf;fk;> gpsTg; ngUf;fy; Kiwfs; - Mutif> RUs; tif> ,Ugf;f gpsT. gpsTngUfypd; tiffs; - kPNuhgpsh];bf; kw;Wk; N`hNyhgpsh];bf;. jtis kw;Wk; Nfhopapd; xU mLf;F> kw;Wk; %tLf;F fUf;Nfhs khf;f Kiwfs;.

myF 4: cWg;ghf;fk;: jtisapd; %is kw;Wk fz;; cUthf;fk;. Nfhopapd; fU R+o;glyq;fs; - ghY}l;bfspd; jha; Nra; ,izg;Gj; jpRtpd; tiffs; kw;Wk; gzpfs;;.

myF 5: fUj;J}z;baf;fk; - fUj;J}z;baj;jpd; tiffs;> cl;fU irl;Nlhgpshr xUq;fpizr; nray;ghLfs; -cl;fU kWgjpg;G.

myF 6: (Not for Semester Examination)- ciwa itj;Jg; ghJfhj;jy;> fUkWgjpg;G> nraw;if fUj;jhpj;jy; - ntspf;fUTWjy;> rpidigapy; Nfkpl; kw;Wk; irNfhl; flj;Jjy; .

CO-PO Mapping with Programme Outcomes: Developmental Biology Code: 22K5Z09

CO/PO	1	2	3	4	5	6	7	8	9	10
1	2	1			1					
2		2	2			2				
3	1	2			1					
4	2				1			1		
5	1							2		2

1.Low, 2-Moderate, 3-High Correlation

SEM V	CC 10	PRACTICAL III BIOLOGICAL TECHNIQUES ANIMAL PHYSIOLOGY AND BIOCHEMISTRY, DEVELOPMENTAL BIOLOGY& MICROBIOLOGY.	22K5Z10P	Inst. Hrs. 3	Credit: 3

Course Objectives: *This course to study the fundamental of different biological instrument and develop the skills of students by providing the knowledge of Biochemistry.*

CO	STATEMENT
1	Develop skill in use and operating the instrument
2	Understanding the enumeration of RBC
3	Understanding and analyze the various sample
4	Apply the skill the study of development of embryo.
5	Analyzese and isolation of micro organism

BIOLOGICAL TECHNIQUES

1. Microscope
2. Micorometer
3. pH meter
4. Electrophoresis
5. Camera Lucida

ANIMAL PHYSIOLOGY

1. Salivary amylase activity of human saliva in relation to temperature.
2. Qualitative tests for ammonia, urea and uric acid.
3. Enumeration of RBC by haemocytometer.
4. Effect of temperature on the ciliary activity of fresh water mussel
5. Spotters: Sphygmomanometer, Kymograph.

BIOCHEMISTRY

1. P^H Measurement of various samples.
2. Qualitative tests for protein carbohydrates and lipids.
3. Beer –Lambert law verification using colorimeter.
4. Spotters: Model of amino acids. Haemoglobin, ATP.

DEVELOPMENTAL BIOLOGY

1. Examination of prepared micro slides to study the following:

   Frog – egg, cleavage, blastula, yolk plug stage and Gastrula.

   Chick – egg, Developmental stages: 24hrs, 48hrs & 72hrs.

MICROBIOLOGY

1. Fixing and staining of bacteria – Simple and Gram staining.

2. Demonstration – Sterilization procedures.
3. Motility of bacterial cell
4. Spotters ; Autoclave, petriplate, inoculation loop needle and Laminar air flow.

CO-PO Mapping with Programme Outcomes: BIOLOGICAL TECHNIQUES ANIMAL PHYSIOLOGY AND BIOCHEMISTRY, DEVELOPMENTAL BIOLOGY & MICROBIOLOGY. Sub Code: 22K5Z10P

CO/PO	1	2	3	4	5	6	7	8	9	10
1	2	1			1					
2		2	2			2				
3	1	2			1					
4	2				1			1		
5	1			1		1	1		1	

SEM V	MBE 1	MICROBIOLOGY	22K5ZELZ1:1	Inst.Hrs.5	Credit:5

Course Objectives: *The complex course with re markable utility and importance. Microbiology deals with the study of microbes such as bacteria, viruses and other microbes covers the theoretical studies and practical proficiency. Which may help placement in clinical microbiological laboratories.*

CO	STATEMENT
1	1. Enumerate the basic structure of bacteria, viruses and other forms.
2	2. Understand the biological diversity of microbial forms and various techniques for handling microbes in the laboratory.
3	3. Distinguish the various microbial metabolic pathways
4	4. Understand the industrially and medically important microorganisms.
5	5. Understand the course of infection and create awareness.

UNIT I: Microbiology: Scope and History.Ultrastructure of a bacterial cell, fungal cell, yeast and Bacteriophage.

UNIT II: Nutritional classification of Bacteria, Grams staining-Gram positive and Gram negative bacteria. Growth of Bacteria : Sampling and Processing, Preparation of culture medium. Maintenance of pure culture. Bacterial Growth curve .Measurement of Bacterial biomass. Continuous culture and Batch culture.

UNIT III: Microbial metabolism : Generation of ATP, Biosynthesis : Co_2 and N_2 fixation. Microbial enzymes introduction and types.

UNIT IV: Food Microbiology: Food poisoning , Food preservation and spoilage .Agricultural Microbiology - *Azobactoter.* Industrial Microbiology: production of Ethonol; Antibiotics and Production of Penicillin.

UNIT V: Medical Microbiology: Microbial diseases in man (Brief study of each disease) a) Bacterial disease: Typhoid and Tuberculosis. Viral disease: AIDS, Polio,Viral hepatitis and Common cold

UNIT: **VI: (Not for Semester Examination)-** Occupational diseases **:** Lung disease-silicosis, Skin disease-Dermatitis .Emerging infectious disease. COVID 19 causes-pathogenesis-prevention and control measures.

Text Books:

1. Arumugam.N (2000). Microbiology, Saras Publication,Nagarkoil
2. PelczarM.J,Chan,E.C.S and Kreig N.R(1995). Microbiology TATAMcGRAW Hill

Reference Books

1. Fraziar .W.C.and D.C.West Goff .(1994). Food Microbiology
2. Power .C,B and H.F Daginwala (1997). GeneralMicrobiology vol I&II, Himalaya publishing
3. Alcamo, E (2001) .Fundamentals of Microbiology jones and Bartlet Publishers London.

SEM V	MBE 1	Ez;Zaphpay;	22K5ZELZ1:1	Inst.Hrs.5	Credit:5

myF1: Ez;Zaphpaypd; tuyhW kw;Wk; Kf;fpaj;Jtk;- GNuhNfhpahl;Lfs; kw;Wk; A+Nfhpahl;Lfs; ghf;Bhpah >G+Q;ir> <];l;> Ngf;bhpNahNg[>; kw;Wk; er;Raphpfspd; mikg;G.

myF2: ghf;Bhpahf;fspd; Cl;lg;gz;G mbg;gilahd tifg;ghL fpuhk; rhaNkw;wy; - fpuhk; rhak; Vw;Fk; ghf;;Bhpah> Vw;fh. ghf;Bhpah tsh;r;rp:- khjphp kw;Wk; nrayhf;fk;> tsh;g;G Clfk; jahhpj;jy; - J}a tshpfis guhkhpj;jy;. ghf;Bhpah tsh;r;rp epiy – ghf;Bhpah caph;j;njhifia mstpLjy;.

myF3: Ez;Zaphp tsh;rpij khwwk; :- Vbgp cw;gj;jp nra;jy; caphpaf;ftpay;: CO_2, NO_2 epiyg;gLj;Jjy;> czT+l;lj;Njit. Ez;Zaph; nehjpfs; - mwpKfk; kw;Wk; tiffs;.

myF4: czT Ez;Zaphpay;: czT er;rhjy; - czTg; nghUl;fis ghJfhj;jy; - czT rPh;Nfl;iljy.; Ntshz; Ez;Zaphpay; - mrpNlhNgf;lh; - njhopy;Jiw Ez;Zaphpay; -vj;dhy; ;cw;gj;jp;> Ez;Zaph; vjph;g;gpfs; kw;Wk; ngd;rpypd; cw;gj;jp.;

myF5: kUj;Jt Ez;Zaphpay; : kdpjDf;F Vw;gLk; Ez;Zaphp Neha;fs; (xt;nthU NehAk; RUf;fkhd gbg;G) m) ghf;bhpah Neha;fs; : njhz;il mow;rp Neha;;> fhr Neha; >ilgha;L fha;r;ry;; M) er;Raphp Neha;fs;: val;];> NghypNah>; ituy; fy;yPuy; mow;rp> nghJthd jLky;; rsp.

;**myF6: (Not for Semester Examination)**- njhopy; rhh; Neha;fs;: EiuaPuy; Neha;;- rpypNfh]p]; Njhy; Neha; > Njhy; mow;rp – tsh;e;J tUk; njhw;W – Nfhtpl;19 – Neha;fpUkp – Neha;cz;lhf;Fk; jd;ik – Neha; jLg;G Kiwfs;;.

