ANNEXURE - 11
DEPARTMENT OF ZOOLOGY

VISION:

- To unearth and mould the hidden talents and skills of students towards discoveries, invention research and to make them attain a scientific status.

MISSION:

- Offering an research oriented education, to encourage students to take up mega projects in future.
- To motivate the talented students, through excellent teaching and career guidance.
- To inculcate a scientific tempo as a scientist.

Programme Educational Objectives (PEO)

PEO1	Natural navigators and nimble witted in diagnosing problems, in enlisting steps to rectify them and in providing the most effective solutions in the best possible way
PEO2	Moralistic while demonstrating their academic caliber, in recognizing and acknowledging value systems, in making decisions, accepting responsibilities and while concerned about society and public issues and needs
PEO3	Self-reliant in learning and in real life job situations through which they support their peers and become stable and reliable students, workers and citizens
PEO4	Steadfast in shielding and nurturing environment and stimulate its sustainable growth for a bright future
PEO5	Versatile and vibrant communicators in person and through other media. Vigilant/vital in prolonging the long winding richness and tradition of their mother tongue
PEO6	Neoteric global citizens of our nation, who would take the nation's pride around the world by adapting and adopting the scientific and technological developments
PEO7	Civilized and confident graduates, who believe in lifelong learning with the socio-cultural changes in the generations to come

Programme Objectives (PO)

PO1:	Acquired enriched scientific knowledge on the bio diversity of fauna & flora towards the safe environmental sustainability for noble cause
PO2:	To understand communicate and implement the technical skills on critical thinking and problem solving practices
PO3:	An effective leadership quality towards professional ethics decision making ability and accepting responsibilities to the fellow human being concerned with society.
PO4:	Progressive learning, management and integrating awareness in core areas that is environmentally related to real life job situation through peer support for society and nation.
PO5:	Developed the skill and proficiency in core subjects that enhances nation's pride around the world by adapting scientific tempo development. Inculcate social integrity and socio economic changes that aims for higher standards for future generation.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO 1:	Acquired comprehensive fundamental knowledge on classification of animal kingdom, its characteristics and current trends for future development in animal sciences
PSO 2:	Developed basic laboratory techniques and sill oriented to self employability.
PSO 3:	Awareness on environmental issues, nurturing animal conservation, socio-economic issues and moral values.
PSO 4:	Collaborate with peer to adapt and accept changes towards sustainability of environment and to endeavour research.
PSO 5:	Gained self-reliant learning for entrepreneurial skills in biological sciences viz Bee keeping, sericulture, poultry farming, aquaculture and medical laboratory technologies.

PEO - PO MAPPING

PO / PEO	PO1	PO2	PO3	PO4	PO5
PEO1	2	1	1	3	2
PEO2	2	2	3	1	3
PEO3	1	2	1	1	2
PEO4	2	1	3	3	1
PEO5	1	3	1	1	1
PEO6	2	2	2	3	3
PEO7	2	1	2	1	2

3- Strong 2- Medium 1- Low

SEMESTER - V										
III	Core	Genetics & Biostatistics	212303501	6		6		3	25	75
	Core	Ecology	212303502	5		5		3	25	75
	Core Lab	Genetics, Biostatistics and Ecology	-	4		–		–	–	–
	Core Lab	Physiology Molecular Biology, Biotechnology, Bioinformatics Lab	-	4		–		–	–	–
	Allied Bot.	Taxonomy and Embryology of Angiosperms and Plant Ecology	212403521	4		4		3	25	75
	Allied Bot. Lab	Taxonomy and Embryology of Angiosperms, Plant Ecology, Plant Physiology, Forestry and Hortitulture Lab	-	2		–		–	–	–
IV	SBE - III	Microbiology	214403523	2		2		3	25	75
	SBE - IV	Economic Entomology	218203523	2		2		3	25	75
	WS	Women Studies	214503501	1		1		2	–	100
	Additional Courses	Communicative English–III	-		2			–	–	–
		Computer Literacy	-		1			–	–	–
		Skill Development – Career Guidance	-		3			–	–	–
	SLC	Vermiculture	218003523				4	3	–	100
SEMESTER – VI										
III	Core	Molecular biology, Biotechnology and Bio informatics	212303601	3		3		3	25	75
	Core	Physiology	212303602	2		2		3	25	75
	Core Lab	Genetics, Biostatistics and Ecology	212303603	4		5		3	40	60
	Core Lab	Physiology, Molecular Biology, Biotechnology, Bioinformatics Lab	212303604	4		5		3	40	60
	Elective	Project *Report; @Viva	212303605	5		6		–	40 [24:16]	60 [36:24]
	Allied Bot.	Plant Physiology, Forestry and Horticulture	212403621	4		4		3	25	75
	Allied Bot. Lab	Taxonomy and Embryology of Angiosperms, Plant Ecology, Plant Physiology, Forestry and Horticulture	212403622	2		2		3	40	60
IV	SBE - V	Immunology	214403623	2		2		3	25	75
	SBE - VI	Poultry Science	218203623	2		2		3	25	75
	VBE	Value Based Education	214303601	2		2		2	–	100
	Additional Courses	Communicative English–III	218003601		2		1	3	25	75
		Computer Literacy	218003602		1		1	3	–	100
		Skill Development – Career Guidance	218003603		3		2	3	–	100
		TOTAL		**180**	**36**	**140**	**20**			

ALLIED – ZOOLOGY FOR CHEMISTRY

Sem	Title of the Paper	SUB CODE	Hrs.	Cr.	Exam (Hrs)	Marks	
						Int	Ext
I	Animal Diversity	212303121	4	4	3	25	75
II	Genetics, Cell Biology and Bio chemistry	212303221	4	4	3	25	75
II	Animal Diversity, Genetics, Cell Biology and Bio chemistry Lab	212303222	2	2	3	40	60
III	Microbiology & Immunology	212303321	4	4	3	25	75
IV	Physiology & Biotechnology	212303421	4	4	3	25	75
IV	Animal Diversity, Microbiology, Immunology, Physiology and Biotechnology Lab	212303422	2	2	3	40	60

Core Subject **GENETICS & BIOSTATISTICS** **Code:212303501**
SEMESTER V **6 Hrs/Week**
Credits 6

Preamble:-

- ✍ ***To impart the basic knowledge of Genetics and biostatistics***
- ✍ ***To Inculcate the impact of genes and prediction of it in the population through biostatistics.***
- ✍ ***To Aquire knowledge on biostatistics for biological studies and its significance***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	To gain insight on Mendelian principles, Interaction of genes and its inheritance.	Up to K3
CO2	Impact of crossing over of genes, sex determination and chromosome aberrations on organism.	Up to K3
CO3	To gain knowledge on gene mutation, diseases and genetic counseling.	Up to K3
CO4	To inculcate knowledge on data and representations	Up to K3
CO5	To learn the significance of correlation, probability and goodness of fit in the field of biological studies	Up to K3

K1- Knowledge K2 – Understand K3-Apply

UNIT – I: **[20 Hrs]**

Mendelian Principles – Monohybrid and Dihybrid experiment. Interaction of genes – Epistasis, Complementary and supplementary genes - Lethal genes - Multiple Alleles – Blood group inheritance, Polygenic inheritance – skin colour.

UNIT – II: **[15 Hrs]**

Linkage and Crossing over in Drosophila – Chromosome mapping. Sex determination. Extra Chromosomal inheritance. Chromosomal aberration.

UNIT – III: **[20 Hrs]**

Gene Mutation, Syndromes - Turner's, Down's and Klienfelter's syndromes; Genetic diseases – Phenylketonuria and Alkaptoneuria. Inbreeding and outbreeding – Genetic counseling.

UNIT – IV: **[15 Hrs]**

Collection of Data – Primary and Secondary data, classification and Tabulation – Diagrammatic and Graphic Representation, Measures of Central tendency – Mean, Median, Mode.

UNIT – V: **[20 Hrs]**

Measures of Dispersion – Standard Deviation and Standard error - Correlation, Rank correlation, Regression - Probability- Addition Theorem and Multiplication Theorem, Chi square test. Goodness of fit and students 't' test.

TEXT BOOKS:

01. Arumugam N., Biostatistics and Computer Application, Saras Publications, India, 2012.
02. Dr.Meyan Pillai R.P., Genetics, Saras Publication, India, 2012.

REFERENCES:

01. Gupta S.V., and Kapoor V.K., Fundamentals of Mathematical Statistics, Rastogi Publications, India, 2009.
02. Sinnot E.W., Dunn L.C., and Dobzansky, Principles of Genetics, McGraw – Hill Co, New York, ISBN 57–13342,1958.
03. Winchester A.M., Genetics, Oxford and IBH Pub Co., New Delhi, 1967.

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [20 Hrs]				
1.1	Mendelian Principles	2	Chalk &Talk	Black Board
1.2	Monohybrid and Dihybrid experiment.	3	Chalk &Talk	Black Board
1.3	Interaction of genes Epistasis, Complementary and supplementary genes	5	Chalk &Talk	Black Board
1.4	Lethal genes - Multiple Alleles	5	Chalk &Talk	Black Board
1.5	Blood group inheritance, Polygenic inheritance – skin colour	5	Chalk &Talk	Black Board
UNIT – II [15 Hrs]				
2.1	Linkage and Crossing over in Drosophila	5	Chalk &Talk	Black Board
2.2	Chromosome mapping. Sex determination.	5	Chalk &Talk	Black Board
2.3	Extra Chromosomal inheritance. Chromosomal aberration.	5	Chalk &Talk	Black Board
UNIT – III [20 Hrs]				
3.1	Gene Mutation, Syndromes	5	Chalk &Talk	Black Board
3.2	Turner's Down's and Klienfelter's syndromes	5	Chalk &Talk	Black Board
3.3	Genetic diseases – Phenylketonuria and Alkaptoneuria.	5	LCD	LCD
3.4	Inbreeding and outbreeding – Genetic counseling.	5	Chalk &Talk	Black Board
UNIT – IV [15 Hrs]				
4.1	Collection of Data – Primary and Secondary data	5	Chalk &Talk	Black Board
4.2	classification and Tabulation	2	Chalk &Talk	Black Board
4.3	Diagrammatic and Graphic Representation, Measures of Central tendency	5	LCD	LCD
4.4	Mean, Median, Mode.	3	Chalk &Talk	Black Board
UNIT – V [20 Hrs]				
5.1	Measures of Dispersion – Standard Deviation and Standard error	5	Chalk &Talk	Black Board
5.2	Correlation, Rank correlation, Regression	5	Chalk &Talk	Black Board
5.3	Probability, Addition Theorem and Multiplication	5	Chalk &Talk	Black Board
5.4	Theorem, Chi square test, Goodness of fit and students 't' test.	5	Chalk &Talk	Black Board

MAPPING OF COs WITH POs

	PO1	PO2	PO3	PO4	PO5
CO1	3	2	1	1	3
CO2	2	1	3	2	2
CO3	3	3	3	3	1
CO4	2	3	2	3	1
CO5	3	2	1	3	3

3 - Strong 2 - Medium 1- Low

COURSE DESIGNER: Dr. K.S. Malar

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Core Subject **ECOLOGY** **Code:212303502**

SEMESTER V **5 Hrs/Week**

Credits 5

Preamble:

To study the concepts of ecology and the impact of pollution

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	To develop an environmental related policy dedicated to the study of eco-and socio evolutionary dynamics	Up to K3
CO2	To understand a technological modeling platform for the integration of community ecology	Up to K3
CO3	To create the managering skills and interrelationship between biotic and abiotic components of nature as well as relationship among the individuals	Up to K3
CO4	To gain insight into eco-evolutionary dynamics within and across trophic levels.	Up to K3
CO5	The students will get knowledge on conservation and management of natural resources and control of pollution strategies in the environment	Up to K3

K1- Knowledge K2 – Understand K3-Apply

UNIT – I: **[15 Hrs]**

Light: Spectra, Light on Land, Light in water, Biological effects of Light – (effect on metabolism, reproduction, development and pigmentation only).

Temperature: Range, Diurnal variation, thermal stratification and Biological effect. (Effects of temperature on metabolism) and morphology (Bergmans rule, Allens rule, Jordans rule and Rensih's rule).

UNIT – II: **[15 Hrs]**

Terrestrial habitat: Characteristics, ecological classification of Land, their fauna, and their adaptation. Fresh water: Thermal stratification, types of ponds and pond fauna. Marine habitat: Characteristics, stratification, planktonic, muddy, shore and deep sea adaptations.

UNIT – III: **[15 Hrs]**

Population - Types, density and estimation, Natality, Mortality, Age distribution, growth pattern, fluctuation and equilibrium. Dispersal and distribution. Regulation of population. Animal Relationship: Intra specific,

Inter specific relationship – Neutralism, mutualism, commensalism, parasitism, predation and competition.

UNIT – IV: **[15 Hrs]**

Community ecology - Definition, characteristics, diversity – Ecological niche. Ecological succession.

Ecosystem: Definition–components–food chain and its types. Food web – ecological pyramids – Biogeochemical cycle – Carbon, Phosphorous and Nitrogen cycle.

UNIT – V: **[15 Hrs]**

Pollution: – Causes effects and control measures of air pollution, Water pollution, nuclear and thermal pollution. Climate change, Green house effect and global warming, Bhopal episode and minimata disease.

Wild life conservation and Management.

TEXT BOOKS:

1. Arumugam N., Concepts of Ecology, Saras Publications, 2010.
2. Sharma P.D., Environmental Biology, Rastogi Publications, Meerut, 2006.

REFERENCES:

1. Dash M.C., Fundamentals of Ecology, Tata McGraw – Hill Publishing Co., Ltd, New Delhi – 110 002. ISBN: O – 07 – 460103 – 2, 1996.
2. Odum.E.P., Fundamentals of Ecology, W.B.Saunders Publishers, Philadelphia, 1985.

WEBRESOURCES:

01. https://www.esa.org/about/what-does-ecology-have-to-do-with-me/
02. https://biologydictionary.net/ecology/
03. http://environment-ecology.com/what-is-ecology/205-what-is-ecology.html

PEDAGOGY: Chalk and talk, Group Discussion, PPT, and Field visit

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [15 Hrs]				
1.1	Light-Land, water-Effect on metabolism	2	Chalk & Talk	Black Board
1.2	Biological effects of light	2	Chalk & Talk	Black Board
1.3	Temperature-Stratification-Temperature	6	Chalk &Talk	Black board
1.4	Pigmentation-Diurnal variation	2	Chalk& Talk	Black Board
1.5	All types of rules for light and temperature	2	Chalk &Talk	Black Board
1.6	Revision	1	Chalk &Talk	Black Board
UNIT – II [15 Hrs]				
2.1	Terrestrial habitat-Characteristics	3	Chalk &Talk	Black Board
2.2	Classification of Land	2	LCD	LCD
2.3	Fauna and their adaptations	2	LCD	LCD
2.4	Types of Pond and pond fauna	3	LCD	LCD
2.5	Marine habitat: Characteristics,Stratification,	2	Chalk & Talk	Black Board
2.6	Muddy, Rock and Sandy shore fauna	2	Chalk & Talk	Black Board

2.7	Deep sea adaptations	1	Chalk &Talk	Black Board
	UNIT – III [15 Hrs]			
3.1	Definition about Populations	3	Chalk & Talk	Black Board
3.2	Characteristics of population-Estimation, Natality & Mortality and other factors	3	Chalk &Talk	Black Board
3.3	Population fluctuations and Equilibrium	2	Chalk &Talk	Black Board
3.4	Regulation of population	2	Chalk & Talk	Black Board
3.5	Animal relationship-Intra and Inter relationship	3	Chalk & Talk	Black Board
3.6	Predation and parasites	2	Chalk & Talk	Black board
	UNIT – IV [15 Hrs]			
4.1	Characteristics of Community	1	Chalk & Talk	Black Board
4.2	Ecological succession and Niche	2	Chalk & Talk	Black Board
4.3	Components of ecosystem & Ecological pyramids	4	Chalk & Talk	Black Board
4.4	Biogeochemical cycle- Carbon cycle	2	Chalk & Talk	Black Board
4.5	Biogeochemical cycle-Phosphorous cycle	2	Chalk &Talk	Black Board
4.6	Biogeochemical cycle- Nitrogen cycle	4	Chalk &Talk	Black Board
	UNIT – V [15 Hrs]			
5.1	Types of Pollution-Air and water	4	LCD	LCD
5.2	Nuclear and thermal pollution	2	LCD	LCD
5.3	Climate change-Green house effect	2	LCD	LCD
5.4	Global warming-Bhopal episode	2	LCD	LCD
5.5	Introduction about wild life conservation	2	LCD	LCD
5.6	Different Protective laws for wild life conservation	3	Chalk & Talk	Black Board

MAPPING OF COs WITH POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	1	2	3
CO2	3	1	3	3	1
CO3	3	3	3	3	2
CO4	2	3	1	3	2
CO5	3	1	3	3	3

3 - Strong 2 - Medium 1- Low

COURSE DESIGNER: Dr. P.Murali

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Skill Based Elective - III **MICROBIOLOGY** **Code: 214403523**

SEMESTER V **2 Hrs/Week**

Credits 2

Preamble:-

- ***To introduce the basic concepts of Microbiology and its importance for human life.***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	To make an awareness among the students about the history , scope and importance and classification of microorganisms.	Up to K3
CO2	Course will enable the students to learn various culture techniques and its growth rate.	Up to K3
CO3	To understand the types of culture media and nutritional requirements.	Up to K3
CO4	To emphasize the role of microorganisms in various field like Agriculture pharmaceutical and food industries.	Up to K3
CO5	To learn the causative agent , pathogenicity and control measures of pathogenic microbes.	Up to K3

K1- Knowledge K2 – Understand K3-Apply

UNIT – I: **[6 Hrs]**

Introduction to Microbiology - History and scope of microbiology - classification - Whittaker's Five Kingdom concept - Ultra structure of bacterium (*E.coli*).

UNIT – II: **[6 Hrs]**

Sterilization techniques- physical and chemical methods- Types of bacterial culture media - Nutritional types of bacteria-bacterial growth curve and growth rate- Reproduction of bacteria.

UNIT – III: **[6 Hrs]**

Methods in culturing bacteria - concepts of pure culture technique-serial dilution technique-spread plate, pour plate and streak plate methods.

UNIT – IV: **[6 Hrs]**

Agricultural Microbiology – Biofertilizer (Azolla, Cynobacteria) - Industrial Microbiology - Production of antibiotic (Penicillin) – Biofuel – ethanol. Food Microbiology- Methods of food preservation.

UNIT – V: **[6 Hrs]**

Medical Microbiology - epidemiology, causative agent, symptom, pathogenicity , prevention and controlling measure of tuberculosis, Polio, typhoid, AIDS and candidiasis.

TEXT BOOKS:

01. Dr. Arumugam N., Text book of Microbiology, Saras Publication, 2009.
02. Michael J. Pelczaretal –Microbiology Tata Mc Graw Hill Publications.

REFERENCES:

1. Prescott L., Harley and Klein, Microbiology, VI edition, Mc Graw – Hill Publications, 2004.
2. Ananthanarayanan R., and JayaramPaniker C.K., Text Book of Microbiology, 5th Edition, Orient Longman, 1994.
3. Black J., Microbiology – Principles and Explorations, Prentice Hall International Inc, New Jersey, 1999.
4. Chakaraborty P., A Text Book of Microbiology, New Central Book Agency Pvt Ltd., Calcutta, 1995.
5. Madigan M., Martinko J., and Parker J., Biology of Microorganisms, Prentice Hall International Inc, New Jersey, 2005.

WEB RESOURCES:

01. http://www.slidefhare.net/tamilsilambarasan/sterilization -disinfection-45668455
02. http://www.slidefhare.net/ArchanaShaw2/ultrastructure-and-characteristic features-bacterium
03. http://www.slidefhare.net/alubajessabeth/cultivation-of-bacteria
04. http://www.slidefhare.net/jyotsnanarang/food-preservation-
05. http://www.slidefhare.net/chaturvedipooja69/bacterial-infection

PEDAGOGY: Lecture, PPT.

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [6 Hrs]				
1.1	Introduction to Microbiology	1	Lecture	PPT
1.2	History and scope of microbiology	1	Lecture	PPT
1.3	classification - Whittaker's Five Kingdom concept	2	Lecture	Black board
1.4	Ultra structure of bacterium (*E.coli*)	2	Lecture	Charts and black board
UNIT – II [6 Hrs]				
2.1	Sterilization techniques	1	Lecture	Black board
2.2	Types of microbiological culture media	2	Lecture	Black board
2.3	Nutritional types of bacteria	1	Lecture	Black board
2.4	bacterial growth curve and growth rate	1	Lecture	Black board
2.5	Reproduction of bacteria.	1	Lecture	Black board, Charts
UNIT – III [6 Hrs]				
3.1	Cultivation of bacteria	2	Lecture	Visual aids
3.2	Methods of culturing bacteria	2	Lecture	Visual aids
3.3	concepts of pure culture technique	2	Lecture	Visual aids
UNIT – IV [6 Hrs]				
4.1	Agricultural microbiology- introduction	2	Lecture	PPT
4.2	Biological Nitrogen fixation	1	Lecture	PPT
4.3	Industrial microbiology- penicillin production	2	Lecture	PPT
4.4	Food microbiology- preservation methods	1	Lecture using ppt	PPT
UNIT – V [6 Hrs]				
5.1	Tuberculosis	1	Lecture	Visual aids
5.2	Typhoid	1	Lecture	Visual aids
5.3	AIDS	2	Lecture using PPT	Visual aids

5.4	Polio	1	Lecture	Visual aids
5.5	Candidiasis	1	Lecture	Visual aids

MAPPING OF COs WITH POs

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	2	2	3	2	3
CO3	3	3	2	1	1
CO4	3	2	2	3	2
CO5	3	1	1	3	3

3 - Strong 2 - Medium 1- Low

COURSE DESIGNER: Mrs. R. Latha

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Skill Based Elective –IV **ECONOMIC ENTOMOLOGY** **Code: 218203523**

SEMESTER V **2 Hrs/Week**

Credits 2

Preamble:-

- ***To impart knowledge and awareness on insects and control of insect pests.***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	Identify insects upto order level and can distinguish them.	Up to K3
CO2	Explain the features and bionomics of important insect pests.	Up to K3
CO3	Characterize insects as beneficial, harmful and productive insects	Up to K3
CO4	Describe various control measures of insect and their management.	Up to K3
CO5	Apply the knowledge gained on economically important insects in their future studies and research.	Up to K3

K1- Knowledge K2 – Understand K3-Apply

UNIT – I: **[4 Hrs]**

Classification of Insects up to order level (29 orders)

Economic importance of Insects

Pollinating Insects – Butterfly and lac insect

UNIT – II: **[8 Hrs]**

Pests of Paddy : *Scirpophaga incertulas* and *Nilaparvata lugens*

Pests of Cotton : *Aphis gossypii* and *Pectinophora gossypiella*

Pests of Brinjal : *Euzophera perticella* and *Leucinodes orbonalis*

Pests of Bhendi : *Erias vitella* and *Helicoverpa armigera*

UNIT – III: **[6 Hrs]**

Pests of stored products : *Sitophilus oryzae* and *Triboleum casteneum*.

Pests of Animal Husbandry : Blackfly and Cattle grub

Biology of vectors : Housefly and Mosquito

UNIT – IV: **[6 Hrs]**

Predatory pest (Dragonfly and Ladybird Beetle), Parasitic insects (Fireant and *Braconid* wasp), Parasitoid (*Trigogramma* and Green Lacewig), Scavenger insects (Flesh fly and Rove Beetle)

UNIT – V: **[6 Hrs]**

Methods of pest control – Natural Control, Artificial control, Chemical Control and Biological control.

Integrated pest management.

Collection and Identification of insects in the field.

TEXT BOOKS:

01. Nalina Sundari M.S., Santhi Y.R., Entomology, Chennai, 2008.
02. Vasantha Raj David B., Kumaraswami T., Elements of Economic Entomology, Popular Depot, Chennai, 1978.

REFERENCES:

01. Agricultural Entomology: ICAR, New Delhi, 2009.
02. Dennis Hill, Agricultural Insect Pests of the Tropics and their Control, 1975,
03. Mani M.S., Text book of Entomology.
04. Metcalf. Flint and Metcalf, Destructive and Useful insects, 4th Edition 1998.
05. Ramakrishna T.V., Hand Book of Economic Entomology for South India, Ayyar.
06. Vasantha Raj David, Text book of Economic Entomology

WEB RESOURCES:

01. https://en.wikipedia.org/wiki/Economic_entomology#:~:text=Economic%20entomology%20is%20a%20field,these%20are%20termed%20as%20vectors.
02. https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/economic-entomology

PEDAGOGY: Chalk and Talk, PPT, Discussion.

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [4 Hrs]				
1.1	Classification of Insects up to order level	2	Lecture	Board
1.2	Economic importance of Insects	2	PPT	LCD
UNIT – II [8 Hrs]				
2.1	Pests of Paddy : *Scirpophaga incertulas* and *Nilaparvata lugens*	2	PPT	LCD
2.2	Pests of Cotton: *Aphis gossypii* and *Pectinophora gossypiella*	2	PPT	LCD
2.3	Pests of Brinjal: *Euzophera perticella* and *Leucinodes orbonalis*	2	PPT	LCD
2.4	Pests of Bhendi : *Erias vitella* and *Helicoverpa armigera*	2	PPT	LCD

UNIT – III [6 Hrs]				
3.1	Pests of stored products : *Sitophilus oryzae* and *Triboleum casteneum.*	2	PPT	LCD
3.2	Pests of Animal Husbandry: Blackfly and Cattle grubs	2	Lecture	Black board
3.3	Biology of vectors : Housefly and Mosquito	2	Lecture	Black board
UNIT – IV [6 Hrs]				
4.1	Predator (Dragonfly and Ladybird Beetle),	2	PPT	LCD
4.2	Parasite (Fireant and *Braconid* wasp), Parasitoid	1	PPT	LCD
4.3	Parasitoid (*Trigogramma* and Green Lacewing),	1	PPT	LCD
4.4	Scavenger (Flesh fly and Rove Beetle)	1	PPT	LCD
4.5	Structure and life cycle of Lac insect	1	PPT	LCD
UNIT –V [6 Hrs]				
5.1	Methods of pest control – Natural Control, Artificial control, Chemical Control and Biological control.	4	Lecture	Black board
5.2	Integrated pest management	2	Lecture	Black board

MAPPING OF COs WITH POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	3	2
CO2	2	2	3	2	3
CO3	3	3	2	1	1
CO4	3	2	2	3	2
CO5	3	1	1	3	3

3 - Strong 2 - Medium 1- Low

COURSE DESIGNER: Dr.K.A.M.KARTHIKEYAN

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Self learning Course **VERMICULTURE** **Code: 218003523**

SEMESTER V **Addl. Credits 4**

Preamble:

- ✍ ***To enhance ecosystem development by vermiculture for organic farming.***

UNIT-I:

Manures:Definition – types – composition and value – sources and production ofmanures –Compost- Different composting technologies-Mechanical compost plants-Vermicomposting-Green manures-Oilcakes-Sewage sludge-Biogas plant slurry-Plantand animal refuges.

UNIT – II:

Fertilizers-classification- Nitrogenous,phosphatic and potassic fertilizers Nitrogenous fertilizers: Organic N forms, Synthetic N fertilizers – Manufacturing of ammonium sulphate, ammonium chloride, ammonium nitrate and urea.

Phosphatic fertilizers: P fertilizer sources – processing rock phosphate, bones for bone meal preparation – basic slag – preparation of single, triple super phosphate and thermo-phosphate.

Potassic fertilizers: K fertilizer – natural sources – manufacturing of potassium chloride, potassium sulphate and potassium nitrate.

UNIT – III:

Mixed and complex fertilizers: Sources and compatibility – preparation of major, secondary and micronutrient mixtures. Complex fertilizers – manufacturing of ammonium phosphates, nitro phosphates and NPK complexes. Biofertilizers and their advantage-Fertilizer control order and fertilizer storage

UNIT – IV:

Organic chemistry as prelude to agrochemicals - Diverse type of agrochemicals - Botanical insecticides – Pyrethrum - Synthetic pyrethroids-Synthetic organic insecticides - Major classes - synthesis and properties of some important insecticides under each class.

UNIT – V:

Herbicides-Major classes-Synthesis and properties of 2,4 -D,atrazine, glyphosate, butachlor and benthiocarb.- Fungicides - Majior classes-synthesis and properties of carbendazim, carboxin, captantridemorph and copper oxy chloride- Insectides actand plant growth regulators.