CO-PO Mapping with Programme Outcomes: Microbiology Code: 22K5ZELZ1:1

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
1	1		2	1	1			1	1	
2	1	1		2		1		1		
3		1		1		1		1		1
4	1	1		1			1			1
5	1		2	1		1	1		1	

1.Low, 2-Moderate, 3-High Correlation

SEM V	MBE1	WILD LIFE BIOLOGY	22K5ZELZ1:2	Inst.Hrs.5	Credit 5

Course Objectives: *Wild life biology deals with the study of nature fauna of a region. The course deals with the theoretical studies such as the geographical distribution and causes for depletion. The course helps in the placement in wild life conservator, museum etc.,*

CO	STATEMENT
1	Acquire knowledge about the wild animal
2	Understand the diversity and geographical distribution of wild animals.
3	Distinguish threatened and endangered species
4	Differentiate the national parks from national sanctuaries
5	Disseminate the acquired knowledge to the society

UNIT I : Wild life biology- Definition ,Scope and importance. Wild life conservation-endangered, threatened and endemic species.

UNIT II: Wild life management techniques; Vegetative analysis- GIS-Remote sensing in wild life, habitat survey- Habitat manipulation -food- water- shade improvement-impact and removal of alien species.

UNIT III: Wild life observation and Records, Red date book and Field notes datasheets. Wild life Photography-types of cameras Field equipments-altimeter-pedometer- filed compass binoculars.

UNIT IV: Wild life census techniques: Planning census- sample counts-Direct count (Block count, Transect count) Indirect count (Call count, Pellet count). Capture and recapture techniques

UNIT V: Wild life administration and legislation- Administrative seliceps-Advisory bodies-Natural. Board for wild life -Wild life act 1972 and its amendments- Eco development- Eco restoration and Eco tourism- Village forest council.

UNIT VI: (Not for Semester Examination)- Health care of wild life-Infectious diseases, Viral diseases (Foot and mouth), Protozoan (Toxoplasmosis) Helminthes- Fasciolopsis.

Text Books:

1. Arumugam,N (2015). Environmental Biology,Saras Publications, Nagarcoil.
2. Odum, E.P (1953). Fundamentals of Ecology, W.B. Saunders, Philadelphia.
3. Sharma.P.D (1994). Environmental Biology,Rastogi Publications

References:

1. Saharia, V.B. (1982) Wildlife in India, Nataraj Publishers, Dehra Dun
2. Rodgers, W.A (1991). Techniques for Wildlife census in India – A Field manual technical Manual – Wildlife Institute of India, Dehra Dun.
3. Sukumar. R. (1989). Ecology and management of Asian elephants. Oxford University Press.

SEM V	MBE1	tdtpyq;F caphpay; ;	22K5ZELZ1:2	Inst.Hrs.5	Credit.5

myF-1: ,e;jpa tdcaphpapd; - Nehf;fk; kw;Wk; Kf;fpaj;Jtk;. td caphpay; -tiuaiw - td caphpapd; nghUshjhu Kf;fpaj;Jtk; - td caph;ghJfhg;gpd; mtrpak;- mope;J tUk; caphpdk; - mr;RWj;Jk; kw;Wk; cs;Sh;,dq;fs.;.

myF 2: tdtpyq;F guhkhpg;G Kiwfs; - jhtu gFg;gha;T – GIS- tdcaphpapd; njhiy czh;T – thopl Ma;T – thopl ifahSjy; czT – ePh;-epoy; Nkk;ghL md;dpa ,dj;jpd; jhf;fk; kw;Wk; tpyFjy;.

myF 3: tdtpyq;F cw;W Nehf;Fjy; kw;Wk; gjpNtL – Gyk; Fwpg;Gfs;> juTj;jhs; td tdtpyq;F Gifg;gl fUtp tiffs;- fs cgfuzq;fs; - caukhdp – ngNlhkPl;lh; - fs jpirfhl;b – njhiy Nehf;fp.

myF 4: tdtpyq;F fzf;nfLg;G El;gq;fs;; :-fzf;nfLg;G jpl;lkpLjy; -khjphpvz;Zjy; -nfLg;G – Neub fzf;nfLg;G (njhFjp fzf;nfLg;G> ghpkhw;w fzf;nfLg;G) kiwKf fzf;nfLg;G. (tpspg;G vz;zpf;if cUz;il vz;zpf;if) gpbj;jy; kw;Wk; kPl;L ngWjy;; El;gq;fs;.

myF 5: tdtpyq;F Nkyhz;ik kw;Wk; rl;l jpl;lq;fs;> Nkyhz;ik gbfs; -MNyhrid mikg;Gfs; - Njrpa tdtpyq;F rl;lk; 1972 kw;Wk; mkyhf;fq;fs; - Rw;WR+oy; tsh;r;rp – Rw;WR+oy; kWrPuikg;G kw;Wk; Rw;WR+oy; Rw;Wyh kw;Wk; fpuhk tdrig.

myF 6: (Not for Semester Examination)- tdtpyq;F Rfhjhu ghJfhg;G – njhw;W Neha;fs; - itu]; Neha;;fs; (ghjk; kw;Wk; tha;) GNuhl;NlhNrhtd; (lhf;N]hgpsh];khrp];)- n`y;kpd;j]; -(/ghrpNahNyhg;rpf;];) Neha;.

CO-PO Mapping with Programme Outcomes: Wild Life Biology Code: 22K5ZELZ1:2

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
1	1		2		1	1			1	
2	1	1		1	2		1		1	
3	2		1		1	1		1	1	
4	1		2	1	1		1	1	1	
5	2	1	1	1		1	1	2	1	

1. Low, 2-Moderate, 3-High Correlation

SEM V	SBEC2	AVIAN BIOLOGY	22K5SBEC2:1	Inst.Hrs.2	Credit 2

Course Objectives: *This Course deals with importance of birds their significes in agriculture environmental cleaning, Endanged species and Protection.*

CO	STATEMENT
1	Acquire knowledge about the birds are glorified reptiles and their classification
2	Understand the biological importance of birds
3	List out the role of birds on environment and mankind
4	Understand wild and domestic birds and their habitat
5	Differentiate the migratory birds and non migratory birds conservation

UNIT I: Introduction – Birds as Glorified Reptiles- History of Avifauna – Classification of birds

UNIT II: Birds of Biological Significances – Game Birds – Plumage Birds – Song Birds – Cage Birds

UNIT III: Importance of Birds – Scavengers – Prey – Vector and Medicine

UNIT IV: Birds in Agriculture – Horticulture and Forestry

UNIT V: Migratory Birds – Bird watching and conservation of Birds-Endangered birds and Bird sancturies

UNIT VI: (Not for Semester Examination)- Bird sanctuaries -Tamilnadu -India-Protection Act.

Text Books:

1. Donald S. Farner, James .R. King ,Kenneth C. Parkes(1982). Avian Biology (Vol VI) Academic Press., US.
2. Richard Grimmett,Carolin skip,Tim inskipp(1998). Birds of the Indian sub continant. II EDN Oxford Press.
3. Salim Ali (2009). The Book of Indian Birds. XIII Edn, Oxford Press.

Reference Books:

1. Allen A. (1961). The book of Bird life
2. The Wealth of India - Birds (1990)
3. Publication and Information – CSIR

SEM V	SBEC2	gwit caphpay;	22K5SBEC2:1	Inst.Hrs.2	Credit 2

;**myF 1:** mwpKfk; - Ch;tdtw;wpd; kfpik thae;jit gwitfs; - gwit njhFjpapd; tuyhW – gwitfspd; tifghL.

myF 2: gwitfspd; caphpay; Kf;fpaj;Jtk; - tpisahl;L gwitfs; - gwitfspd; ,wFfs; - ghLk; gwitfs; - $z;L gwitfs;

myF 3: gwitfspd; Kf;fpaj;Jtk; - J}a;ikgLj;jpfs; - ,iu-Neha; flj;jpfs; kw;Wk; kUe;J gwitfs;;;.

myF 4: tptrhaj;jpy; gwitfs; - tdtpay; kw;Wk; Njhl;lf;fiy.

myF 5: gwitfs; tyirNghjy; - gwitfis fz;fhzpj;jy; kw;Wk; ghJfhj;jy; - mope;J tUk; gwit ,dq;fs;.

myF 6: (Not for Semester Examination)- gwit ruzhyaq;fs; - jkpo; ehL - ,e;jpah – gwit ghJfhg;G rl;lq;fs;

CO-PO Mapping with Programme Outcomes: Avian Biology Code: 22K5SBEC2:1

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
1	1				1	1			1	1
2	1	1		1	2		1		1	
3			1		1	1		1	1	1
4	1		2	1	1		1	1	1	
5	2	1	1	1		1	1	2	1	

1.Low, 2-Moderate, 3-High Correlation

SEM V	SBEC2	ORANAMENTAL FISH CULTURE	22K5SBEC2:2	Inst.Hrs.2	Credit 2

Course Objectives: *The Course deals with the culture of ornamental fishes, types of ornamental fishes, setting up an aquarium and maintenance of aquarium understand the feed and feeding schedule of ornamental fishes.*

CO	STATEMENT
1	Aquire knowledge about ornamental fishes
2	List out the types of ornamental fishes.
3	Understand the construction.
4	Differenciate supplement and live feed.
5	List out the types of breeding in ornamental fishes

UNIT I: Importance and scope of ornamental fish culture – commercial value of ornamental fishes in India.

UNIT II: Important ornamental fishes –Morphological characteristics of Guppy, Gold fish, Molly, Angel fish and Zebra fish.

UNIT III: Setting of Aquarium - materials [Aerotors, filter, lighting, net, biofilters, and ornamental plant maintenance of aquarium.

UNITIV: Food and feeding – types of food – natural, supplement and live feed – feeding schedule.

UNIT V: Breeding of ornamental fishes – types of breeding – mass production of ornamental fish with emphasize to gold fish.

UNIT VI: (Not for Semester Examination)- Disease management in fishes –bacterial [finort] virus [lymphocytosis] fingal [saprolegina] preventive and control measures.

Text Book:

1. Arumugam, N.(2008). Aquaculture,SarasPublications,Nagarcoil
2. Kameleeswar Pandey and Shukla J.P(2005). Fish and fisheries. RastogiPublications.
3. GuptaS.K and Gupta P.C.(2006). General and Applied Ichthology, S Chand & co publishers.

Reference:

1. HoarW.S and Randall (1988). FishPhysiology (VolI&II)AcdemicPress Inc.
2. Santhanam, R (1987). Fisheries Science Daya Publishing House,
3. RamasamyP(1992). Diseases of shrimps in Aquculture System. Vanitha Publishing house.

SEM V	SBEC2	myq;fhu kPd;tsh;g;G	22K5SBEC2:2	Inst.Hrs.2	Credit 2

myF 1: myq;fhu kPd; tsh;g;G : Nehf;fk; -kw;Wk; Kf;fpaj;Jtk; - ,e;jpahtpy; myq;fhu kPd;fspd; nghUshjhu kjpg;G.

myF 2: myq;fhu kPd;fspd; Kf;fpaj;Jtq;fs; – Gwj;Njhw;w gz;Gfs; - fg;gp> jq;fkPd;> Nkhyp> Njtij kPd; kw;Wk; thpf;Fjpiu kPd;.

myF 3: kPd; njhl;b mikj;jy; - Njitahd nghUl;fs; - fhw;wikg;ghd; - tbfl;b – ntspr;rk; -tiy –caph; tbfl;b – myq;fhu jhtuq;fs;- kPd; njhl;b guhkhpg;G.

myF 4: czT kw;Wk; czT+l;lk;: czT tiffs;- ,aw;if – Jiz kw;Wk; caph; czT czT+l;Lk; ml;ltiz.

myF 5: myq;fhukPd;fspd; ,dg;ngUf;fk; - tiffs;- jq;f kPd;fspd; mjpf msT cw;gj;jp.

myF 6: (Not for Semester Examination)- kPd;fspd; Neha; Nkyhd;ik – ghf;Bhpah (JLg;G mOfy;)> itu]; (ypk;Nghirl;Nlhrp];) > fhshd; (];NgNuhny[pdh) jLg;G kw;Wk; fl;LgLj;Jk; Kiwfs;.

CO-PO Mapping with Programme Outcomes: ORANAMENTAL FISH CULTURE

Code: 22K5SBEC2:2

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
1	2	1			1		1			1
2	2	1	1	1		1		1		1
3		2		1	1	3				
4					2		2		1	
5	3		1	1	1		3		1	

1.Low, 2-Moderate, 3-High Correlation

SEM VI	CC11	IMMUNOLOGY	22K6Z11	Inst.Hrs.7	Credit 7

Course Objectives: *The course is a walk for the Post Graduate students' entrant to know immune system, Concepts, practices and procedures. It highlights make students aware about the immune components involving in the blood circulation. This also compares with understand the immune levels that involves in clinical trials and immunity. Students will gain awareness about through knowledge in this line.*

CO	STATEMENT
1	Define the general factors involved in different immunities
2	Summarize antigens, Cytokines and immune components involved in defense system
3	Point out the autoimmune diseases and its causes
4	Analyze the different assays indulged in evaluating immune components in human
5	Hypothesis of hyper sensitivity reactions, mechanisms etc. in immune system

UNIT I : Introduction- History of Immunology. Innate immunity; Physical and mechanical factors biochemical factors, Cellular factors, Genetic factors. Acquired immunity; Active immunity, Passive immunity. Lymphoid organs; Primary lymphoid organs; Thymus, bursa of Fabricius, bone marrow, Secondary lymphoid organs; Spleen, lymph nods, tonsil.

UNIT II: Cells of the immune systems: Origin of cells, stem cells. Cells of lymphoid lineage: Lymphocytes Null cells – structure and types. Cells of myeloid lineage: monocytes, polymorphonuclear leucocytes, neutrophils, basophils, eosinophils. Accessory cells: Mast cells, antigen presenting cells, platelets.

UNIT III: Antigens: Comparison between antigens and haptens, epitopes, paratopes. Antibodies: Basic structure and types of immunoglobulin, biological properties. Immune response – humoral immunity: B cells in antibody formation. Cell mediated immunity: Cells involved in CMI, cytokines and Lymphokines, immune responses to tumour cells.

UNIT IV: Auto immunity: Auto immune disease – causes and brief description. Eg., Myasthenia gravis, lupus erythematous, Rheumatoid arthritis, Hashoimoto's disease, Vaccines ; Types, immunization, brief study on transplantation immunology. Types and mechanism of transplantation.

UNIT V: Immunological techniques. Precipitation: VDRL test, immune diffusion, single and RIA immuno electrophoresis. Agglutination: ABO – Blood typing, Widal test.

UNIT VI: (Not for Semester Examination)- Immune regulation mechanism – immuno – induction, immune suppression, immune-tolerance, immune-potentiation. Importance of immune regulation and its mechanism in immune system.

Text Books:

1. Dulsi Fatima, N.Arumugam (2001). Immunology, Saras Publications, Nagarcoil.
2. Kannan, I. (2007). Innunology. MJP Publications,Chennai..
3. Rajasekara Pandian,M and Senthilkumar,B. (2007). Immunology and Immunotechnology, Panima Publishing Corporation New Delhi.

Reference books:

1. Delves, P.J, Martin, S.J, Burton, D.R and Roitt, I.M. (2011). Roitts Essential Immonology XII Edn. Wiley- Blackwell, Publications.
2. Roit, J.M ,J. Brosthoff and D.K.Male : Immunology (Mobby International Ltd)

SEM VI	CC11	Neha; jilfhg;gpay;	22K6Z11	Inst.Hrs.7	Credit 7

myF 1: Kd;Diu: Neha; jilfhg;gpaypd; tuyhW> cs;shh;e;j Neha; vjph;g;G rf;jp: cly; kw;Wk; ,ae;jpu fhuzpfs;> caph; Ntjpaf;fhuzpfs;> nry;Y}yhh; fhuzpfs;> kuG fhuzpfs;. ngwg;gl;l Neha; vjph;g;G rf;jp: nraypy; Neha; vjph;g;G rf;jp> nrayw;w Neha; vjph;g;G rf;jp. epzePh; cWg;Gfs;: ijk]; Ngg;hprpa]pd; gh;rh – vYk;G kQ;ir> ,uzlhk; epiy epzePh; cWg;Gfs;: kz;zPuy;> epzePh; Kbr;R> lhd;rp]; .

myF 2: Neha; vjph;g;G kz;lyj;jpd; nry;fs; : capuZf;fspd; Njhw;wk; > jz;L capuZf;fs;. epzePh; guk;giu nry;fs;: ypk;Nghirl;Lfs;> G+Q;ir nry;fs;- mikg;G kw;Wk; tiffs;. ikNyhapl; guk;giu nry;fs;: NkhNdhirl;Lfs;> ghypepA+f;spahh; YNfhirl;Lfs;> ePA+l;;Nuh/gpy;fs;> NgNrh/gpy;fs;> <rpNdhgpy;];> Jiznry;fs;: kh];l; nry;fs;> Md;bn[d; toq;Fk; nry;fs;> jl;Lf;fs;.

myF 3: Md;bn[d;fs;: Md;b[d; kw;Wk; n`g;ld; ,ilahd xw;Wik> vg;gpNlhg;Gfs;> ghuhNlhg;Gfs;> Md;bghbfs;: ,k;ANdhFNshGypd; mbg;gil mikg;G> caphpay; gz;Gfs;> Neha;vjph;g;G rf;jpapd; nray;ghL - ,uj;jf;frpT Neha; vjph;g;G rf;jp: Md;bghb cUthf;fj;jpd; gp.nry;. nry; rhh;e;j Neha; jilf;fhg;gpay;: nry; rhh;e;j Neha;jilf;fhg;gpay; gq;F ngWk; nry;fs;. irl;Nlhifdl;fs; kw;Wk; ypk;Nghifd;fs;. Gw;W nry;fspy; Neha; jilf;fhg;G.

myF 4: Rarhh;G Neha; vjph;G rf;jp: Ra jilfhg;G Neha;fs;- fhuzpfs; kw;Wk; RUf;fkhd tps;ffk; v.fh> ka];jPdpah fpNuhyp];> Y}g]; vhpj;khl;Nlhrp];> Mh;j;hpl;b]; (%l;L typ). `Nrha;Nkhl;Nlhtpd; Neha;. jLg;G kUe;J: tiffs;> Neha;jLg;G kUe;J > cWg;G khw;w jilfhg;gpay;. cWg;G khw;wj;jpd; tiffs; kw;Wk; nray; Kiwfs;.

myF 5: Neha; jilfhg;gpay; El;gq;fs;> tPo;gbjy;> tp.b.Mh;.vy;. Nrhjid> Neha; vjph;g;G guTjy;> xw;iw kw;Wk; Mh;.I. v ,k;ANdh vnyf;l;Nuh /NghNuhrp]; jphpgiljy;: v.gp.X. ,uj;jk; tiffs;> itlhy; Nrhjid.

myF 6: (Not for Semester Examination)- Neha; vjph;G fl;LghLr; nray;ghl;L Kiwfs; - Neha;jilfhg;G J}z;Ljy;> Neha; vjph;g;G rf;jp xLf;fk; - Neha; vjph;g;G rfpg;Gj;jd;ik – Neha; vjph;g;G fl;Lghl;bd; Kf;fpaj;Jtk; kw;Wk; mjd; nray;Kiwfs;.