REFERENCES:

01. Buchel, K. H. 1983 Chemistry of pesticides. John Wiley and Sons New York.
02. Collings G. H. 1955 Commercial Fertilizers. Mc Graw Hill Publishing Co. New York.
03. Geroge W. W 1986. Fundamentals of pesticides A self-instruction Guide. Thomas publication P.O. Box 9335. Frenocalifornia.
04. Sree Ramulu, U. S. 1979. Chemistry of Insecticides and Fungicides. Oxford and IBH Publishing House Co. New Delhi.

COURSE DESIGNER: Dr.A.DHANALAKSHMI

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Core Subject **MOLECULAR BIOLOGY, BIOTECHNOLOGY AND BIOINFORMATICS** **Code: 212303601**

SEMESTER VI **3 Hrs/Week**

Credits 3

Preamble:-

- ***To educate the concepts of Molecular Biology and to explore the Biotechniques and tools of Bioinformatics.***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	Summarize structure and model of DNA and genetic codes.	Up to K3
CO2	Explain the events of DNA replication and gene regulation in Prokaryotes	Up to K3

CO3	Distinguish the tools of biotechnology with reference to their function,	Up to K3
CO4	Describe the steps and methods recombinant technologies.	Up to K3
CO5	Determine the significance of various tools of bioinformatics	Up to K3

K1- Knowledge K2 – Understand K3-Apply

UNIT – I: **[9Hrs]**

Structure of DNA - Watson and Crick's structural model of DNA. Genetic code: Characteristics of genetic code. DNA as the genetic material: Griffith experiment.

UNIT – II: **[9 Hrs]**

DNA replication in Prokaryotes. Transcription and Translation in Prokaryotes (Protein synthesis). Regulation of gene action in Prokaryotes - Lac operon model.

UNIT - III: **[9 Hrs]**

Tools for gene cloning - Restriction enzymes, DNA ligages, linkers and adaptors. Gene cloning vectors - plasmid, Bacterophage and cosmid. Steps in gene cloning - Cloning of Human insulin gene

UNIT – IV: **[9 Hrs]**

Hybridoma technology – Monoclonal antibody. – Recombinant protein – interferon and interleukin. Super bug to control oil pollution-Bioremediation. Enzyme immobilization methods and advantages. Biopesticides (Bacillus thuringiensis).

UNIT – V: **[9 Hrs]**

Bioinformatics – definition – scope of bioinformatics – types of sequences in bioinformatics. Nucleotide sequence database (EMBL, GenBank, DDBJ),Protein Sequence databases (PDB),Bioinformatics Tools –Homology and Similarity Tools (BLAST, Clustal W). Protein Functional Analysis Tools (PFAM) - Structural analysis tool (Protparam) – Phylogenetic Analysis Tool (PHYLP).

TEXT BOOKS:

01. Arumugam N., Biotechnology, Saras Publications, India 2010.
02. Gupta P.K., Biotechnology and Genomics, Rastogi Publications, Meerut, 2004.

REFERENCES:

01. Atwood T.K., and Pamy D.J., Smith – Introduction to Bio Informatics, Pearson Educational Ltd., New Delhi, 2004.
02. Dubey R.C., Biotechnology, S.Chand and Co, New Delhi, 2001.
03. Irfan Khan A., and Atiya Khanum, Emergeing Trends in Bio Informatics, Ukaaz Publications, Andhara Pradesh, 2002.

WEB RESOURCES:

01.https://youtu.be/ftyM-LcELSI
02.https://youtu.be/m1IBdrbOkMw
03.https://youtu.be/-KBAfkItJfw
04.https://youtu.be/M3zllm8QbCM
05.https://youtu.be/GnTN6oL9DvQ

PEDAGOGY: Chalk and talk, PPT, Discussion.

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [9 Hrs]				
1.1	Structure of DNA - Watson and Crick's structural model of DNA.	3	Lecture	Black board
1.2	Genetic code: Characteristics of genetic code	3	Chalk & talk	Black board
1.3	DNA as the genetic material: Griffith experiment	3	PPT	LCD
UNIT – II [9 Hrs]				
2.1	DNA replication in Prokaryotes	3	PPT	LCD
2.2	Transcription and Translation in Prokaryotes (Protein synthesis)	3	Chalk & talk	Black board
2.3	Regulation of gene action in Prokaryotes - Lac operon model	3	Chalk & talk	Black board
UNIT – III [9 Hrs]				
3.1	Tools for gene cloning - Restriction enzymes, DNA ligages, linkers and adaptors..,	3	Lecture	Black board
3.2	Gene cloning vectors - plasmid, Bacterophage and cosmid	3	Chalk & talk	Black board
3.3	Steps in gene cloning - Cloning of Human insulin gene	3	Chalk & talk	Black board
UNIT – IV [9 Hrs]				
4.1	Hybridoma technology – Monoclonal antibody.	2	PPT	LCD
4.2	Recombinant protein – interferon and interleukin	2	Chalk & talk	Black board
4.3	Super bug to control oil pollution.	2	Chalk & talk	Black board
4.4	Enzyme immobilization methods and advantages	1	Chalk & talk	Black board
4.5	Bio pesticides – BT toxins	2	Chalk & talk	Black board
UNIT – V [9 Hrs]				
5.1	Bioinformatics – definition – scope of bioinformatics –),	2	Lecture	Black board
5.2	types of sequences in bioinformatics. Nucleotide sequence database (EMBL, GenBank, DDBJ	2	Lecture	Black board
5.3	Protein Sequence databases (PDB),	1	Lecture	Black board
5.4	Bioinformatics Tools –Homology and Similarity Tools (BLAST, Clustal W).	2	Lecture	Black board
5.5	Protein Functional Analysis Tools (PFAM) - Structural analysis tool (Protparam) – Phylogenetic Analysis Tool (PHYLP).	2	PPT	LCD

MAPPING OF COs WITH POs

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	2	2	3	2	3
CO3	3	3	2	1	1
CO4	3	2	2	3	2
CO5	3	1	1	3	3

3 - Strong 2 - Medium 1- Low

COURSE DESIGNER: Dr. A.DHANALAKSHMI

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Core Subject **PHYSIOLOGY** **Code: 212303602**
SEMESTER VI **2 Hrs/Week**
Credits 2

Preamble:

- ***To introduce the students to the structural and functional aspects of various systems of human.***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	Recognize various organ systems of human and their function.	Up to K3
CO2	Summarize the mechanism of transport of gages and composition of blood	Up to K3
CO3	Explain theimportance of kidney in excretion and distinguish different muscles.	Up to K3
CO4	Describe the mechanism of conduction of nerve impulses and nerve coordination.	Up to K3
CO5	Interpret the biological importance of endocrine system and physiology of receptor organs.	Up to K3

K1- Knowledge K2 – Understand K3-Apply

UNIT – I: **[6 Hrs]**

Digestion: Digestive system in man – Physiochemical process of digestion and absorption of carbohydrate, Protein and lipid – Basal metabolic rate.

UNIT – II: **[6 Hrs]**

Respiratory system: Respiratory system in man – Transport of gases – Respiratory quotient (RQ) – mechanism of respiration.

Circulatory system: Composition of blood – structure of human heart – origin and conduction of heart beat – Electrocardiogram.

UNIT – III: **[6 Hrs]**

Excretory system: structure of kidney and nephron – Urine formation.

Muscles: Types of muscles - Ultrastructure of skeletal muscle – physio–chemical properties of muscle - mechanism of muscle contraction.

UNIT – IV: **[6 Hrs]**

Nervous Co-ordination: Structure of neuron and Brain: Conduction of nerve impulse through mylinated and non mylinated neuron – synapse – Neuromuscular junction.

UNIT – V: **[6 Hrs]**

Endocrine system – Pituitary, Thyroid, Parathyroid, Islets of Langerhans, Adrenal and Sex glands.

Receptor Organs:

Eye – Structure and Physiology of vision.

Ear – Structure and Mechanism of hearing

TEXT BOOKS:

01. Arumugam N., Physiology, Saras Publications, 2010.
02. Verma and Agarwal, Animal physiology, S. Chand & co, India, 2004.

REFERENCES:

01. Balwin Ernest. An Introduction to ComparitivePichemistry, Cambridge University Press.
02. Hoar, William S.,2004 General Comparative physiology, prentice Hall of India, Pvt Ltd, New Delhi.
03. Sambasivaiah, Kamalakara Rao and Augustine Chellappa, 1990. A Text book of Animal Physiology and Ecology, S. Chand & Co., Ltd., New Delhi.
04. Parameswaran, Anantakrishnan and Ananthasubramananiam, 1975. Outlines of Animal Physiology, S. Viswanathan Printers

WEB REBRESORCES:

01.https://youtu.be/Og5xAdC8EUI
02.https://youtu.be/yj7bfZKlIp8
03.https://youtu.be/9_h0ZXx1lFw
04.https://youtu.be/NfEJUPnqxk0
05.https://youtu.be/98-6WfdumZY

PEDAGOGY: Chalk and Talk, PPT, Discussion.

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [6 Hrs]				
1.1	Digestion: Digestive system in man	1	PPT	LCD
1.2	Physiochemical process of digestion and absorption of carbohydrate, Protein and lipid	4	Chalk & talk	Black board
1.3	Basal metabolic rate.	1	Chalk & talk	Black board
UNIT – II [6 Hrs]				
2.1	Respiratory system in man mechanism of respiration.	1	PPT	LCD
2.2	Transport of gases	1	PPT	LCD
2.3	Respiratory quotient (RQ) Mechanism of respiration.	1	Chalk & talk	Black board
2.4	Composition of blood -	1	PPT	LCD
2.5	Structure of human heart , origin and conduction of heart beat	1	PPT	LCD
2.6	Electrocardiogram (ECG) blood pressure	1	Chart	Black board
UNIT – III [6 Hrs]				
3.1	Types of Nitrogenous wastes	1	Chart	Black board
3.2	Structures of kidney and nephron	1	PPT	LCD
3.3	Urine formation	1	Chart	Black board
3.4	Types of muscles - Ultrastructure of skeletal muscle	1	PPT	LCD
3.5	Physiochemical properties of muscle -	1	Chart	Black board
3.6	Muscles mechanism of muscle contraction	1	Chart	Black board
UNIT – IV [6 Hrs]				
4.1	Structure of neuron	1	PPT	LCD
4.2	Conduction of nerve impulse through myelinated and nonmyelinated neuron – the synapse – Neuromuscular junction	5	Chart	Black board

UNIT – IV [6 Hrs]				
5.1	Pituitary, Thyroid, Parathyroid, Islets of Langerhans, Adrenal and Sex glands.	2	PPT	LCD
5.2	Eye – Structure and Physiology of vision	2	PPT	LCD
5.3	Ear – Structure and Mechanism of hearing	2	PPT	LCD

MAPPING OF COs WITH POs

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	2	2	3	2	3
CO3	3	3	2	1	1
CO4	3	2	2	3	2
CO5	3	1	1	3	3

3 - Strong 2 - Medium 1- Low

COURSE DESIGNER: Dr. A.DHANALAKSHMI

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Core Lab **GENETICS, BIOSTATISTICS AND ECOLOGY** **Code:212303603**

4 Hrs/Week

SEMESTER VI **Credits 5**

Preamble:

- ***To acquire identification, observation and practical skills.***

Genetics:

- Observation and record of simple mendelian traits in human (III B.Sc. Zoology Students).
- Monohybrid experiment.
- Dihybrid experiment.
- Observation of fingerprint patterns amoung the III B.Sc. Zoology Students.

Spotters:

1. Back cross
2. Test cross
3. Coat colour in mice
4. Comb pattern in fowl
5. Haemophilia

Biostatistics:

- ABO Blood group to be analyzed among the students.
- Biostatistical analysis of length of polyalthia leaves using central measures of tendency and measure of deviation.
- Biostatistical analysis of serration of neem leaves using central measures of tendency and measure of deviation
- Study of probability using Coin tossing experiment .
- Correlation analysis of Height and weight of students.

Spotters:

1. Pie diagram
2. Bar diagram
3. Histogram

4. Band Graph

5. Frequency curve.

Ecology

- Estimation of dissolved oxygen in water sample.
- Estimation of salinity, Alkanity and BOD in water sample
- Mounting of planktons

Spotters:

- Food web of terrestrial Ecosystem.
- Fauna of muddy, Rocky, sandy and sea shore.
- Commensalism – Hermit crab & Sea anemone
- Biogeochemical cycle – Nitrogen Cycle

COURSE DESIGNER: Mrs. R. LATHA

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Core Lab **PHYSIOLOGY, MOLECULAR BIOLOGY, BIOTECHNOLOGY AND BIOINFORMATICS LAB**

SEMESTER VI **Code:212303604**

4 Hrs/Week

Credits 5

Preamble:-

- ***To acquire basic practical knowledge and skill***

Physiology

- Qualitative analysis of Nitrogenous waste product, Ammonia, urea and uric acid.
- Salivary amylase activity in relation to temperature.
- Qualitative estimation of Haemoglobin
- Qualitative estimation of Haemin crystals.
- Estimation of Red Blood Corpuscles by Haemocytometer.
- Estimation of White Blood Corpuscles by Haemocytometer
- Sphygmomanometer
- ECG

Molecular Biology

- Structure of DNA, RNA -'t' RNA, r-RNA, Protein synthesis, Griffith experiment.

Biotechnology

- Polymerase chain reaction – Demonstration
- Poly Acrylamide Gel Electrophoresis – Demonstration
- Northern & Southern blotting techniques.(Virtual Lab)
- Isolation of DNA from animal tissue – Demonstration
- Transgenic animals (Photograph)

Bioinformatics

- Sequence Retrieval system (SRS)
- Pubmed
- Genbank – NCBI
- DDBJ

COURSE DESIGNER: Dr. P. MURALI

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Elective **PROJECT** **Code: 212303605**

SEMESTER VI **5 Hrs/Week**

Credits 6

Students have to carry out project work under the guidance of the members of the Zoology Department during VI semester – 5 hrs per week. Based on the number of staff, the number of students per batch will be fixed. Project work may be chosen in the field of Zoology Major. Each batch has to complete the project work in the month of March. It will be duly signed by the project guide and the HOD of Zoology. The VIVA on project work will be conducted at the end of VI semester. The viva on project will be conducted jointly by Guide, External Examiner, HOD and the members of staff.