CO-PO Mapping with Programme Outcomes: Immunology Code: 22K6Z11

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
1	1	1		2	1		1		1	
2							1		2	
3	1		1		2		1			1
4	1		1		2		1	1	1	
5		1		1		1				1

1.Low, 2-Moderate, 3-High Correlation

SEM VI	CC12	ENVIRONMENTAL BIOLOGY	22K6Z12	Inst.Hrs.7	Credit:7

Course Objectives: *The course focuses on the interactions between species and their environments. Also, on some of the important aspects viz. growth and survival of populations and communities in different habitats, energy flow, interactions between the communities, and consequences of changing environment on the biodiversity.*

CO	STATEMENT
1	Identifying the evolutionary and functional basis of animal ecology.
2	Understanding the basics of interactions between species and their environment.
3	Enables knowledge into practice and multiple uses of environment
4	Assessing the environmental problems involving humans and natural systems.
5	Create awareness amoung people about natural resources

UNIT I: Introduction- scope and basic concepts of Environmental Biology- Environment: Atmosphere (Air), Hydrosphere (water), Lithosphere (soil); Abiotic factors: Temperature and Light - Effects of light and temperature on animals. Biotic factors: Producers, Consumers and Decomposers.

UNIT II: Ecosystem; Natural ecosystem and Man- made ecosystems - Pond as an typical Ecosystem - Trophic levels, Energy flow, Ecological pyramids and Productivity - Food chain and Food web - Animal association -Symbiosis, commensalism, mutualism, Antagonism, predator/ prey and competition

UNIT III: Principles and concepts of Biogeochemical cycles-carbon, nitrogen, oxygen, phosphorus and sulphur. Laws of limiting factors. Habitat Ecology: Fresh water, Marine water and Terrestrial habitat.

UNIT IV: Community Ecology: Types of communities; Characteristic of community-density, structure, stratification, interdependence, Ectone, Edge effect, Ecological niche and Ecological succession. Population ecology-Density, Natality, Mortality, Age distribution, Population growth, equilibrium, fluctuation, Biotic potential, Dispersal and Dispersion. Regulation of population density.

UNIT V: (Not for Semester Examination)- Environmental Pollution: Air, water, Land, Noise, Thermal and Radiation. Global warming and Biomagnification. Biological indicators and their role in environmental monitoring-Environmental conservation and management.

UNIT VI: BOD, COD, TDS-Acute toxicity - Chronic toxicity -Assessment of safety/risk.

TEXT BOOKS

1. Arumugam N., (2014). Concepts of Ecology (Environmental Biology), Saras Publication.
2. Kumaraswamy K, Alagappa Moses and M.Vasanthy (2013): Environmental Studies, Bharathidasan University.
3. Arumugam, N and V. Kumaresan (2014). Environmental Studies, Saras Publication.

REFERENCE BOOKS

1. Sharma P.D (1994): Environmental Biology, Rastogi publication.
2. Odum, E.P (1953): Fundamentals of Ecology, W.B.Saunders, Philadelphia.
3. Saharia V.B. (1990): Wildlife in India, Nataraj Publications, Dehradun.

SEM VI	CC12	Rw;Wr;R+oy; caphpay;	22K6Z12	Hrs.7	Credit:7

myF -1 Rw;Wr;R+oy; mwptpaypd; Nehf;fk; kw;Wk; mbg;gil fUj;Jf;fs; - Rw;Wr;R+oy;: tspkz;lyk; > fhw;W> ePh;> kz;> capupy;yh mq;fq;fs;: ntg;gepiy kw;Wk; xspapd; caphpdq;fs; kPjhd tpisT. Caphpd mq;fq;fs;: caphpd mq;fq;fs;: cw;gj;jpahsh;fs;> Efh;gth;fs; kw;Wk; rpijg;gth;fs;.

myF-2 R+oy; njhFg;G: ,aw;if Rw;Wr;R+oy; kw;Wk; nraw;if Rw;Wr;R+oy; - Fsk; - Rw;Wr;R+oypy; Kf;fpa fhuzp. czT+l;ll epiyfs;> Mw;wy; Xl;lk;> R+o;epiyapay; gpukpLfs; kw;Wk; cw;gj;jp> czT rq;fpyp kw;Wk; czT tiy> tpyq;fpd cwT Kiwfs; - ,iz tho;f;if Kiw> gfph;e;J tho;jy;> ,ize;J tho;jy;> Kuz; tho;f;if Kiw nfhd;W cz;Zk; tho;f;if Kiw.

myF-3 caph;GtpNtjpay; Row;rpapd; Nehf;fk; - fhh;gd; Row;rp. iel;u[d; Row;rp> gpuzthA Row;rp> gh];Nghu]; Row;rp> ry;gh; Row;rp. ntg;g ,aq;fpay; tpjp> tho;tpl R+oypay; - ed;dPh;> fly; ePh;> kw;Wk; epyg;gug;G.

myF-4 rKjha R+o;epiyapay; - rKjha tiffs; - rKjhaj;jpd; gz;Gfs; -mLf;fikT> rKjha rhh;e;J tho; jd;ik> vf;NfhNlhd; kw;Wk; vy;;iy tpisT> thopl KLf;F> R+o;epiyj;njhlh;G top caphpdj;njhif R+o;epiyapay; - nrwpT> gpwg;Gtpfpjk;> ,wg;G tpfpjk;> gUt tpfpjk;> tsh;r;rp> caphpdj; njhif rkepiy> caphpdj;njhif Vw;w- ,wf;fk;> caphpdj;jpwd;> guTjy;;;;;;;;;;;;;;> caphpdj; njhFjp msT xOq;fikg;G.

myF-5 RwlWr;R+oy; khRgLjy;: fhw;W>ePh;> epyk;> xyp> ntg;gk;> fjphpaf;f top khRgLjy;> Gtp ntg;gkakhjy; kw;Wk; caph; cUg;ngUf;fk;. Caphpay; Fwpf;fhl;bfs; kw;Wk; Rw;WR+oy; fz;fhzpg;gpy; mjd; gq;fspg;G Rw;Wr;R+oy; ghJfhg;G kw;Wk; Nkyhz;ik.

myF-6 (Not for Semester Examination)- BOD, COD ,TDS - cldb> ehs;gl;l er;Rj;jd;ik - ghJfhg;G kw;Wk; Mgj;J kjpg;gPL.

CO-PO Mapping with Programme Outcome: Environmental Biology Code: 22K6Z12

CO/PO	1	2	3	4	5	6	7	8	9	10
1		1			1				1	3
2		1		1	2	1		2		1
3	1	2		1	2			1	1	2
4		-		1	1	2	1		1	2
5		1			2	1	1			2

1.Low, 2-Moderate, 3-High Correlation

SEM VI	CC13(P)	PRACTICAL IV - IMMUNOLOGY, ENVIRONMENTAL BIOLOGY, BIOTECHNOLOGY& SERICULTURE.	22K6Z13P	Ins. Hrs.3	Credit: 3

Course Objectives: *Students gain practical knowledge about techniques used in identification of blood grouping create the different skill development in environmental and occupational toxicology estimations, Biotechnology aspect and also students gain knowledge about Sericulture as well as execute field visit.*

CO	STATEMENT
1	Develop practical skills to identify blood grouping and have a thorough knowledge on structure of antibody and Immuno electrophoresis.
2	Learns to estimate dissolved oxygen, CO_2, salinity and Ca and gain knowledge on animal association and fauna and flora.
3	Identify and characterize the importance spotters concerning biotechnology.
4	Develop skills on sericulture to work in commercial establishments.
5	Gain practical experience and discuss information's as a result of field study

IMMUNOLOGY

1. ABO blood grouping and Rh typing
2. Lymphoid organs of the mouse.
3. Spotters: Structure of antibody and Immuno electrophoresis.

ENVIRONMENTAL BIOLOGY

1. Estimation of Dissolved oxygen
2. Estimation of Carbon di oxide
3. Estimation of salinity.
4. Estimation of Calcium

Spotters: Animal Association, Intertidal fauna. (Sandy, Rocky & Muddy shores.) Identification of planktons. Study of fauna and flora in college campus.

BIOTECHNOLOGY

Spotters:

1. Plasmids
2. Blotting techniques (Southern)
3. PCR.
4. Gene cloning – Agrobacterium.
5. Biofertilizer.

SERICULTURE

1. Life cycle of silkworm 2.Male and female moth,
3. Silk gland, silk thread, cocoon and Mulberry plant.

Field study (Tour report).

CO-PO Mapping with Programme Outcome: IMMUNOLOGY, ENVIRONMENTAL BIOLOGY, BIOTECHNOLOGY& SERICULTURE.
Code: 22K6Z13P

CO/PO	1	2	3	4	5	6	7	8	9	10
1		1			1				1	
2		1		1	2	1		2		1
3	1	2		1	2			1	1	
4				1	1	2	1		1	
5		1			2	1	1			2

1.Low, 2-Moderate, 3-High Correlation

SEM VI	MBE2	BIOTECHNOLOGY	22K6ZELZ2:1	Inst.Hrs.6	Credit:5

Course Objectives: *To get knowledge about application oriented aspects, provides a platform to learn the deliberate use of living organisms for human welfare and the importance of Environmental Biotechnology*

CO	STATEMENT
1	Understand the basic concepts of biotechnology, cloning vectors and Gene transfer methods in bacteria, animal and plants. .
2	Students gain knowledge of basic molecular techniques, monoclonal antibodies production and HGP.
3	Understanding the Enzyme technology, transgenic animals and production of recombinant protein and vaccine
4	Understand the application of the fermentation technology in industry.
5	knowledge on application of Biofertilizers and Biopesticides in increasing the crop yield and Bioremediation technique for the protection of environment..

UNIT I: Biotechnology: Scope and importance. Gene cloning tools: Restriction endonuclease enzyme and Lygase. Cloning vectors – Plasmids-pBR322, viral DNAs -Labda phage DNA and Cosmids- pLFR5. Gene transfer methods in bacteria (Transfection), animal (Microinjection) and plants (Agroinfection).

UNIT II: Molecular techniques: Gel electrophoresis, Blotting techniques - Western, northen and southern . Hybridoma technology - Monoclonal antibodies production. Human Genome Project.

UNIT III: Enzyme technology: Isolation and purification of enzymes, immobilization of enzymes; Production of recombinant insulin and vaccine. Production of Transgenic animals- basic concept, significance and ethical issues.

UNIT IV: Industrial Biotechnology: Production of organic compounds by microbial fermentation – Ethanol Production. Fermentation technology - fermenter types, upstream and downstream process– Applications of biotechnology in industry.

UNIT V: Agricultural biotechnology: Biofertilizers - types – Mass production of Rhizobium- application. Biopesticides – Bacterial and Plant biopesticids. Environmental Biotechnology: Bioremediation- methods and types.

UNIT VI: (Not for Semester Examination)- Applications of biotechnology on medicine, industry, agriculture and environment.

Text books:

1. Kumaresan,N(2015). Biotechnology,Saras Publications,Nagercoil.
2. Ramawat ,K.G, and Shaily Goyal (2009).Comprehensive Biotechnology.S.Chand and company Ltd. New Delhi.
3. Sathyanarayana(2010).Biotechnology,Books and Allied (p)Ltd.Kolkata.

Reference books:

1. R. Primrose. Molecular Biotechnology (ASM Press, Washington)
2. B.R. Glick and J.J. Pasternak. Molecular Biotechnology (ASM Press, Washington)
3. S. Desmond and T. Nicholl.Genetic Engineering (Cambridge University Press)

SEM VI	MBE2	caph;j;njhopy;El;gtpay;	22K6ZELZ2:1	Inst. Hrs.6	Credit:5

;

myF 1:caph;j;njhopy;El;gtpaypd; Nehf;fk; kw;Wk; Kf;fpaj;Jtk;. kugZ FNshdpq; fUtpfs;: vz;Nlhepa+f;spNa]; nehjp fl;LghL kw;Wk; ypNf];; - FNshdpq; ntf;lhh;fs; - gpsh];kpL pBR322> ituy; b.vd;.V kw;Wk; fh];kpL. ghf;Bhpahtpy; [Pd; ghpkhw;wk; (buhd;];/ngf;rd;) tpyq;F (ikf;Nuh,d;rf;rd;) kw;Wk; jhtuk; (mf;Nuh njhw;W).

myF 2: %yf;$W El;gq;fs;: n[y; vyf;l;Nuh/Nghuhrp];> gpshl;bq; El;gq;fs; - nghJ jj;Jtk; kw;Wk; mjd; tiffs;. i`gphpNlhkh El;gq;fs; - NkhNdhFNshdy; Md;bghbfs; cw;gj;jp. kdpj [PNdhk; jpl;lk;.

myF 3: nehjp El;gtpay;: nehjp jdpikgLj;Jjy; kw;Wk; Rj;jpfhpj;jy; - nehjpfspd; mirTwhj;jd;ik – kugZkhw;wkile;j ,d;Rypd; kw;Wk; jLg;G kUe;J cw;gj;jp. kugZ khw;wk; mile;j tpyq;Ffs; cw;gj;jp – mbg;gilj; ;jj;Jtk;> Kf;fpaj;Jtk; kw;Wk; newpKiw gpur;ridfs;.

myF 4: njhopw;rhiy caph;j;njhopy;El;gtpay; : Ez;Zaphp nehjpj;jy; %yk; fhpk $l;Lg;nghUs; cw;gj;jp- vj;jdhy; cw;gj;jp. nehjp El;gtpay; - nehjpfyd; tiffs; Nky; ePNuhl;l kw;Wk; fPo; ePNuhl;l nray; Kiwfs;. njhopw;rhiyfspy; caph;j;njhopy;El;gtpay; gad;ghL.

myF 5: tptrha caph;j;njhopy;El;gtpay;: caph; cuq;fs; - tiffs; - iuNrhgpak; ngUksT cw;gj;jp kw;Wk; mjd; gad;ghLfs; . caph;G+r;rpf;nfhy;ypfs; - ghf;Bhpah kw;Wk; jhtu caph; G+r;rp nfhy;ypfs;. R+o;epiyapay; caph;j;njhopy;El;gtpay; caphp kWrPuikg;G – Kiwfs; kw;Wk; tiffs;.

myF 6:; **(Not for Semester Examination)-** caph;j;njhopy;El;gtpaypd; gad;ghLfs;: kUj;Jtk;> R+o;epiy – tptrhak; - tpz;ntsp.

CO-PO Mapping with Programme Outcome: Biotechnology Code: 18K6ZELZ2

CO/PO	1	2	3	4	5	6	7	8	9	10
1	3	3	3	2	-	-	2	1	2	-
2	1		2			2	1	-	-	1
3	1		-	2	-	-	2			1
4		2	1	1	1	-	1	2	1	-
5	2		1	1		2	-			2

1.Low, 2-Moderate, 3-High Correlation

SEM VI	MBE 2	BIODIVERSITY	22K6ZELZ2:2	Inst.Hrs.6	Credit:5

Course Objectives: *The Course deals with the diversity of coral, insects, birds, artic animals and human races. It highlights economic importance and adaptation of animals.*

CO	STATEMENT
1	Acquire knowledge about the biodiversity.
2	Understand the types of corals reefs.
3	List out the butterfly diversity.
4	List out the birds sanctuaries.
5	Analyzse the impact of global warming on polar animals

UNIT I: Scope and importance – types of biodiversity, special emphasize to fauna.

UNIT II: Coral reef diversity – morphology – types –coral reefs in India - economic importance.

UNIT III: insect diversity – butterfly diversity - habitat – favorite to plants and flowers – Butterfly Park in India.

UNIT IV: Avian diversity – scope and importance – bird sanctuaries – bird watching.

UNIT V: Artic diversity – bolar bear and penguin – adaptation impact of global warming on polar animals.

UNIT VI: (Not for Semester Examination)- Human races – Coccacian –Mongoloid – Negroid –Australoid – Tribal communities in India

Textbooks:

1. Arumugam N., (2014). Concepts of Ecology (Environmental Biology), Saras Publication.
2. Sharma P.D. (1994). Environmental Biology, Rastogi Publications.
3. Arumugam, N and V. Kumaresan (2014). Environmental Studies, Saras Publication.

References:

1. Odum, E.P (1953). Fundamentals of Ecology, W.B.Saunders, Philadelphia.
2. Saharia V.B. (1990). Wildlife in India, Nataraj Publications, Dehradun

SEM VI	MBE 2	caphpd gy;tifik	22K6ZELZ2:2	Inst.Hrs.6	Credit:5

myF1: caphpd gy;tifik Nehf;fk; kw;Wk; Kf;fpaj;Jtk; - tpyq;Ffspd; tiffs;.

myF2: gtsg;ghiw gd;Kfj;jd;ik – tiffs; - ,e;jpahtpy; gtsg;ghiwfs; - nghUshjhu Kf;fpaj;Jtk;.

myF3: tz;zj;Jg;G+r;rp – thoplk; - tpUg;gkhd jhtuq;fs; kw;Wk; g+f;fs;- ,e;jpahtpy; tz;zj;Jg; G+r;rp G+q;fh. ;

myF4: gwitfs; tsk; - Nehf;fk; kw;Wk; Kf;fpaj;Jtk; - gwitfs; ruzhyaq;fs; - gwitfs; fz;fhzpg;G.
myF 5: Mh;bf; tsk; - JUtf;fub kw;Wk; ngd;Fapd; -jftikg;Gfs;- JUt tpyq;Ffspy; cyf ntg;gkakhjypdhy; Vw;gLk; tpisTfs;.

myF6: (Not for Semester Examination)- kdpj ,dq;fs; - fhf;Nfrpad;fs; >kq;Nfhypah;fs; >ePf;Nuhf;fs;> M];buhy;Lfs; ,e;jpahtpd; goq;Fbapdh;;.

CO-PO Mapping with Programme Outcome: Biodiversity Code: 22K6ZELZ2:2

CO/PO	1	2	3	4	5	6	7	8	9	10
1	2	1	1		2	1	1			
2	1		1	1		1	1			
3	1	2	2		1	1		1		1
4	1		1	1			1			
5					1	1		1		1

1.Low, 2-Moderate, 3-High Correlation

SEM VI	MBE3	SERICUTURE	22K6ZELZ3:1	Inst.Hrs.6	Credit:5

Course Objectives: *The course gives insights into the principles of sustainable sericulture and how these principles can guide silkworm rearing into an enduring practice.*

CO	STATEMENT
1	Identifying the types of silkworm and organizations involved in sericulture.
2	Describing the cultivation practices involved in mulberry plants.
3	Understanding the biology of silkworm and rearing practices.
4	Categorize the mounting technology and diseases affecting silkworm.
5	Evaluate the importance of sericulture.

UNIT I: Definition and Scope -History of sericulture- World silk production and silk road. Development of sericulture in India. Economic importance. Distribution and types of races. Non-mulberry silkworms- Tasar, Muga and Eri. Sericulture organization in India; role of state departments of Sericulture, Central Silk Board, Universities and NGOs in Sericulture development.