Internal = 40 Marks	External = 60 Marks
Report = 30	Report = 50
Viva = 10	Viva = 10
Total = 40	Total = 60

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Part – IV **IMMUNOLOGY** **Code: 214403623**
Skill Based Elective–V **SEMESTER VI** **2 Hrs/Week**
Credits 2

Preamble:-

- ***The current understanding of cellular the underlying immunity, basic concepts and principles on the evolution of components enables the students to understand the concepts in immunology. It invokes awareness and enlightens one to understand the resistance to diseases and its environment.***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	To know the humoral and cellular mediated immunity and their relative significance.	Up to K3
CO2	To understand of the basic characteristics of white blood cells	Up to K3
CO3	To create the basic knowledge about the structure and types of immunoglobulin's and their immune responsiveness	Up to K3
CO4	To promote the critical thinking of immunological response and how it is triggered and regulated	Up to K3
CO5	The students will be able to transfer the ideas and knowledge of immunology into clinical decision making through cases studies presented in class.	Up to K3

K1- Knowledge K2 – Understand K3-Apply

UNIT – I: **[6 Hrs]**

History of immunology. Immunity-definition and types (innate and aquired). Primary Lymphoid organs - Bone marrow and Thymus - Secondary Lymphoid organs - Lymph node and spleen.

UNIT – II: **[6 Hrs]**

Cells of immune system-stem cells, T & B lymphocyte, Null cells, NK cells, Macrophages, Eosinophils, Basophiles and platelets

UNIT – III: **[6 Hrs]**

Antigen – Epitope - chemical nature- Factors of Antigenicity- types of antigen-Cross reactive antigen, heterophil antigen and haptens. Immunoglobulins- types and functions of immunoglobulin. Typical structure of IgG

UNIT – IV: **[6 Hrs]**

Immune response- Humoral and cell mediated immune response- antigen and antibody reaction- precipitation, agglutination and flocculation. Complement activation- classical and alternate pathways

UNIT – V: **[6 Hrs]**

Hypersensitivity - Type-I,II,III & IV. Autoimmune diseases - Haemolytic anaemia and Rheumatoid Arthritis. Transplantation immunology – Types of graft and mechanism of graft rejection. Vaccines and immunization schedule.

TEXT BOOK:

01.Dr.Arumugam N., Immunology and Microbiology, Saras Publication, 2009.

REFERENCES:

01.Eli Benjamine Richard coico Immunology, Sunshine, A.John wiley &sons INC Publication.
02.Roitt Brotoff mab. Immunology – Publication: Harcourt Brace & Company.

WEB RESOURCES:

01.https://www.immunology.org/public-information/what-immunology
02.https://www.nature.com/subjects/immunology

PEDAGOGY: Chalk and talk, Group Discussion, PPT,
Preserved insects using Insect Box and Field visit

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [6 Hrs]				
1.1	History of immunology	1	Chalk & Talk	Black Board
1.2	Immunity-definition and types (innate and acquired).	1	Chalk & Talk	Black Board
1.3	Primary Lymphoid organs - Bone marrow	1	Chalk &Talk	Black board
1.4	Primary Lymphoid organs -Thymus	1	Chalk& Talk	Black Board
1.5	secondary Lymphoid organs - Lymph node	1	Chalk &Talk	Black Board
1.6	Spleen	1	Chalk &Talk	Black Board
UNIT – II [6 Hrs]				
2.1	Cells of immune system-stem cells	1	Chalk &Talk	Black Board
2.2	T & B lymphocyte	1	LCD	LCD
2.3	null cells,	1	LCD	LCD
2.4	NK cells	1	LCD	LCD
2.5	Macrophages	1	Chalk & Talk	Black Board
2.6	Eosinophils, Basophils and Platelets	1	Chalk & Talk	Black Board
UNIT – III [6 Hrs]				
3.1	Antigens-Epitopes-chemical nature	1	Chalk & Talk	Black Board
3.2	factors of antigenicity	1	Chalk &Talk	Black Board
3.3	types of antigen-cross reactive antigen	1	Chalk &Talk	Black Board
3.4	Heterophil antigen and Haptens.	1	LCD	LCD
3.5	Immunoglobulin's- types and functions of Immunoglobulin.	1	LCD	LCD
3.6	Typical structure of IgG	1	LCD	LCD
UNIT – IV [6 Hrs]				
4.1	Immune response- Humoral and cell mediated immune response	1	Chalk &Talk	Black Board
4.2	Antigen and antibody reaction-precipitation	1	Chalk & Talk	Black Board
4.3	Agglutination	1	Chalk & Talk	Black Board
4.4	Flocculation	1	Chalk & Talk	Black Board
4.5	Complement activation- classical pathway	1	Chalk &Talk	Black Board

4.6	Complement activation- alternate pathways	1	Chalk &Talk	Black Board
UNIT – V [6 Hrs]				
5.1	Hypersensitivity reaction- Type-I,II,III & IV	1	Chalk &Talk	Black Board
5.2	Autoimmune diseases - Hemolytic Anemia	1	Chalk & Talk	Black Board
5.3	Rheumatoid Arthritis	1	Chalk & Talk	Black Board
5.4	Transplantation immunology – types of graft	1	Chalk & Talk	Black Board
5.5	Mechanism of graft rejection	1	Chalk & Talk	Black Board
5.6	Vaccines and immunization schedule	1	Chalk & Talk	Black Board

MAPPING OF COs WITH POs

	PO1	PO2	PO3	PO4	PO5
CO1	2	3	1	2	3
CO2	3	1	3	3	1
CO3	3	2	3	2	2
CO4	2	3	1	3	2
CO5	3	1	3	3	3

3 - Strong 2 - Medium 1- Low

COURSE DESIGNER: Dr. P. Murali

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Part - IV **POULTRY SCIENCE** **Code: 218203623**

Skill Based Elective–VI **SEMESTER VI** **2 Hrs/Week**

Credits 2

Preamble:-

- ***To impart knowledge on Poultry farming technology.***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	Select the basic needs of establishing a poultry farm.	Up to K3
CO2	Design management strategies of layers and broilers and successfully rear chick.	Up to K3
CO3	Manage poultry birds during extreme environmental conditions.	Up to K3
CO4	Formulate feed and additives for poultry animal.	Up to K3
CO5	Differentiate diseases of poultry and prepare vaccination schedule.	Up to K3

K1- Knowledge K2 – Understand K3-Apply

UNIT – I: **[6 Hrs]**

Choosing Commercial Layers: Mediterranean breed and Broilers - Dorking

Poultry housing.

The deep litter system.

Cage rearing.

UNIT – II: **[6 Hrs]**

Practical aspects of Chick rearing.

Management of layers.

Management of broilers.

UNIT – III: **[6 Hrs]**

Lighting.

Summer management.

Winter management.

Debeaking.

UNIT – IV: **[6 Hrs]**

Non – nutritive feed additives.

Feed stuff for Poultry.

Feed formulation.

UNIT – V: **[6 Hrs]**

Viral disease - Ranikhet

Bacterial disease – Salmonelloses

Fungal disease – Aspergillosis

Parasitic disease - Coccidiosis.

Vaccination Programme.

TEXT BOOK:

01. Gnanamani M.R., Modern Aspects of Commercial Poultry Keeping, 10th Edition, Giri Publication, Alwar Nagar, Nagamalai, Madurai – 19, Tamilnadu. 2010.

REFERENCES:

01. Naidu P.M.N, Poultry Keeping in India, Indian Council of Agricultural Research, New Delhi, 2006.
02. Scott M.L., Nesmehi M.C, and Young R.J., Nutrition of the Chicken, New York, 1999.
03. Singh R.A, Poultry Production, New Delhi, 1997.

WEB RESOURCES

01.https://youtu.be/9uOcNV2iSuU
02.https://youtu.be/mh8CUuLp61g
03.https://youtu.be/ratYU3kvH4A
04.https://youtu.be/TlM13gQZ5us
05.https://youtu.be/ckUKqZJJwv8

PEDAGOGY: Chalk andTalk, PPT, Discusson.

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [6 Hrs]				
1.1	Choosing commercial layers Mediterranean breed and Broilers - Dorking.	2	Lecture	Black board
1.2	Poultry housing.	2	Chalk & talk	Black board
1.3	The deep litter system	1	Chalk & talk	Black board
1.4	Cage rearing	1	Chalk & talk	Black board
UNIT – II [6 Hrs]				
2.1	Practical aspects of Chick rearing	2	Chalk & talk	Black board
2.2	Management of layers.	2	Chalk & talk	Black board
2.3	Management of broilers.	2	lecture	Black board
UNIT – III [6 Hrs]				
3.1	Lighting.	2	Chalk & talk	Black board

3.2	Summer management.	1	Lecture	Black board
3.3	Winter management.	1	Lecture	Black board
3.4	Debeaking	2	PPT	LCD
UNIT – IV [6 Hrs]				
4.1	Non – nutritive feed additives.	2	Lecture	Black board
4.2	Feed stuff for Poultry.	2	Chalk & talk	Black board
4.3	Feed formulation.	2	Lecture	Black board
UNIT – V [6 Hrs]				
5.1	Viral disease - Ranikhet	1	PPT	LCD
5.2	Bacterial disease – Salmonelloses	1	PPT	LCD
5.3	Fungal disease – Aspergillosis	1	PPT	LCD
5.4	Parasitic disease - Coccidiosis.	1	PPT	LCD
5.5	Vaccination Programme	2	Lecture	Black board

MAPPING OF COs WITH POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	3	2
CO2	2	2	3	2	3
CO3	3	3	2	1	1
CO4	3	2	2	3	2
CO5	3	1	1	3	3

3 - Strong 2 - Medium 1- Low

COURSE DESIGNER: Dr.K.A.M.KARTHIKEYAN

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ANNEXURE - 11

DEPARTMENT OF ZOOLOGY

VISION:

- To unearth and mould the hidden talents and skills of students towards discoveries, invention research and to make them attain a scientist status.

MISSION:

- Offering an research oriented education, to encourage students to take up mega projects in future.
- To motivate the talented students, through excellent teaching and career guidance.
- To inculcate a scientific tempo as a scientist.

Programme Educational Objectives (PEO)

PEO1	Natural navigators and nimble witted in diagnosing problems, in enlisting steps to rectify them and in providing the most effective solutions in the best possible way
PEO2	Moralistic while demonstrating their academic caliber, in recognizing and acknowledging value systems, in making decisions, accepting responsibilities and while concerned about society and public issues and needs
PEO3	Self-reliant in learning and in real life job situations through which they support their peers and become stable and reliable students, workers and citizens
PEO4	Steadfast in shielding and nurturing environment and stimulate its sustainable growth for a bright future
PEO5	Versatile and vibrant communicators in person and through other media. Vigilant/vital in prolonging the long winding richness and tradition of their mother tongue
PEO6	Neoteric global citizens of our nation, who would take the nation's pride around the world by adapting and adopting the scientific and technological developments
PEO7	Civilized and confident graduates, who believe in lifelong learning with the socio-cultural changes in the generations to come

Programme Objectives (PO)

PO1:	Acquired enriched scientific knowledge on the bio diversity of fauna & flora towards the safe environmental sustainability for noble cause
PO2:	To understand communicate and implement the technical skills on critical thinking and problem solving practices
PO3:	An effective leadership quality towards professional ethics decision making ability and accepting responsibilities to the fellow human being concerned with society.
PO4:	Progressive learning, management and integrating awareness in core areas that is environmentally related to real life job situation through peer support for society and nation.
PO5:	Developed the skill and proficiency in core subjects that enhances nation's pride around the world by adapting scientific tempo development. Inculcate social integrity and socio economic changes that aims for higher standards for future generation.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO 1:	Built in knowledge based core concept, skills method and practices to make the different fields of zoology.
PSO 2:	Demonstrates the acquired skills in laboratory techniques and the inter and intra specific relationship of an animals and their impact on environmental consequences.
PSO 3:	Show their skills in experiments and utilization of biological techniques and molecular tools that is further oriented towards advanced research in zoology.
PSO 4:	Understand the values of attitudes, phenotypic and genotypic expression of an organism and its co-existences in various discipline in zoology that is applied to solve the problem at national and international level of society.
PSO 5:	Expertise in entrepreneurial zoology enhances self relevant jobs. Biostatistical tools and application knowledge to analyse the data for effective interpretation and integration in biophysics, bio chemistry and bioinformatics to global standards.

PEO - PO MAPPING

PO / PEO	PO1	PO2	PO3	PO4	PO5
PEO1	2	1	1	3	2
PEO2	2	2	3	1	3
PEO3	1	2	1	1	2
PEO4	2	1	3	3	1
PEO5	1	3	1	1	1
PEO6	2	2	2	3	3
PEO7	2	1	2	1	2

3- Strong 2- Medium 1- Low

M.Sc ZOOLOGY:CHOICE BASED CREDIT SYSTEM WITH OBE PATTERN

FOR THOSE WHO HAVE JOINED FROM THE ACADEMIC YEAR 2021–22 ONWARDS

Sem			Subject	Code	Hrs.	Cr.	Adl. Cr.	Exam (Hrs)	Marks Allotted	
									Int.	Ext.
SEMESTER I										
I	01	Core	Genetics	212304101	5	3		3	25	75
	02	Core	Animal Physiology	212304102	5	4		3	25	75
	03	Core	Developmental Biology	212304103	5	4		3	25	75
	04	Core	Bio Statistics & Computer Application	212304104	5	3		3	25	75
	05	Core Lab	Practical - I	212304105	5	3		3	40	60
	06	Elective Major	Elective - I	-	5	3		3	25	75
	07	SLC	In Plant Training *Report;@Viva	218004123	–		3	–	40 [*30:@10]	60 [*50:@10]
SEMESTER II										
II	01	Core	Cell biology	212304201	5	4		3	25	75
	02	Core	Molecular biology	212304202	5	4		3	25	75
	03	Core	Evolution	212304203	4	4		3	25	75
	03	Core	Techniques in Biology	212304204	5	3		3	40	60
	04	Core Lab	Practical - II	212304205	5	3		3	40	60
	06	NME	Entrepreneurial zoology	214604223	6	4		3	25	75
	07	SLC	Animal Diversity	218004223	-	-	3	3	–	100
SEMESTER III										
III	01	Core	Animal Biotechnology	212304301	6	5		3	25	75
	02	Core	Microbiology	212304302	5	4		3	25	75
	03	Core	Bio informatics	212304303	5	4		3	25	75
	04	Core	Applied Entomology	212304304	5	4		3	25	75
	05	Core Lab	Practical - III	212304305	5	3		5	40	60
	07	Elective	Elective II*		4	3		3	25	75
	08	SLC	Human Health and Hygiene	218004323	–	–	3	3	–	100
SEMESTER IV										
IV	01	Part – III Core	Environmental biology	212304401	4	4		3	25	75
	02	Core	Immunology	212304402	4	4		3	25	75
	03	Core	Aquaculture	212304403	4	4		3	25	75
	04	Core	Apiculture	212304404	4	3		6	40	60
	05	Core Lab	Practical - IV	212304405	5	5		6	40	60
	07	Elective	Elective III*	-	3	3		3	25	75
	08	Elective	Project *Report;@Viva	212304408	6	5		–	40 [24:16]	60 [36:24]
	09	SLC	Human diseases and control	218004423			3	3	–	100
TOTAL					**120**	**90**	**12**			

Each Elective paper has two choices, select any one.