UNIT II: Selection of mulberry variety. Methods of propagation. Environmental conditions for cultivation-temperature, humidity, and light-Preparation of land. Irrigation-manuring-application of fertilizers. Pruning-mulching-Harvesting of leaves-Preservation of leaves. Diseases and pests of mulberry.

UNIT III: Mulberry Silkworm-Life cycle of *Bombyx mori* - Silk gland. Rearing house and rearing appliances. Rearing operation. Seed production- Hatching-Brushing-Feeding-Bed Cleaning-Spacing- Early age and Late age rearing of silkworm.

UNIT IV: Methods of mounting Chandrika mountage. Harvesting of cocoons - Quality of cocoons. Reeling of cocoons – Process of reeling – Stifling and storage – Storage and deflossing. Reeling Equipments. Diseases and Pests of silkworm - causative agents, symptoms, prevention, and control measures.

UNIT V: Importance of mulberry silk- Silk composition. Utility of sericulture by products-Economics of sericulture. Employment generation in sericulture: Role of women in sericulture.

UNIT VI: (Not for Semester Examination)- Sericultural practices adopted -Europe, South Korea, Japan, and other countries. Sericultural practices in tropical and temperate climate. Recent trends in Seri- biotechnology.

Textbooks

1. Ganga G and Sulochana Chetty, J (1997): Sericulture, Oxford and IBH Co. New Delhi
2. Mariyappan P, (2017): Sericulture (Tamil), Eiyal Publication, Thanjavur

References

1. FAO (1992): Sericulture Training Manual, Oxford & IBH.

SEM VI	MBE3	gl;LGO tsh;g;G	22K6ZELZ3:1	Inst.Hrs. 6	Credit:5

myF 1: gl;LGO tsh;g;gpd; Nehf;fk; -tuyhW – cyf gl;L cw;gj;jp kw;Wk; gl;L rhiy . ,e;jpahtpy; gl;L cw;gj;jp – nghUshjhu Kf;fpaj;Jtk; - gl;L cw;gj;jp nra;Ak; tpyq;Ffs; tiffs; - ky;nghpapy;yh gl;L G+r;rp –lhrh> Kf> vhp> ,e;jpahtpy; gl;L njhopy; thhpak; - gl;L tsh;g;gpy; khepy Jiwfspd; gq;F – kj;jpa gl;L thhpak; - gl;L tsh;g;gpd; tsh;r;rpapy; gy;fiyfofk; kw;Wk; muR rhh;gw;w mikg;gpd; gq;fspg;G. .

myF 2: ky;nghp tsh;g;G – ky;nghp tiffs; Njh;e;njLg;G – tpij top ngUf;f tiffs; - ky;nghp tif R+oy; - ntg;gepiy - <ug;gjk; - xsp epyk; jahh; nra;jy; - ePh;g;ghrhik –cuNkyhz;ik – cuq;fs; - fpis ePf;fk; - %lhf;F mikj;jy; - ,iy gwpj;jy; kw;Wk; Nrkpj;jy; . ky;nghp Neha;fs; > jPq;Faphpfs**;.**

myF 3: ky;;nghp gl;Lg;GOtpd; Gwj;Njhw;wk; - ,sk; caphp kw;Wk; Kjph; caphp gl;Lr;Rug;gp. ghk;gpf;]; Nkhhp tho;f;if Row;rp – gl;Lg;GO tsh;g;gfk; kw;Wk; tsh;g;gpw;Fj; Njitahd cgfuzq;fs;. nghhpj;jy; – J}hpifaply; - czT+l;lk; – gLf;if Rj;jk; nra;jy; - ,lntspapLjy; - ,sk;caphp kw;Wk; Kjph; caphp tsh;g;G.;

myF 4: gl;LGOf; $L fl;Ljy; - Kjph;e;j GOf;fis Vw;wpfspy; ,Lk; Kiwfs; - gl;Lf;$L mWtil nra;jy; - gl;Lf; $l;bd; juk; $l;Lg;GOit nfhs;Sjy; Nrkpj;jy; - ntsp ciw ePf;Fjy; - E}w;Wf; fUtpfs; - gl;Lg;GOtpd; Neh;a;fs; kw;Wk; jPq;Faphpfs; - Neha;f;fhuzpfs;> mwpFwpfs;>fl;LgLj;Jjy;; ;; kw;Wk; jLg;G Kiwfs;.

myF 5: ky;nghp gl;Ltpd; Kf;fpaj;Jtk; > gl;LE}ypd; juk; - gl;Lnjhopy; fpilf;Fk; cghpnghUl;fs; - gl;LGOtsh;g;gpd; nghUshjhuk; - Ntiytha;g;G – gl;LGO tsh;;g;gpy; kfsphpd; gq;F .

myF 6: (Not for Semester Examination)- gl;LGO tsh;g;gpd; nray; Kiwfs; %yk; gad;gLj;Jk; > njd;nfhhpah> [g;ghd; kw;Wk; ,ju ehLfs; - ntg;gkz;ly R+o;epiyfs; - rkpgj;jpa gl;Lj;njhopy; El;gtpay; .

CO-PO Mapping with Programme Outcome: Sericulture Code: 22K6ZELZ3:1

CO/PO	1	2	3	4	5	6	7	8	9	10
1	1	1	1	-	-	1	2	1	-	2
2	1	1	-	-	-	1	3	1	-	2
3	1	1	-	-	-	1		1	-	3
4	-	1	1	-	-	2	2	2	-	2
5	-	-	-	-	-	1	1	`1	-	2

1.Low, 2-Moderate, 3-High Correlation

SEM VI	MBE 3	APPLIED ZOOLOGY	22K6ZELZ3:2	Ins.hrs.6	Credit.5

Course Objectives: *This Course is focused on the theoretical and applied knowledge on the various branches of biology. Which may help in successful entrepreneur.*

CO	STATEMENT
1	Acquire the knowledge about apiculture.
2	Understand the mechanism of vermicomposting.
3	Differentiate the nature and exotic species of poultry.
4	Compare the economics of fresh water and marine Penaeus species.
5	Understanding the concept of integrated forming.

UNIT I: Beekeeping - scope - Types of bees - Bee Hive - Extraction of Honey - Importance of Honey and by products.

UNIT II: Vermiculture - scope - Types of earthworm - Vermi compost production Applications of vermicompost.

UNIT III: Poultry - scope - Farming Native - (example) and Exotic (examples) poultry nutrition Economic importance.

UNIT IV: Aquaculture : Scope - Fresh water (*catla*) Prawn (*m.rosenbergii)* culture techniques (intensive) - Economic importance.

UNIT V: Components of integrated farming system -Beekeeping - vermiculture - Aquaculture - poultry - in Agriculture - Farm visit.

UNIT VI: (Not for Semester Examination)- Role of Bee keeping , Vermiculture, Poultry and Aquaculture on Economics and International trade.

Text Book;

1.Shukla G.S and Upadhyay V.B (1990). Economic Zoology Rastogi Publications.

2. Arumugam N.(2000). Aquaculture Saras Publicatioins.

Refrences Book:

1. Gupta,S.K and Gupta P.C (2006). General and Applied Icthyology. S. Chand & Co New Delhi.

SEM VI	MBE 3	gad;ghl;L tpyq;fpay;	22K6ZELZ3:2	Ins.hrs.6	Credit.5

myF 1: NjdP tsh;g;G - Nehf;fk; - tiffs; - NjdP ngl;b - Njd; gphp;j;njLj;jy; - Njd; kw;Wk; cg nghUl;fspd; Kf;fpaj;Jtk;.

myF 2: kz;GO tsh;g;G : Nehf;fk; - tiffs; - kz;GO cuk; jahhpj;jy; - kz;GO cuj;jpd; gad;ghl;L Kiwfs;;.

myF 3: Nfhop tsh;g;G -Nehf;fk; - gz;iz mikj;jy; ehl;L Nfhop (mrpy;) may; (nts;is ny`hd;) - czTl;lk; - nghUshjhu Kf;fpaj;Jtk; .

myF 4: ePhpd tsh;g;G - Nehf;fk; - ed;dPh; (fl;yh)> ,why; (*Nkf;Nuhgpuhf;fpak*;) - tsh;g;G Kiwfs; (jPtpu nrwpe;j) - nghUshjhu Kf;fpaj;Jtk;.

myF 5: xUq;fpize;j gz;iz mikj;jypd; $Wfs;- NjdPtsh;g;G- kz;GO tsh;g;G - ePhpd tsh;g;G - Nfhop tsh;g;G- tptrhak; - gz;iz Nkyhz;ik.

myF 6: (Not for Semester Examination)- cyf nghUshjhuk; kw;Wk; th;j;jfj;jpy; NjdP tsh;;g;G> kz;GO tsh;g;G - Nfhop tsh;g;G kw;Wk; ePhpd tsh;g;gpd; gq;F.

CO-PO Mapping with Programme Outcomes: Applied Zoology Code: 22K6ZELZ3:2

CO/PO	1	2	3	4	5	6	7	8	9	10
1	2		1		1			1		1
2		1					1			
3	2		1	1		1			1	
4	1		1	1		2		1		
5		1			1			2		2

1.Low, 2-Moderate, 3-High Correlation

SEM I	AC 1	BIOLOGY OF INVERTEBRATES AND CHORDATES	22K1B/CHAZ1	Ins.Hrs.5	Credit.3

Course Objectives: *The course is a walk for the Bachelors' entrant through the amazing diversity of living forms from simple to complex. It highlights how the organisms evolve and establish themselves and adapt their environment. These also compares with the basis of morphology and functional aspects of invertebrates and Chordates.*

CO	STATEMENT
1	Acquire knowledge about the diversity of invertebrates.
2	Knowledge about helminthus of public importance.
3	Develop awareness about Arthropod vectors .
4	Compared the organs and related functions of chordates.
5	Learn the of Respiration and Circ n process.ulatio
6	To knowledge about Parental care and migration of birds.

UNIT I: General characters of Phylum Protozoa, Porifera and Coelenterata upto class level with suitable examples– Paramecium – Organization and life history.

UNIT II: General characters of Phylum Platyhelminthes, Ashelminthus and Annelida upto class level with suitable examples – *Fasciola hepatica*– Organization and life history.

UNIT III: General characters of Phylum Arthropoda, Mollusca and Echinodermata up to class level with suitable examples. Prawn (*Penaeus monodon)* – Organization and life history.

CHORDATES

UNIT IV: General characters of Class: Pisces, Amphibia and Reptilia – Shark – Digestive, Respiratory, Nervous, Circulatory, Excretory and Reproductive system.

UNIT V: General characters of the Class: Aves and Mammalia – Pigeon - Digestive, Respiratory, Nervous, Circulatory, Excretory and Reproductive system.

UNIT VI: (Not for Semester Examination)- General characters: Corals and coral reefs,Protozoans diseases, Economic importance of mollusca, Parental care of fishes and Migration of Birds.

Text books:

1. Arumugam.N. Invertebrata, Saras Publications, Nagercoil.
2. Verma and Agarwal. Invertebrata,Chand & Co.,
3. Arumugam.N. Chordata, Saras Publications, Nagercoil.

Reference books:

1. Ayyer E.K. and T.N. Anathakrishnan (1992). A Manual of Zoology. Vol.1 (Invertebrata) Part I &II Vishwanatan Pvt. Ltd.,

SEM I	AC1	KJnfOk;G mw;wit kw;;Wk; KJnfOk;G cs;sitfspd; caphpay;	22K1B/CHAZ1	Inst.Hrs.5	Credit.3

myF1: njhFjp xUnry; caphpfs; (GNuhl;NlhNrhth); JisAlypfs; (/Nghhpnguh) kw;Wk; FopAlypfs; (rPyd;Nul;lh) nghJgz;;Gfs;; tFg;G tiu jFe;j cjhuzj;Jld; tpsf;fk; - ghukPrpak; tho;f;if tuyhw;iw tphpthf mwpjy;.

myF 2: njhFjp – jl;ilGOf;fs; (gpshl;bn`y;kpd;j];) cUisGOf;fs; (M];nfy;kpd;j];) kw;Wk; tisjirGOf;fs; (md;dyplh) nghJgz;;Gfs;; tFg;G tiu jFe;j cjhuzj;Jld; tpsf;fk; - fy;yPuy; GO cUthf;fk;; tho;f;if tuyhw;iw tphpthf mwpjy;.

myF 3: njhFjp – fZf;fhypfs;; (Mh;j;NjhuNghlh); nky;Ylypfs;; (nkhy];fh;) kw;Wk; Kl;Njhopfs; (vf;fpNdhnlh;Nkl;lh) nghJg;gz;;Gfs;; tFg;Gtiu jFe;j cjhuzj;Jld; tpsf;fk; - ,why; cUthf;fk;; tho;f;if tuyhw;iw tphpthf mwpjy;.

myF 4: njhFjp – kPd;fs; (gP];r];;) ,Utho;tpfs; (Mk;/gpgpah) kw;Wk; Chtdtw;wpd; nghJgz;;Gfs;; tiu jFe;j cjhuzj;Jld; tpsf;fk; - Rwhtpd; nrhpkhd kz;lyk; fhw;Nwhl;l kz;lyk; euk;G kz;lyk; ,uj;jXl;l kz;lyk; fopTePf;f kw;Wk; ,dngUf;f kz;lyk;.

myF 5: njhFjp gwitfs; kw;Wk; ghY}l;bfspd; nghJg;gz;;Gfs;; tiu jFe;j cjhuzj;Jld; tpsf;fk; - Gwhtpd; nrhpkhd kz;lyk; >fhw;Nwhl;l kz;lyk;> euk;G kz;lyk; >,uj;jXl;l kz;lyk; >fopTePf;f kw;Wk; ,dngUf;f kz;lyk;.

myF 6: (Not for Semester Examination)- nghJthd gz;Gfs;: gtsk; kw;Wk; gtwg;ghiwfs; GNuhl;NlhNrhtd; Neha;fs;. nky;Ylypfspd; nghUshjhu Kf;fpaj;Jtk;> kPd;fs; kw;Wk; gwitfs; tyirNghjy;.

CO-PO Mapping with Programme Outcomes: Biology of Invertebrates and Chordates

Code: 22K1B/CHAZ1

CO/PO	1	2	3	4	5	6	7	8	9	10
1	2		1		1			1		1
2		1					1			
3	2		1	1		1			1	
4	1		1	1		2		1		
5		1			1			2		2

1.Low, 2-Moderate, 3-High Correlation

SEM2	AC3	COMMERCIAL ZOOLOGY	22K2B/CHAZ3	Inst. Hrs. 4	Credit.3

Course Objectives: *To aim of this course is to developknowledge about students learn knowledge vermicompost preparation and economic importance of poultry,Apiculture, Sericulture and Aquaculture and their culture method.*

CO	STATEMENT
1	Explain what are the prerequire site to get started in vermiculture
2	Understand care and management of Apiary
3	Impart training in extension management and transfer of technology
4	Understand the aquaculture system
5	Understand the economic importance of poultry

UNIT I: Vermicuture and compositing: - types of earthworm - rearing and management -Types of Vermicompost economic importance.

UNIT II: Apiculture: Species of honey bees - types of bee hives- care and management - honey extraction - Composition and value of honey, economics of beekeeping.

UNIT III: Sericulture: Life cycle of silk worm (*Bombyx mori*) feeding and feeding habits, economic importance of silk.

UNIT IV: Aquaculture: Construction, management of a fish pond- Morphology, Food and feeding habit (Catla, Rohu and Mrigal). Ornamental fishes (Gold fish, Fighter and Angel fish) - Supplementary Live feed.

UNIT V: Poultry: Types of breeds - Feed - Diseases and control measures (Egg and Chicken), Economics of poultry.

UNIT VI: (Not for Semester Examination)- Uses of Vermicompost, Medicinal value of honey. Uses of silk.importance of Egg and chicken, Importance of ornamental fish culture.

Text book:

1. G.S.Shukla and V.B. Upadhyay - Economic Zoology .Rastogi Publications.

Reference books:

1 Ansan ;and S.P. Sinna - A hand book of Economic Zoology (S. Chand& Co.)
Sarder Singh - Bee keeping in India
2. S.R. Uial and M.N. Narasimhanna - Central silk Board, Government of India, Bombay.
3. Santhanam - Aquaculture

SEM 2	AC3	tzpf tpyq;fpay;	22K2B/CHAZ3	Inst. Hrs. 4	Credit.3

myF 1: kz;GO tsh;g;G kw;Wk; kz;GO cuk; kz;GOtpd; tiffs; tsh;g;G kw;Wk; guhkhpg;G. kz;GO cuk; jahhpf;Fk; Kiwfs; kw;Wk; nghUshjhu Kf;fpaj;Jtk;.

myF 2: NjdP tsh;g;G : NjdPf;fspd; ,dq;fs;> NjdP$l;bd; tiffs; > ghJfhj;jy; kw;Wk; guhkhpj;jy;> Njd; gphpj;;njLj;jy;> Njd; $l;Lg;nghUl;fs; kw;Wk;> kjpg;gPL> NjdP tsh;g;gpd; nghUshjhu Kf;fpaj;Jtk;.

myF 3: gl;L GO tsh;g;G : gl;Lg;GOtpd; tho;f;ifr; Row;rp(*ghk;gpf;]; Nkhhp*) gl;LGOtpd; czT kw;Wk; gof;f Kiw> gl;bd; nghUshjhu Kf;fpaj;Jtk;.

myF 4: kPd; tsh;g;G: kPd; Fsk; fl;Lkhdk; kw;Wk; guhkhpg;G > czT kw;Wk; Jiz czT> cldb czT kw;Wk; gof;f Kiw (fl;yh >NuhF kw;Wk; kph;fhy;) Gwj;;Njhw;w mikg;G. myq;fhu kPd;fs; (jq;fkPd;> rz;;ilapLk; kPd; kw;Wk; Njtij kPd;fs;).

myF 5: Nfhop tsh;g;G: Nfhopfspd; tiffs; kw;Wk; czT > NfhopfSf;F Vw;gLk; Neha;fs; kw;Wk; fl;LgLj;Jk; Kiwfs; (Kl;il kw;Wk; NfhopfSf;F) Nfhoptsh;g;gpd; nghUshjhu Kf;fpaj;Jtk;.

myF 6: (Not for Semester Examination)- kz;GO nghUshjhu Kf;fpaj;Jtk;> Njdpd; kUj;Jt Fzk;> gl;bd; gad;fs;> Nfhop kw;Wk; Kl;ilapd; Kf;fpaj;Jtk;> myq;fhu kPd; tsh;g;gpd; Kf;fpaj;Jtk; .