*** Elective I:** Bio Chemistry & Bio Physics – 212304106
Dairy Farming - 212304107

*** Elective II:** Sericulture - 212304306
Stem Cell - 212304307

*** Elective III:** Nanobiology - 212304406
Forensic Science - 212304407

Core Subject **ANIMAL BIOTECHNOLOGY** **Code: 212304301**

SEMESTER III **6 Hrs/Week**

Credits 5

Preamble:

- ***To emphasis the application, facilities and research field in the animal biotechnology and to enhance the students skills for future.***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	Inculcate knowledge about tissue techniques and cultures.	Up to K5
CO2	Importing techniques on cultures and growth cycles.	Up to K5
CO3	Applications – transfections and Transgenic animals.	Up to K5
CO4	Understanding engineering biology and their expression.	Up to K5
CO5	Representation of embryo transfer technology learning.	Up to K5

K1- Knowledge K2 – Understand K3-Apply K4- Analyse K5- Evaluate

UNIT – I: **[18 Hrs]**

History scope and advantages of tissue culture; Laboratory facilities, Substrate, feeder, layer, gas prase, culture media and procedures.

UNIT – II: **[18 Hrs]**

Tissue disaggregation techniques; primary cultures; cultural cell and evolution of cell lines; maintenance, cloning of cells, growth cycles of animal cells.

UNIT – III: **[18 Hrs]**

Somatic cell fussion and hybridomos, gene transfer (transfection) for eggs – embryos – cell lines and stem cells, targeted gene transfer – transgeneic animals – mice – sheep – pigs – rabbits – goats – cows – fish applications.

UNIT – IV: **[18 Hrs]**

Tissue culture, (Slide, flask and test tube cultures). Organ cultures; whole embroyonic culture; tissue engineering biology of cloning vectors for animal cells. Expressing cloned genes in animal cells.

UNIT – V: **[18 Hrs]**

Invitrofertilization and embryo transfer in human – ZIFT, GIFT, ICSI representation – embryo transfer – split embryo technology for cattles – cloning of farm animals and humans.

TEXT BOOK:

01. Gupta P K , Biotechnology & Genetics, RAStogi publications, Meerut.

REFERENCES:

01. Cross B.A., Animal Biotechnology Ptil, Trans. R.Soc. lond. B 324:- 563-575, 1989.
02. Jan Freshney R., Culture of animal cells. A Manual of basic techniques. Alan. R. Liss. Inc . New York.(1987).

03. Spider R.E., and Griffths JB, Animal Biotechnology, Vol 1-3, Academic Press, London.1982.

WEB RESOURCES:

01. https://www.bio.org/sites/default/files/legacy/bioorg/docs/files/Animal_onepager.pdf
02. https://www.ncbi.nlm.nih.gov/books/NBK207574/

PEDAGOGY: Chalk & Talk, PPT

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No.of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [18 Hrs]				
1.1	History scope and advantages of tissue culture	10	Chalk & Talk	Black Board
1.2	Laboratory facilities, Substrate, feeder, layer, gas prase, culture media and procedures.	8	PPT	LCD
UNIT – II [18 Hrs]				
2.1	Tissue disaggregation techniques	6	Chalk& Talk	Black Board
2.2	primary cultures; cultural cell and evolution of cell lines	6	Chalk& Talk	Black Board
2.3	maintenance, cloning of cells, growth cycles of animal	6	Chalk& Talk	Black Board
UNIT – III [18 Hrs]				
3.1	Somatic cell fussion and hybridomos, gene transfer (transfection) for eggs	7	Chalk& Talk	Black Board
3.2	embryos – cell lines and stem cells, targeted gene transfer	5	Chalk& Talk	Black Board
3.3	transgeneic animals – mice, sheep, pigs, rabbits, goats, cows,fish applications.	6	Chalk& Talk	Black Board
UNIT – IV [18 Hrs]				
4.1	Tissue culture, (Slide, flask and test tube cultures).	4	Chalk& Talk	Black Board
4.2	Organ cultures; whole embroyonic culture	4	Chalk& Talk	Black Board
4.3	tissue engineering biology of cloning vectors for animal cells.	5	Chalk& Talk	Black Board
4.4	Expressing cloned genes in animal cells.	5	Chalk& Talk	Black Board
UNIT – V [18 Hrs]				
5.1	Invitrofertilization and embryo transfer in human – ZIFT, GIFT, ICSI	10	Hospital Visit	
5.2	representation – embryo transfer – split embryo technology for cattles	4	Chalk& Talk	Black Board
5.3	cloning of farm animals and humans.	4	Chalk& Talk	Black Board

MAPPING OF COs WITH POs

	PO1	PO2	PO3	PO4	PO5
CO1	3	1	1	2	2
CO2	2	3	2	1	1
CO3	1	2	2	2	3
CO4	3	3	3	3	2
CO5	3	3	2	2	3

Strong – 3 Medium – 2 Low – 1

COURSE DESIGNER: Dr.K.S. Malar

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Core Subject **MICROBIOLOGY** **Code: 212304302**

SEMESTER III **5 Hrs/Week**

Credits 4

Preamble:

To inculcate the knowledge classifications, identification and growth of microorganisms and their economic importance.

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	Classify the microorganism and explain their structures.	Up to K5
CO2	Differentiate bacteria through staining and establish bacteria by different culture methods.	Up to K5
CO3	Describe the regulation of biochemical pathway in bacteria and microbial physiology.	Up to K5
CO4	Explain the beneficial and economic aspects of bacteria.	Up to K5
CO5	Characterize the microbial diseases and their control strategies.	Up to K5

K1- Knowledge K2 – Understand K3-Apply K4- Analyse K5- Evaluate

UNIT – I: **[15 Hrs]**

Structure of prokaryotic cell, structure of a bacterium - Classification of prokaryotes - Identification - Staining - Grain and acid fast staining - Structure of Virus - Bacteriophage - Growth of microorganisms - Nutrition Nutrient media - Culture methods - Physiology of growth - Methods of measurement of growth - Growth curve (sigmoid)

UNIT – II: **[15 Hrs]**

Basic mechanisms of metabolism in microbes - Pathways of hexose breakdown -Oxidation of pyruvate - Biosynthesis of low molecular weight building blocks -Fermentation - Electron transport under anaerobic conditions - Photosynthesis in bacteria

UNIT – III: **[15 Hrs]**

Potable water - Sewage treatment with microbes - Treatment of industrial effluents -Micro organisms involved in Carbon, phosphorus and Nitrogen cycle

UNIT – IV: **[15 Hrs]**

Biology and economic importance of *Agaricusbisporus*, *Rhizobium*-and *Pseudomonas* – Methods of Food preservation - Spoilage of milk and milk products, meat and meat products by microorganisms - pasteurization and other processing techniques - Fermentation technology - Fermentor - Types of fermentor - production of microbial products through fermentor -Production of alcohol, vinegar, penicillin

UNIT – V: **[15 Hrs]**

Biology, infective processes and control of diseases - *Vibrio cholerae, Tubercle bacilli.* Mycoplasma, Immunodeficiency virus

TEXT BOOKS:

01. Hans G.Schlegel, General Microbiology, 7th edition, Cambridge University Press, 1995.
02. Ananthanarayanan, Jayaram Paniker, Text Book of Microbiology, 5th Edition, Orient Longman, 1997.

REFERENCES:

01. Frazier W.C., Westhoff D.C., Food Microbiology, 4th Edition, Tata McGraw Hill Pvt Ltd, 1995.
02. Casida L.E., Industrial Microbiology, Wiley Eastern Ltd. 1993.
03. Pelczar MJ., Chan E.C.S., Kreig N.R., Microbiology, 5th Edition, Tata McGraw Hill Pub. Co.Ltd., 1998.
04. Prescott, Haricy, Klein, Microbiology, 4th Edition, WCB McGraw Hill Co. 1999.
05. Staincr R.Y., Doudoroff M, Addberg E.A., General Microbiology, 3rd Edition, MacMiUan India, 1970.

WEB RESOURCES:

01.https://www.slideshare.net/9426401633/classification-of-bacteria-67934044
02.https://www.slideshare.net/khehkesha/fermentation-presentation
03.https://www.slideshare.net/vijalshrivas/microbiology-of-waste-water-treatment
04.https://www.slideshare.net/pramodkumarsikarawar/food-preservation-66624992
05.https://www.slideshare.net/thirupathiSathya/vibrio-cholerae-ppt-for-students

PEDAGOGY : Chalk and talk, PPT,Discussion.

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No.of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [15 Hrs]				
1.1	Structure of prokaryotic cell	2	Lecture	Black board
1.2	structure of a bacterium	2	Chalk & talk	Black board
1.3	Classification of prokaryotes	3	Chalk & talk	Black board
1.4	Staining - Grain and acid fast staining	3	Chalk & talk	Black board
1.5	Structure of Virus – Bacteriophage	3	Chalk & talk	Black board
1.6	Culture methods	2	Chalk & talk	Black board
UNIT – II [15 Hrs]				
2.1	Basic mechanisms of metabolism in microbes	2	Chalk & talk	Black board

2.2	Pathways of hexose breakdown - Oxidation of pyruvate	3	Chalk & talk	Black board
2.3	Biosynthesis of low molecular weight building blocks	3	Chalk & talk	Black board
2.4	Fermentation	2	Chalk & talk	Black board
2.5	Electron tansport under anaerobic conditions	3	Chalk & talk	Black board
2.6	Photosynthesis in bacteria	2	Chalk & talk	Black board
UNIT – III [15 Hrs]				
3.1	Potable water	3	Chalk & talk	Black board
3.2	Sewage treatment with microbes	4	Chalk & talk	Black board
3.3	Treatment of industrial effluents	4	Chalk & talk	Black board
3.4	Micro organisms involved in Carbon, phosphorus and Nitrogen cycle	4	Chalk & talk	Black board
UNIT – IV [15 Hrs]				
4.1	Biology and economic importance of Agaricusbisporus, Rhizobium- and Pseudomonas	3	Chalk & talk	Black board
4.2	Methods of Food preservation	2	Chalk & talk	Black board
4.3	Spoilage of milk and milk products, meat and meat products by microorganisms	3	Chalk & talk	Black board
4.4	pasteurization and other processing techniques -	3	Chalk & talk	Black board
4.5	Fermentation technology	2	Chalk & talk	Black board
4.6	production of microbial products	2	Chalk & talk	Black board
UNIT – V [15 Hrs]				
5.1	Biology, infective processes and control of diseases	6	Chalk & talk	Black board
5.2	*Vibrio cholerae, Tubercle bacilli*	4	Chalk & talk	Black board
5.3	Mycoplasma, Immunodeficiency virus	5	Chalk & talk	Black board

MAPPING OF COs WITH POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	3	2
CO2	2	2	3	2	3
CO3	3	3	2	1	1
CO4	3	2	2	3	2
CO5	3	1	1	3	3

Strong – 3 Medium – 2 Low – 1

COURSE DESIGNER: Dr. K.A.M.Karthikeyan

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Core Subject **BIO INFORMATICS** **Code: 212304303**
SEMESTER III **5 Hrs/Week**
Credits 4

Preamble:

- ***To enable the students to understand the basic aspects and functioning of computers and their packages, role of computers in the study of biology and understand the applications and need for Bioinformatics and their tools.***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	They can know the type of computer and their different applications	Up to K5
CO2	Operate software's to construct word process, work sheet and slide preparation and to overcome computer virus..	Up to K5
CO3	Describe the content and properties of most important bioinformatics tools, data bases, perform text, sequence based searches and analyse them	Up to K5
CO4	Explain principles and execute, pair wise and multiple sequence alignment by dynamic programming.	Up to K5
CO5	Predict the primary, secondary, tertiary and quaternary structures of protein sequence. They can also design their template and predict the 3D structures of protein using homology modelling and make them energy minimisation and also validate them	Up to K5

K1- Knowledge K2 – Understand K3-Apply K4- Analyse K5- Evaluate

UNIT – I: **Introduction to computers:** **[15 Hrs]**

a) History, generations and components of computers

b) Classifications of computer-main frame, mini, micro and super computer

c) Operating system-Windows, Microsoft office and components

d) Popular software packages- MS word, MS power point, MS Excel-statistical applications.

UNIT – II: **System software:** **[15 Hrs]**

a) Internet- Modem- TCP/IP protocols -online services -commercial organization-Education, web browsers and portals-

b) Creation of web pages using HTML- web page

c) Electronic mail – Creation and management, data storage using email

d) Virus- Booting virus -EXE. virus and antivirus

UNIT – III: **Databases:** **[15 Hrs]**

a) Bioinformatics– Databases- classification- Data type, Maintainer status, data access, Data source, Data Design and Organisation-

b) NCBI –Structure, Tools and database, Sequence submission, Sequence retrieval

c) EMBL – Structure, Sequence submission, Sequence retrieval

d) DDBJ – Structure, Mass submission, Sequence retrieval.

UNIT – IV: **Sequence analysis:** **[15 Hrs]**

a) Sequence alignment- Concept- Scoring matrices- PAM, BLOSUM

b) Sequence pairing – BLAST, Multiple sequence alignment

c) Methods of Gene prediction methods and difficulties

d) Molecular phylogeny – Mechanism- Phylogenetic markers, representation- Roots, Out, Distance scale, internal branch, CLADE, Horizontal branch, Cladogram, Dendrogram, Unrooted and rooted trees, Methods of phylogenetic analysis- Maximum like hood method, Distance method.

UNIT – V: **Proteomics:** **[15 Hrs]**

a) Protein structure and prediction - Confirmation parameters of secondary structures, Secondary structure types- Secondary structure prediction – their limitations.

b) Methods of protein modeling – Homology, Abnitio and Threading – Model refinement

c) Comparative modeling – Swiss model

d) Evaluation – Spdb`v and Ramachandran Plot. Internal evaluation, External evaluation of proteins

TEXT BOOKS:

01. Sanjay Saxena, 2007. A first course in Computers Based on Windows XP and office XP, Vikas Publishing House Pvt. Ltd. Nodia

02. Zhumur Ghosh and Bibekanana Mallick, 2015. Bioinformatics Principle and application, Oxford University press.

REFERENCES:

01. Curran B.G. Walker R.J. and Bhatia S.C. 2010. Bioinformatics, CBS Publishers & distributions Pvt Ltd, New Delhi
02. Sundararajan S. and Balaji R. 2002. Introduction to Bioinformatics, Himalaya Publishing House, Mumbai
03. Prakash, Lohar S. 2009. Bioinformatics, MJP Publishers, Chennai
04. Sinha P.K. 2007. Computer Fundamentals 4th edition, BPB Publication
05. Anand Solomon K. 2008. Molecular Modeling and Drug Designing, MJP Publishers, Chennai

PEDAGOGY : Chalk & Talk, Group Discussion, PPT

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No.of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [15 Hrs]				
1.1	Introduction to computers: History, generations and component of computers-	3	Discussion	Smart Board
1.2	Classifications of computer-main frame, mini, micro and super computer	4	Chalk & Talk	Green Board
1.3	Operating system-Windows, Microsoft office and components	4	Chalk & Talk	Green Board
1.4	Popular software packages- MS word, MS power point, MS Excel-statistical applications.	4	Chalk & Talk	Green Board

UNIT – II [15 Hrs]				
2.1	Internet- Modem- TCP/IP protocols -online services	3	Lecture	Smart Board PPt
2.2	commercial organization- Education, web browsers and portals	3	Chalk & Talk	Green Board
2.3	Creation of web pages using HTML- web page - Electronic mail – Creation and management	4	Chalk & Talk, display models,	Green Board, Chart
2.4	data storage using email- Virus- Booting virus -EXE. virus and antivirus	5	Chalk & Talk, PPT	Green Board, LCD
UNIT – III [15 Hrs]				
3.1	Bioinformatics\– Databases- classification- Data type	3	Chalk & Talk	Green Board
3.2	Maintainer status, data access, Data source	3	Chalk & Talk	Green Board
3.3	Data Design and Organisation- NCBI –Structure, Tools and database, Sequence submission	3	Chalk & Talk	Green Board
3.4	Sequence retrieval- EMBL – Structure, Sequence submission	3	Chalk & Talk	Green Board
3.5	Sequence retrieval- DDBJ – Structure, Mass submission, Sequence retrieval.	3	PPT	LCD
UNIT – IV [15 Hrs]				
4.1	Sequence alignment- Concept- Scoring matrices- PAM, BLOSUM - Sequence pairing	3	Discussion	Green Board
4.2	BLAST, Multiple sequence alignment - Methods of Gene prediction methods and difficulties	4	Chalk & Talk	Green Board
4.3	Molecular phylogeny – Mechanism- Phylogenetic markers, representation- Roots, Out, Distance scale, internal branch, CLADE	4	Chalk & Talk	Green Board
4.4	Horizontal branch, Cladogram, Dendrogram, Unrooted and rooted trees, Methods of phylogenetic analysis- Maximum like hood method, Distance method	4	Chalk & Talk	Green Board
UNIT – V [15 Hrs]				
5.1	Protein structure and prediction - Confirmation parameters of secondary structures, Secondary structure types- Secondary structure prediction –Their limitations.	4	Lecture	Green Board
5.2	Methods of protein modeling – Homology, Abinto and Threading	4	Chalk & Talk	Green Board
5.3	Model refinement Comparative modeling – Swiss model Evaluation – Spdb`v and Ramachandran Plot. Internal evaluation,	4	Chalk & Talk	Green Board
5.4	External evaluation of proteins	3	Chalk & Talk	Green Board

MAPPING OF COs WITH POs

	PO1	PO2	PO3	PO4	PO5
CO1	3	1	2	3	3
CO2	1	2	3	3	3
CO3	3	2	3	1	3
CO4	3	3	3	3	2
CO5	3	3	1	3	2

Strong – 3 Medium – 2 Low – 1

COURSE DESIGNER: Dr. P. Murali

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Core Subject **APPLIED ENTOMOLOGY** **Code: 212304304**

SEMESTER III **5 Hrs/Week**

Credits 4

preamble:

- ✍ ***The impact of insects on the Indian and global economy to its environment and make the students self reliant person in***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	Learn the insect diversity and unique features features.	Up to K5
CO2	Envisages an insight on economically important insects and pests of various foods, fiber and household	Up to K5
CO3	Understands various insect pest management methods and its significance	Up to K5
CO4	Understand vector – Man interaction, pathogenecity and apply vector control management	Up to K5
CO5	Gain knowledge in ecological role of insects and its behavioural pattern.	Up to K5

K1- Knowledge K2 – Understand K3-Apply K4- Analyse K5- Evaluate

UNIT – I: **[15 Hrs]**

Classification according to imms- Classification of apterygota upto families- Classification of the following insect orders- Orthoptera, Hemiptera, Diptera, Hymenoptera, Lepidoptera and Coleoptera

UNIT – II: **[15 Hrs]**

Bioecology of useful insects like soil builders,weed killers, Predators,parasites,scavengers. Honey bees-Silkworm-Lac insects- Useful by-products of lac insects- economic values-Aa sorts of insect pests of pests of stored products,their biology-mode of infestation, damages caused and control methods. Life history, mode of infection, damage symptoms and extent of damage and control methods of majorcrop plants such as cotton, sugarcane, paddy,coconut and vegetables.

UNIT – III: **[15 Hrs]**

Pest status and control methods- Chemical, biological, cultural pesticides etc., Chemical control- classification, pesticide resistance and

residue problems. Pesticides and pest resurgence, Integrated pest Management (IPM)- Definition and method of the program.

UNIT – IV: **[15 Hrs]**

Vector bionomics: Definition-Types of Vectors-assessment of vector status- zoonosis: Vector –man-Pathogen model: biology and Vector Status of insects belonging to the orders: Philiaptera, Siphnoaptera, Diptera, Hemiptera and Lepidoptera; Pre-requisites for vector management, Integrated Vector Management (IVM) insect allergens, Vaccines and vector –borne diseases. Medical importance of ticks and mites.

UNIT – V: **[15 Hrs]**

Insect and its environment- successful group: population: growthmodels-factors regulating the structure:behavioural expression sof insects- specific & Cyclic patterns- behaviourial adaptations- clock controlled behavioural activities- Cryptobiology.

TEXT BOOK:

01.Fenemore, PG and alka Prakash, Applied Entomology, Wiley easternLtd. (1992) New Delhi.

REFERENCES:

01. Chapman RF, The insects Structure and function ELBS3rd edn. London. (1982)
02. Ross,HH (1982). A texty book of Entomology, John Wiley and sons , Newyork.
03. Annual Review of entomology 1-40, annual Review Inc. California.
04. Srivastava,KP (1988) A textbook of applied Entomology, Kalyani Publications, New delhi.
05. David,BV and T.Kumarasamy (1982). Elements of Economic Entomology- Popular Book depot, Madras.

WEB RESOURCES

01. https://www.slideshare.net/anusharajan/classification-of-insects-181874635
02. https://www.slideshare.net/agriyouthnepal/insect-pest-of-rice
03. https://www.slideshare.net/venug3016/insect-pest-of-cotton-1
04. https://www.slideshare.net/rakeshmeena42/pests-of-cotton-and-their-management
05. https://www.slideshare.net/mastz04/chapter5a

PEDAGOGY: Chalk & Talk, Group Discussion, PPT

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No.of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [15 Hrs]				
1.1	Apterygota classification	3	Lecture	PPT,Chart
1.2	Classification upto orders-Orthoptera, Hemiptera	3	Lecture	PPT, Chart
1.3	Order :Diptera, Hymenoptera	3	Lecture	PPT, Chart
1.4	Order- Lepidoptera, Coleoptera	3	Lecture	PPT, Chart
UNIT – II [15 Hrs]				
2.1	Soil builders, weed killers, Predators, parasites	2	Lecture	PPT, Chart
2.2	Beneficial insects- Honeybee, silkworm and lac insects	3	Lecture	PPT,Chart

2.3	Pest of crops- Paddy, sugarcane paddy- Life history, control measures	3	Lecture	PPT, Chart
2.4	Cotton, coconut pest Pest of vegetables Life history, control measures	2	Lecture	PPT,Chart
2.5	Pest of vegetables Life history, control measures	2	Lecture	PPT, Chart
UNIT – III [15 Hrs]				
3.1	Pest status and control methods – Chemical control	3	Lecture	PPT,Chart
3.2	Biological methods	3	Lecture	PPT,Chart
3.3	Cultural practices	2	Lecture	PPT, Chart
3.4	Pest resistance and residual problem Integrated pest management	2	Lecture	PPT,Chart
3.5	Integrated pest management	2	Lecture	PPT, Chart
UNIT – IV [15 Hrs]				
4.1	Vector- bionomics- Types of vector-zoonosis	1	Lecture	PPT, Chart
4.2	Vector man pathogen model	2	Lecture	PPT,Chart
4.3	Biology and vector status- through orders	3	Lecture	PPT, Chart
4.4	Integrated vector management	2	Lecture	PPT, Chart
4.4	Vector borne diseases and vaccine	2	Lecture	PPT,Chart
4.5	Medical importance – ticks and mites	2	Lecture	PPT, Chart
UNIT – V [15 Hrs]				
5.1	Insect and environment	2	Lecture	PPT, Chart
5.2	Growth model- factorsregulating the structure	3	Lecture	PPT, Chart
5.3	Behaviourial expression of insects	2	Lecture	PPT,Chart
5.4	Behaviourial adaptation of insects	2	Lecture	PPT, Chart
5.5	cryptobiology	3	Lecture	PPT,Chart

MAPPING OF COs WITH POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	3	2
CO2	2	2	3	2	3
CO3	3	3	2	1	1
CO4	3	2	2	3	2
CO5	3	1	1	3	3

Strong – 3 Medium – 2 Low – 1

COURSE DESIGNER: Mrs. R. Latha

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Core Lab **PRACTICAL - III** **Code: 212304305**
SEMESTER III **5 Hrs/Week**
Credits 3

Preamble:

- ***To enable students obtain practical knowledge and skill on Animal Biotechnology and Microbiology.***

ANIMAL BIOTECHNOLOGY

01. Isolation of E-coli plasmids – demonstration only
02. Technique a. Typical cloning b. Callus culture c. Hybridization d. Blotting technique
03. Instrument a. PCR b. Electrophoresis c. UV illuminator
04. Models a. Typical fermenter b. Culture system – Batch and continuous culture
05. Transgenic animals – a report on methodology

MICROBIOLOGY

06. Simple staining of Bacteria
07. Differential staining of Bacteria (Gram's stain and acid fast)
08. Preparation and sterilization of culture medium (nutrient agar)
09. Determine number of Microbes – spread and pour plate method.
10. Effect of temperature and pH on bacterial growth
11. Degradation (Fermentation) of starch by bacteria
12. Testing the sensitivity of Bacteria to the antibiotics

PEDAGOGY: Chalk and talk, PPT,Discussion.

WEB RESOURCES:

01. https://www.slideshare.net/prashanthkumarguddeti/staining-techniques-in-microbiology
02. https://www.slideshare.net/AshfaqAhmad52/bacterial-growth-68254865

COURSE DESIGNER: Dr .K.A.M.Karthikeyan

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Elective II-Major **SERICULTURE** **Code: 212304306**

SEMESTER III **4 Hrs/Week**

Credits 3

Preamble:

- ***To make students understand the basic concepts in mulberry cultivation and rearing of Bombyxmori and management of their diseases.***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	Classify varieties of mulberry and strains of silkworm.	Up to K5
CO2	Differentiate male and female larva, pupa and adult of *Bombyx mori*.	Up to K5
CO3	Describe the functioning of reeling appliances.	Up to K5
CO4	Explain the diseases of silkworm and their management	Up to K5
CO5	Start a sericulture unit with the knowledge gained in the course	Up to K5

K1- Knowledge K2 – Understand K3-Apply K4- Analyse K5- Evaluate

UNIT – I: **[12 Hrs]**

Taxonomic classification of mulberry - Methods of propagation and cultivation - Harvesting and storage - Pests and diseases of mulberry -

UNIT – II: **[12 Hrs]**

Taxonomic classification of mulberry silkworm - Life cycle - Morphology of egg, larva, pupa and adult - Anatomy of silkworm larva - Embryonic development of silkworm - Hibernation of eggs-Voltinism

UNIT – III: **[12 Hrs]**

Rearing House - Rearing appliances - Brushing -Rearing of young age and late age silkworms - Care during rearing ,moulting arid bed cleaning - Optimum environmental conditions - Mounting - Spinning - Harvest, storage and marketing of cocoons - Diseases of silkworm - Mode of infection, symptoms and treatment

UNIT – IV: **[12 Hrs]**

Reeling appliances - Methods of reeling - Reeling industry

UNIT – V: **[12 Hrs]**

Sericulture farm management - Economics of sericulture - Cocoon marketing and role of extension centres

TEXT BOOK:

01. The Silkworm - Biology, genetics and breeding, Dilip De Sarkar, 1998, Vikas Publication House Pvt, Ltd.
02. An introduction to Sericulture, tflitibn, Ganga G., Sulochana Chetty J., 1998, Oxfqrd&IBH

REFERENCES:

01. Handbook of Practical Sericulture, 4th Edition, Ullal S.R., Narasimhanna M.N., 1994, CentralSilkBoaid, Bangalore.
02. Mulberry cultivation, Sericulture Maoual I, Rangaswami G, Narasimhanna ,M.N., Kasiviswanathan K., Sasuy 1995, Oxford & IBH Pub. Co. Pvt Ltd.
03. Silkworm rearing. Sericulture Manual D, Krishnasamy S., Narasimhanna M.N., Siyanarayanan SJL, Kumararaj S, 1995, Oxford & IBH Publishing Co. Pvt Ltd.
04. Silk reeling, Sericulture Manual HL Krishnaswamy S., Madhava Rao N.R, Suryanarayanan S.K., 1991, Oxford & IBH Publishing Co. Pvt Ltd.