CO-PO Mapping with Programme Outcomes: COMMERCIAL ZOOLOGY Code: 22K2B/CHAZ3

CO/PO	1	2	3	4	5	6	7	8	9	10
1	-	1	-	-	1	-	-	-	1	3
2	-	1	-	1	2	1	-	2	-	1
3	1	2	-	1	2	-	-	1	1	2
4	-	-	-	1	1	2	1	-	1	2
5	-	1	-	-	2	1	1	-	-	2

1.Low, 2-Moderate, 3-High Correlation

SEM I&II	AC2 (P)	ALLIED ZOOLOGY – PRACTICAL BIOLOGY OF INVERTEBRATES AND CHORDATES & COMMERCIAL ZOOLOGY	22K2B/CHAZ2P	Inst .Hrs. 6	Credit. 3

Course Objectives: *Students will be able to learn the dissection and mounting techniques of invertebrates & chordates and identify the Species and By products of Honey.*

CO	STATEMENT
1	Expose the digestive system and Nervous system of Earthworm and Prawn by Dissection.
2	Have knowledge on body and Penial Setae of Earthworm, Mouth parts of Honeybee and Placoid scales of Shark.
3	. Identify some Invertebrates and Chordates.
4	Know the different Animals used for Commercial Zoology
5	Know the Value of Animal Products.

Dissections:

Earthworm - Digestive system and Nervous system .
Prawn - Appendages, Digestive system and Nervous system.
Frog/Rat - Video clipping.

Mounting:

Earthworm - Body and penial setae
Honeybee/ Mosquito - Mouth parts
Shark - Placoid scales.

Spotters:

Amoeba, Paramecium (Entire and Conjugation), *Fasciola* (W.M), Redia, Cercaria, Freshwater mussel, Star fish, Shark, Frog, Calotes and Pigeon.

Species of animal used:

Vermiculture - Earthworm
Honey bee - *Apis indica*
Sericulture - *Bombyx mori*
Aquaculture - Major carps and 5 aquarium fishes
Poultry - Any three types.

Products:

Honey, Bee wax, Silk, Cod-liver oil & Egg.

CO-PO Mapping with Programme Outcomes: Allied Zoology – Practical Biology Of Invertebrates and Chordates, Commercial Zoology Code: 22K2B/CHAZ2P

CO-PO	1	2	3	4	5	6	7	8	9	10
1	-	1	-	-	1	-	-	-	1	3
2	-	1	-	1	1	1	-	2	-	1
3	1	2	-			-	-	1	1	

4	-	-	-	1	1		1	-	1	1
5	-	1	-	-	2	1	1	-	-	

1.Low, 2-Moderate, 3-High Correlation

VIII. Continuous Internal Assessment System

	Maximum	**Components**			**Passing Minimum**
		Attendance	CIA	Seminar / Assignment	
Theory	**25**	05	15	05	**10**
Practical*	**40**	05	25	10 (Record)	**16**

IX. Question Pattern

	Part A	**Part B**	**Part C**
Semester Exam: Theory (75)	20 X 1=20 (Answer All)	4X 5= 25 (Internal choice)	3 X10 =30 (Open choice)
Semester Exam: Practical (60)	5X10 = 50*	-	-
Semester Exam: SBEC Theory (75)	5 X 5= 25 (Internal choice)	5X10=50 (Open choice)	-
CIA Exam: Theory (50)	10 X 1=10 (Answer All)	4 X 5= 20 (Internal choice)	2 X10 =20 (Open choice)
CIA SBEC Theory (50)	5x5 = 20 (Internal choice)	3 X10 =30 (Open choice)	-
Model Exam Thoery (75)	20 X 1=20 (Answer All)	5 X 5= 25 (Internal choice)	3 X10 =30 (Open choice)
Model Exam: Practical (50) *	5X10 = 50	-	-

X . Question Allocation and Blooms Taxonomy for (Direct) Assessment

Unit	Section & Marks	Question Number	Blooms Level	Action Verbs
1	**A (1 mark)**	**1-4**	I / II	***Level 1:*** *Choose, Define, Find, How, Label, List, Match, Name, Select, Show, Tell, What, When, Where, Which, Who, Why* ***Level II:*** *Classify, Compare, Contrast, Demonstrate, Explain, Extend, Illustrate, Infer, Interpret, Outline, Relate, Show, Summarize, Translate* ***Level II1:*** *Apply, Build, Choose, Construct, Develop, Experiment with, Identify, Interview, Make use of, Model, Organize, Plan, Select, Solve, Utilize* ***Level 1V:*** *Analyze, Assume, Categorize, Discover, Dissect, Distinguish, Divide, Examine, Function, Inference, Inspect, Motive, Relationships, Simplify, Survey, Take part in, Test for, Theme* ***Level V:*** *Agree, Appraise, Assess, Award, Conclude, Criteria, Criticize, Decide, Deduct, Defend, Determine, Disprove, Estimate, Evaluate, Importance, Influence, Interpret, Judge, Justify, Mark, Measure, Opinion, Perceive, Prioritize, Prove, Rate, Recommend, Rule on, Select, Support, Value* ***Level VI:*** *Adapt, Combine, Compile, Compose, Construct, Create, Delete, Design, Develop, Discuss, Elaborate, Estimate, Formulate, Happen, Imagine, Improve, Invent, Make up, Maximize, Minimize, Modify, Original, Originate, Plan, Predict, Propose, Solution, Solve, Suppose, Test, Theory*
	B (5 mark)	**21 (a) and (b)**	I / II	
	C (10 mark)	**26**	I / II	
II	**A (1 mark)**	**5-8**	I / II	
	B (5 mark)	**22 (a) and (b)**	I / II	
	C (10 mark)	**27**	I / II	
III	**A (1 mark)**	**9-12**	I / II	
	B (5 mark)	**23 (a) and (b)**	III / IV	
	C (10 mark)	**28**	III / IV	
IV	**A (1 mark)**	**13-16**	I / II	
	B (5 mark)	**24 (a) and (b)**	III / IV	
	C (10 mark)	**29**	V / VI	
V	**A (1 mark)**	**17-20**	I / II	
	B (5 mark)	**25 (a) and (b)**	V / VI	
	C (10 mark)	**30**	V / VI	

BL	No. Of Questions (Sections)			Total Marks	% of Marks
	A	B	C		
I. Remembering	12	4	2	12	50
II. Understanding	08			48	
III. Applying	-	4	2	**20**	**33**
IV. Analyzing	-			**20**	
V. Evaluating	-	2	1	10	17
VI. Creating	-			10	
Total Questions	**20**	**10**	**5**	**120**	**100**

XI. Teaching Methodology Adopted: (**department specific**) + Department may adopted at least a 20 % of ICT enabled classes out of total hours of each course work and proper documents *(Date, Hour, Course and unit, name of the faculty and sign of the representative student)* to be maintained for the same

XII. Outline of Learning Outcomes- based Curriculum Frame work (LOCF) **(**All the following categories of courses will be given with definition, procedure and system of implementation) 1. **LC:** Language Course (Part I):

2. **ELC:** English Language Course (Part II):
3. **CC** : Core Course :
4. **AC :** Allied Course
5. **EC**: Elective Course :
6. **MBE**: Major Based Elective:
7. **SBEC:** Skill Based Elective Courses:
8. (A) Internship-External
   (B) Internship-Internal
   (C) Field Work
9. **VA**: Value Added courses:
10. **NME** : Non-Major Elective:
11. **VE:** Value Education
12. **ES:** Environmental Studies
13. **SSD:** Soft Skill Development:
14: Extension and Extra Curricular Activities:
15. **ECC** - Extra Credit Course:
    (A) **SS**-Self Study:

(B) **MOOC**:
(C) **Add on Course:**

* add-on Certificate Courses with 10-30 contact hrs conducting by Course Coordinator of the department /College
# List of MOOC Courses will be given by the Course Coordinator

$ **External or Internal Internship:** 2 weeks During Month of March - April Executed by Internship Coordinator through internal guide
OR
Field work: Can be a field study / industrial visit During Month of March - April Executed by Internship Coordinator through internal guide with submitting a 10 to 15 page report.

QUESTION BLUE PRINT (75 Marks)

Q.No	***Unit***	***Blooms Level***
Part A		
1	1	Remembering I / Understanding II
2	1	Remembering I / Understanding II
3	1	Remembering I / Understanding II
4	1	Remembering I / Understanding II
5	II	Remembering I / Understanding II
6	II	Remembering I / Understanding II
7	II	Remembering I / Understanding II
8	II	Remembering I / Understanding II
9	III	Remembering I / Understanding II
10	III	Remembering I / Understanding II
11	III	Remembering I / Understanding II
12	III	Remembering I / Understanding II
13	IV	Remembering I / Understanding II
14	IV	Remembering I / Understanding II

15	IV	Remembering I / Understanding II
16	IV	Remembering I / Understanding II
17	V	Remembering I / Understanding II
18	V	Remembering I / Understanding II
19	V	Remembering I / Understanding II
20	V	Remembering I / Understanding II
Part B		
21 (a)	1	Remembering I / Understanding II
(b)	1	Remembering I / Understanding II
22 (a)	II	Remembering I / Understanding II
(b)	II	Remembering I / Understanding II
23 (a)	III	Applying III / Analyzing IV
(b)	III	Applying III / Analyzing IV
24 (a)	IV	Applying III / Analyzing IV
(b)	IV	Applying III / Analyzing IV
25 (a)	V	Creating V / Evaluating V I
(b)	V	Creating V / Evaluating V I
Part C		
26	I	Remembering I / Understanding II
27	II	Remembering I / Understanding II
28	III	Applying III / Analyzing IV
29	IV	Applying III / Analyzing IV

30	V	Creating V / Evaluating V I