WEB RESOURCES:

01.https://www.slideshare.net/ramanlingam/diseases-of-mulberry
02.https://www.slideshare.net/rkhan9392/presentation-on-silk
03.https://www.slideshare.net/nehaagarwal357/sericulture-81714492
04.https://www.slideshare.net/jebapreethi/economic-value-of-products-of-silkworm-autosaved

PEDAGOGY: Chalk and talk, PPT,Discussion.

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [12 Hrs]				
1.1	Taxonomic classification of mulberry	3	Lecture	Black board
1.2	Methods of propagation and cultivation	3	Chalk & talk	Black board
1.3	Harvesting and storage	3	Chalk & talk	Black board
1.4	Pests and diseases of mulberry	3	Chalk & talk	Black board
UNIT – II [12 Hrs]				
2.1	Taxonomic classification of mulberry silkworm	3	Chart	Black board
2.2	Life cycle - Morphology of egg, larva, pupa and adult	3	Chart	Black board
2.3	Anatomy of silkworm larva	2	Chart	Black board
2.4	Embryonic development of silkworm	2	Chart	Black board
2.5	Hibernation of eggs-Voltinism	2	Lecture	Black board
UNIT – III [12 Hrs]				
3.1	Rearing House - Rearing appliances	4	Ppt	LCD
3.2	Mounting - Spinning - Harvest, storage and marketing of cocoons	4	Ppt	Black board
3.3	Diseases of silkworm	4	Lecture	Black board
UNIT – IV [12 Hrs]				
4.1	Reeling appliances	3	Lecture	Black board
4.2	Methods of reeling	3	Chalk & talk	Black board
4.3	Reeling industry	3	Chalk & talk	Black board
UNIT – V [12 Hrs]				
5.1	Sericulture farm management	3	Lecture	Black board
5.2	Economics of sericulture	3	Chalk & talk	Black board
5.3	Cocoon marketing and role of extension centres	3	Chalk & talk	Black board

MAPPING OF COs WITH POs

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	2	2	3	2	3
CO3	1	3	2	1	1
CO4	1	2	2	2	2
CO5	1	1	1	1	3

Strong – 3 Medium – 2 Low – 1

COURSE DESIGNER: Dr. A.DHANALAKSHMI

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Elective II-Major **STEM CELL** **Code: 212304307**

SEMESTER III **4 Hrs/Week**

Credits 3

Preamble:

- ***The student will be able to familiarize students with fundamental process of human embryology and developmental biology and progression of pluripotent stem cells through different phases of development.***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	To Understand the clinical significance of stem cell research and the possible problems that need to be overcome	Up to K5
CO2	To Gain a knowledge of the intrinsic and extrinsic factors important for stem cell renewal and differentiation	Up to K5
CO3	How To identify and summarize different types of pluripotent stem cells and how they are induced	Up to K5
CO4	To Describe the difference between embryonic, adult and induced pluripotent stem cells and how they differ from fully differentiated cell	Up to K5
CO5	To design future experiments based on a data figure from a scientific paper	Up to K5

K1- Knowledge K2 – Understand K3-Apply K4- Analyse K5- Evaluate

UNIT – I: **[10 Hrs]**

Introduction to stem cells - Definition, properties, proliferation, culture of stem cells, Medical applications of stem cells, ethical and legal issues in use of stem cells.

UNIT – II: **[10 Hrs]**

Types of stem cells - Stem Cell biology and therapy - Type's of embryonic stem cell, Adult stem cell, Stem Cell Biology and Therapy, Embryonic Stem Cells, culture and the potential benefits of stem cell technology

UNIT – III: **[14 Hrs]**

Therapeutic applications of stem cells Gene Therapy: Introduction, History and evolution of Gene therapy, optimal disease targets, Failures and successes with gene therapy and future prospects, Genetic Perspectives for Gene Therapy, Gene Delivery methods: Viral vectors and Non-viral Vectors

UNIT – IV: **[14Hrs]**

Ethical Issues associated with stem cell-based regenerative medicine field Regulatory and Ethical Considerations of stem cell and Gene Therapy, Assessing Human Stem Cell Safety, Use of Genetically Modified Stem Cells in Experimental Gene Therapies.

UNIT – V: **[12 Hrs]**

Trans differentiation and direct programming-Editing the stem cell genome-In vivo tools in stem cell biology-Computational tools to dissect stem cell heterogeneity-In vitro cultures of adult stem cells to analyze differentiation capacity

TEXT BOOKS:

01. Stem Cell Biology, Daniel Marshak, Richard L. Gardener and David Gottlieb, Cold Spring Harbour Laboratory Press,(1996).
02. Stem cell biology and gene therapy, Booth C., Cell Biology International, Academic Press
03. Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, Alexander Battler, Jonathan Leo, Springer,

REFERENCES:

01. Stem Cell Biology and Gene Therapy. Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
02. Progress in gene therapy, Volume 2,Pioneering stem cell/gene therapy trials, Roger Bertolotti, Keiya Ozawa and H. Kirk Hammond, VSP international science publishers
03. Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003,
04. Human Embryonic Stem Cells: The Practical Handbook by Stephen Sullivan and Chad A Cowan.

WEB RESOURCES:

01. https://stemcellres.biomedcentral.com
02. https://www.isscr.org

PEDAGOGY: Chalk and talk, Group Discussion, PPT, and Charts

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No.of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [10 Hrs]				
1.1	Introduction to stem cells	2	Chalk & Talk	Black Board
1. 2	Definition, properties, proliferation of stem cells	2	Chalk & Talk	Black Board
1.3	Culture of stem cells	2	PPT	LCD
1.4	Medical applications of stem cells	2	Chalk &Talk	Black Board
1.5	Ethical and legal issues in use of stem cells	2	Chalk &Talk	Black Board
UNIT – II [10 Hrs]				
2.1	Types of stem cells Stem Cell Biology and Therapy	2	PPT	LCD
2.2	Stem Cell biology and therapy, Scientists	2	Chalk & Talk	Black Board
2.3	Types embryonic stem cell and Adult stem cell	2	PPT	LCD

2.4	Embryonic Stem Cells	2	PPT	LCD
2.5	Culture and the potential benefits of stem cell technology	2	Chalk & Talk	Black Board
UNIT – III [14 Hrs]				
3.1	Therapeutic applications of stem cells Gene Therapy	2	Chalk & Talk	Black Board
3.2	Introduction, History and evolution of Gene therapy,	3	Chalk &Talk	Black board
3.3	Future Prospects, Genetic Perspectives for Gene Therapy	3	PPT	LCD
3.4	Gene Delivery methods	2	PPT	LCD
3.5	Viral vectors and Non viral vector	4	Chalk &Talk	Black Board
UNIT – IV [14 Hrs]				
4.1	Ethical Issues associated with stem cell-based regenerative medicine	3	Chalk & Talk	Black Board
4.2	Field Regulatory and Ethical Considerations of stem cell and Gene Therapy	3	Chalk &Talk	Black Board
4.3	Assessing Human Stem Cell Safety,	4	Chalk & Talk	Black Board
4.4	Use of Genetically Modified Stem Cells in Experimental Gene Therapies.	4	Chalk &Talk	Black Board
UNIT – V [12 Hrs]				
5.1	Trans differentiation and direct programming	3	LCD	LCD
5.2	Editing the stem cell genome In vivo tools in stem cell biology-,	3	LCD	LCD
5.3	Computational tools to dissect stem cell heterogeneity	3	LCD	LCD
5.4	In vitro cultures of adult stem cells to analyze differentiation capacity	3	LCD	LCD

MAPPING OF COs WITH POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	2	1	2	2
CO2	3	1	2	3	1
CO3	3	2	1	3	2
CO4	2	3	1	1	2
CO5	3	1	3	2	1

Strong – 3 Medium – 2 Low – 1

COURSE DESIGNER: Dr. P. Murali

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Self Learning Course **HUMAN HEALTH AND HYGIENE** **Code: 218004323**
SEMESTER III **Addl. Credits 3**

Preamble:

- ***The course focuses on problems related to human health and hygiene and the solutions. Emphasis has been given to issues like occupational, social and mental health. Epidemiology of diseases and their prevention are also included.***

UNIT – I:

Status of human health: Concept, definitions, dimensions, determinants and responsibility of health.

Men and Medicine: Concept of primitive, scientific and modern medicine - medical revolution - health care revolution.

UNIT – II:

Nutrition and health: Nutritional epidemiology - nutrients, vitamins, minerals - sources, deficiency disorders - nutritional profile of principal foods – nutritional requirements - Balanced diet - Nutritional problem in public health – malnutrition - community nutritional programmes.

UNIT – III:

Food and hygiene: Food surveillance, hygiene - milk, meat, vegetables, food toxicology and food poisoning, adulteration, food standard - personal hygiene. *Health care*: Indicators of health - levels of health care - health problems - medical care problems - primary health care in India - Hospitals - health agencies - Health programmes in India - International health - NGOs.

UNIT – IV:

Diseases: Definitions and Diagnosis - types, nosocomial disease, respiratory diseases - intestinal infections. STD, zoonotic diseases - prevention and control measures.

UNIT – V:

Society and health: Concept of society, medical sociology and family cycle and stress - family and cultural factors in health and disease.

Occupational health: Health of a worker - occupational hazards occupational diseases, health protection of workers - prevention of occupational disease - occupational health and hazards in India.

TEXT BOOKS:

01. David L.Melson, Lehninger Prineirles of Biochemistry, CBS Publisher's Distributors, New Delhi.
02. Jain J.L., and Sanjay Jain, Fundamentals of Biochemistry, S.Chand and Company Ltd, New Delhi.

REFERENCES:

01. Dr.Palanivelu P., Laboratory Manual for Analytical Biochemistry, M.K.University, Madurai – 21.
02. Jain. Fundamentals of Biochemistry, S.Chand and Company Ltd.
03. Meckee and Meikee, An Introduction of Biochemistry, WCB McGraw – Hill Companies.

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Core Subject **ENVIRONMENTAL BIOLOGY** **Code: 212304401**
SEMESTER IV **4 Hrs/Week**
Credits 4

Preamble:

- ***To enable students aware on the environment and their various components; and conservation of wildlife.***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	Explain the concept and functioning of environment	Up to K5
CO2	Describe the structure and functions of ecosystem	Up to K5
CO3	Disseminate the need for conservation of ecosystem.	Up to K5
CO4	Characterize and analyze human impacts on biodiversity.	Up to K5
CO5	Integrate, evaluate and manage the different public health aspects at local and global levels.	Up to K5

K1- Knowledge K2 – Understand K3-Apply K4- Analyse K5- Evaluate

UNIT – I: **[12 Hrs]**

Population ecology: Characteristics of a population; population growth curves - population regulation - life history strategies (r& k selection) - concept of meta population - demes and dispersal &interdemic extinctions - age structured populations.

UNIT – II: **[12 Hrs]**

Community ecology: Species interactions: types, interspecific competition, herbivory, carnivory, pollination, symbiosis - Nature of communities – community structure and attributes. Levels of species diversity and its measurements – Ecological succession - types and mechanisms.

UNIT – III: **[12 Hrs]**

Ecosystem: Structure and function- Energy flow and mineral cycling - Ecological energetics- productivities - Food web - Ecological pyramids- Ecosystem modelling. *Habitat ecology*: Freshwater environment: factors, organisms, zonation and communities. *Marine habitat*: zonation, biota, communities, planktons estuarine habitat.

UNIT – IV: **[12 Hrs]**

Biogeography and Conservation Major terrestrial biomes- Theory of island biogeography - biogeographical zones of India - Principles of conservation – major approaches to management, Indian case studies on conservation/management strategy. *Natural resources*: Types: Forests, water, minerals, food, land and energy - Problems associated with natural resources - Environmental ethics – Sustainable development.

UNIT – V: **[12 Hrs]**

Urban ecology: Urbanization; city as a system, city planning and its Environment- Bringing nature to the city- Urban problems related to environment-case studies.

Applied ecology: Pollution chemistry- Environmental legislation – Environmental Movements - Space ecology- Human population growth - Future studies- Hazardous wastes- Risk and human health-Wildlife management and legislation.

TEXT BOOK:

01. OdmnEP (1996). Fundamentals of Ecology. 3rdedn, WB Saunders.

REFERENCES:

01. Botkin D and E.Keller (1995). Environmental Science, John Wiley and Sons, USA 627p.
02. Miller GT 1994. Living in the Environment. 8thedn. Wadsworth Pub. Co. USA 700p

WEB RESOURCES:

01.https://www.slideshare.net/gobuktaragang/population-ecology
02.https://www.slideshare.net/sumaiahalghamdi/community-ecology-125518625
03.https://www.slideshare.net/saravanamani1/ecosystem-50288615
04.https://www.slideshare.net/divyashree587268/biogeography-23731574
05.https://www.slideserve.com/maine/applied-ecology

PEDAGOGY: Chalk and talk, PPT, Discussion.

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No.of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [12 Hrs]				
1.1	Characteristics of a population	2	Lecture	Black board
1.2	Population growth curves	2	Chalk & talk	Black board
1.3	Population regulation	2	Chalk & talk	Black board
1.4	Life history strategies	2	Chalk & talk	Black board
1.5	Concept of meta population	2	Chalk & talk	Black board
1.6	Demes and dispersal & interdemic extinctions -	1	Chalk & talk	Black board
1.7	Age structured populations	1	Chalk & talk	Black board
UNIT – II [12 Hrs]				
2.1	Species interactions: types, interspecific competition,	3	Chalk & talk	Black board
2.2	Herbivore , carnivore, pollination, symbiosis	3	Chalk & talk	Black board
2.3	Community structure and attributes.	2	Chalk & talk	Black board
2.4	Levels of species diversity and its measurements	2	Chalk & talk	Black board
2.5	Ecological succession - types and mechanisms.	2	Chalk & talk	Black board
UNIT – III [12 Hrs]				
3.1	*Ecosystem*: Structure and function	2	PPT	LCD
3.2	Energy flow and mineral cycling	2	Chalk & talk	Black board
3.3	Ecological energetics- productivities	2	Chalk & talk	Black board
3.4	Food web - Ecological pyramids- Ecosystem modelling	2	PPT	LCD
3.5	Freshwater environment:	2	Chalk & talk	Black board

3.6	*Marine habitat*	1	Chalk & talk	Black board
3.7	Estuarine habitat	1	Chalk & talk	Black board
UNIT – IV [12 Hrs]				
4.1	Major terrestrial biomes	1	Chalk & talk	Black board
4.2	Theory of island biogeography	1	Chalk & talk	Black board
4.3	Biogeographical zones of India	1	Chalk & talk	Black board
4.4	Principles of conservation – major approaches to management	2	Chalk & talk	Black board
4.5	Indian case studies on conservation/management strategy	2	Chalk & talk	Black board
4.6	*Natural resources*: Types: Forests, water, minerals, food, land and energy	2	PPT	LCD
4.7	Problems associated with natural resources - Environmental ethics – Sustainable development	3	Chalk & talk	Black board
UNIT – V [12 Hrs]				
5.1	Urbanization; city as a system,	1	Chalk & talk	Black board
5.2	City planning and its Environment	1	Chalk & talk	Black board
5.3	Bringing nature to the city	1	Chalk & talk	Black board
5.4	Bringing nature to the city- Urban problems related to environment-case studies.	3	Chalk & talk	Black board
5.6	Pollution chemistry	2	Chalk & talk	Black board
5.7	Space ecology	2	Lecture	Black board
5.8	Wildlife management and legislation.	2	discussion	Black board

MAPPING OF COs WITH POs

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	2	2	3	2	3
CO3	3	3	2	1	1
CO4	3	2	2	3	2
CO5	3	1	1	3	3

Strong – 3 Medium – 2 Low – 1

COURSE DESIGNER: Dr A.DHANALAKSHMI

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Core Subject **IMMUNOLOGY** **Code: 212304402**

SEMESTER IV **4 Hrs/Week**

Credits 4

Preamble

- ***To enable the students to understand the basic fundamentals of Immunology, know the components of Immune system and its mechanism, study the role of Immune system in relation to health and diseases and understand the chemistry of biomolecules like Carbohydrates, Proteins and Lipids and have a comprehensive account on the metabolic pathways /reactions in human.***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

	Course Outcome	**Knowledge Level (According to Bloom's Taxonomy)**
CO1	Learn the fundamentals of antigens, antibodies, and diversity of antibodies	Up to K5
CO2	Acquire knowledge on the types of immune response (humoral and cell mediated) and hypersensitivity reactions	Up to K5

CO3	Differentiate the self and non-self immunity, organs transplantation, auto immune diseases, immunology of tumour and AIDS in human	Up to K5
CO4	Understand the immune response to protozoan, bacterial and viral infections in human	Up to K5
CO5	Empower skill on Immunological techniques	Up to K5

K1- Knowledge K2 – Understand K3-Apply K4- Analyse K5- Evaluate

UNIT – I: **Fundamentals of Immunology** **[12 Hrs]**

a) Antigen and its characters:

Definition- types- properties- role of biological system in immunogenicity- Adjuvants- epitopes-haptens

b) Immunoglobulin and their properties (Self study)

Basic structure- Isotype- allotype- idiotype- domains- constant and variable- IG classes- Sub classes- their properties and functions.

c) Genetic basis of antibody diversity:

Theory of germ line rearrangement- IG genes- light chain gene organization- heavy chain variable region diversity – heavy chain constant chain organization – production of diverse antibody

UNIT – II: **Immune Effector Mechanism** **[12 Hrs]**

a) Complement and its role: Complement components – classical and alternate complement pathways and consequence of complement activation

b) Humoral and cell mediated immunity:

i) Humoral immunity-primary and secondary immune responses, Ag dependent and Ag independent activation, affinity maturation – role of T_H cells in B cell proliferation – class switching mechanism.

ii) Cell mediated immunity:- Role of T cell subsets- mechanism of lysis of cytotoxic cells.

c) Hyper sensitivity reactions:-

i) Ig E mediated hypersensitivity reactions (type 1)

ii) Antibody mediated hypersensitivity reaction (Type II)

iii) Immune complex mediated hypersensitivity reaction (Type III)

iv) T cell mediated (DTH) hypersensitivity reaction (Type IV)

UNIT – III: **Immune System in Health** **[12 Hrs]**

a) Autoimmunity– principles– organ specific and systemic Autoimmune diseases- Treatment of autoimmune diseases.

b) Transplantation immunology:

Relationship of donor and recipient, HLA systems– principles of tolerance immunological basis of graft rejection. Role of immuno suppressive drugs, bone marrow and kidney transplantation

c) Tumour and AIDS immunology:

i) Tumour antigens – classification, immune response to tumours, surveillance, immuno therapy.

AIDS epidemic – clinical and immunological consequence of HIV. Immuno deficiency – Phagocytic deficiency – Humoral deficiency- cell mediated deficiency (one example each) - SCID.

UNIT – IV: **Immune Response to Infectious Diseases** **[12 Hrs]**

a) Viral infection: Viral infection, and immunity. Viral strategies of immune evasion.

b) Bacterial infection:

i) Immune response to extra cellular and intra cellular.

ii) Bacteria defence mechanism-inflammation.

iii) Bacterial evasion of host defence mechanism.

iv) Diptheria and tuberculosis infection and immunity.

c) Immune response against parasites:

i) Protozoan parasites-the effector function of NK cells during protozoan infection- *Plasmodium* and Trypanasomal infection and immunity.

ii) Immune response against Helminthic parasites-role of B cells in Helminth infection.

UNIT – V: **Immuno techniques** **[12 Hrs]**

a) Principles of precipitations- VDRL slide test.

b) Radioimmuno assay of Insulin.

c) ELISA Test

d) Immunodiffusion and Immunoelectrophorosis

TEXT BOOK:

01. Gangal S. and Sontakke, S. 2013 Text Book of Basic and Clinical Immunology, University Press (India) Pvt, Ltd, Hyderabad.

REFERENCES:

01. Hannigan B.M., Moore, C.B.T. and Quinn, D.G. (2010). Immunology, Viva books, New Delhi
02. Roitt, I. 1987, Essential Immunology, P.G. Publishing Pvt. LTd., New Delhi
03. Kuby, T.1994. Immunology, P.G. Publishing Pvt., LTd., New Delhi
04. Tizard I.R.1995. Immunology – An Introduction IV ED. Saunders College Publications, Philadelphia.

PEDAGOGY: Chalk & Talk, Group Discussion, PPT

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No.of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [12 Hrs]				
1.1	Antigen and its characters: Definition- types- properties- role of biological system in immunogenicity- Adjuvants- epitopes-haptens	6	Discussion	Smart Board PPt

1.2	Immunoglobulin and their properties (Self study) Basic structure- Isotype- allotype- idiotype- domains- constant and variable- IG classes- Sub classes- their properties and functions	6	Chalk & Talk	Green Board
1.3	Genetic basis of antibody diversity: Theory of germ line rearrangement- IG genes- light chain gene organization- heavy chain variable region diversity – heavy chain constant chain organization – production of diverse antibody	6	Chalk & Talk	Green Board
	UNIT – II [12 Hrs]			
2.1	Complement and its role: Complement components – classical and alternate complement pathways and consequence of complement activation	3	Lecture	Smart Board PPt
2.2	Humoral and cell mediated immunity: Humoral immunity-primary and secondary immune responses, Ag dependent and Ag independent activation, affinity maturation – role of T_H cells in B cell proliferation – class switching mechanism	3	Chalk & Talk	Green Board
2.3	Cell mediated immunity:- Role of T cell subsets- mechanism of lysis of cytotoxic cells	2	Chalk & Talk, display models,	Green Board, Chart
2.4	Hyper sensitivity reactions:- Ig E mediated hypersensitivity reactions (type 1) Antibody mediated hypersensitivity reaction (Type II)	2	Chalk & Talk, PPT	Green Board, LCD
2.5	Immune complex mediated hypersensitivity reaction (Type III) T cell mediated (DTH) hypersensitivity reaction (Type IV)	2	Chalk & Talk, PPT	Green Board, LCD
	UNIT – III [12 Hrs]			
3.1	Autoimmunity– principles– organ specific and systemic Autoimmune diseases- Treatment of autoimmune diseases.	2	Chalk & Talk	Green Board
3.2	Transplantation immunology: Relationship of donor and recipient, HLA systems– principles of tolerance immunological basis of graft rejection	2	Chalk & Talk	Green Board
3.3	Role of immuno suppressive drugs, bone marrow and kidney transplantation	2	Chalk & Talk	Green Board
3.4	Tumour and AIDS immunology: Tumour antigens – classification, immune response to tumours, surveillance, immuno therapy.	2	Chalk & Talk	Green Board
3.5	AIDS epidemic – clinical and immunological consequence of HIV.	2	PPT	LCD
3.6	Immuno deficiency – Phagocytic deficiency – Humoral deficiency- cell mediated deficiency (one example each) - SCID.	2	Chalk & Talk	Green Board

UNIT – IV [12 Hrs]				
4.1	a) Viral infection: Viral infection, and immunity. Viral strategies of immune evasion.b) Bacterial infection: i) Immune response to extra cellular and intra cellular.	2	Discussion	Smart Board PPt
4.2	Bacteria defence mechanism-inflammation	2	Chalk & Talk	Green Board
4.3	Bacterial evasion of host defence mechanism	2	Chalk & Talk	Green Board
4.4	Diptheria and tuberculosis infection and immunity.	2	Chalk & Talk	Green Board
4.5	Protozoan parasites-the effector function of NK cells during protozoan infection- *Plasmodium* and Trypanasomal infection and immunity.	2	Lecture	Smart Board PPt
4.6	Immune response against Helminthic parasites-role of B cells in Helminth infection	2	Chalk & Talk	Green Board
UNIT – V [12 Hrs]				
5.1	Principles of precipitations- VDRL slide test.	4	Lecture	
5.2	Radioimmuno assay of Insulin	2	Chalk & Talk	Green Board
5.3	ELISA Test	2	Chalk & Talk	Green Board
5.4	Immunodiffusion and Immunoelectrophorosis	4	Chalk & Talk	Green Board

MAPPING OF COs WITH POs

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	3
CO2	3	2	3	1	3
CO3	3	3	3	2	3
CO4	3	3	3	3	3
CO5	3	3	3	1	3

Strong – 3 Medium – 2 Low – 1

COURSE DESIGNER: Dr. K.S. Malar

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Core Subject **AQUACULTURE** **Code: 212304403**

SEMESTER IV **4 Hrs/Week**

Credits 4

Preamble:

- ***To impart basic knowledge on the aquaculture, breeding of fishes and different preservation process.***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	Know the Criteria for aquaculture species selection and principles for site selection for aquaculture.	Up to K5
CO2	Describe nutritional requirements and feed formulation for aquaculture organisms	Up to K5
CO3	Identify the fish diseases and causative organisms	Up to K5

CO4	Illustrate techniques of fish harvesting and its methods	Up to K5
CO5	Demonstrate the methods of preservation and marketing of fishes and crabs.	Up to K5

K1- Knowledge K2 – Understand K3-Apply K4- Analyse K5- Evaluate

UNIT – I: **[12 Hrs]**

Importance of aquaculture - Basic qualification of candidate species - Cultivable fresh water and marine species – construction of ponds – site selection – sail and water types - types of ponds - Preparation and management.- Aquatic plants and their control - Fish enemies and their control - Fertilization of ponds.

UNIT – II: **[12 Hrs]**

Brooders care and management - Bund breeding- Artificial breeding - Induced spawning of carps - Application of synthetic hormones - Transportation of fish seed - Natural culture of fish feed organisms - phytoplankton (diatom) zooplankton (Rotifers, cladocerans) Arjemia, Tubifex - Artificial feed - Feed formulations and management.

UNIT – III: **[12 Hrs]**

Animal husbandry, cum aquaculture, agriculture cum aquaculture - Ectoparasitic Bacterial, viral and fungal diseases.

UNIT – IV: **[12 Hrs]**

Fishing Gears - Line fishing (Hand line), Barbet trap, Cover pot, Gillnet, beam trawl. Bull trawl - Modern method-Echo sounding method, Electric fishing.

UNIT – V: **[12 Hrs]**

Preservation - Drying, suiting, smoking, canning, refrigeration - marketing

TEXT BOOK:

01.Fish and Fisheries of India, Jingram, V.G., 1997,.Hindustan Publishing Co., New Delhi.

REFERENCES:

01. A Hand book of Fish forming, Aganva!, S.C., 1994,Narandra Publishing House, Delhi.
02. Fresh water aquaculturc, Rath, R.K., 1993,Scicntific Publishers, Jodhpm.
03. Pond and Fish culture, Hall, q.B.1999,Agro Botanical Publishers, India
04. Manual of fish genetics, Kiiri Marx, K, Sundararaj, V. and Vasu, 1996,Chennai
05. Fisheries Science, Santhanunt, R.Daya Publishing house, 1995,NewDelhi
06. Prevention and Control of fish and prawn disease II Edn., 2000, - Bismas, K.P. Narandra Publishing-House, Delhi.

WEB RESOURCES:

01.https://www.slideshare.net/nehaagarwal357/induced-breeding-in-fishes
02.https://www.slideshare.net/ShobiyaParamasivam/fishing-gears

PEDAGOGY: Chalk and talk, PPT, Discussion.

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No.of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [12 Hrs]				
1.1	Importance of aquaculture - Basic qualification of candidate species	2	Lecture	Black board
1.2	Cultivable fresh water and marine species	2	Chalk & talk	Black board
1.3	Construction of ponds	2	Chalk & talk	Black board
1.4	Water types - types of ponds - Preparation and management.	2	Chalk & talk	Black board
1.5	Aquatic plants and their control	2	Chalk & talk	Black board
1.6	Fish enemies and their control	1	Chalk & talk	Black board
1.7	Fertilization of ponds	1	Chalk & talk	Black board
UNIT – II [12 Hrs]				
2.1	Brooders care and management	2	Chalk & talk	Black board
2.2	Bund breeding- Artificial breeding	2	Lecture	Black board
2.3	Induced spawning of carps	2	Chalk & talk	Black board
2.4	Application of synthetic hormones	1	Chalk & talk	Black board
2.5	Transportation of fish seed	1	Chalk & talk	Black board
2.6	Natural culture of fish feed organisms	2	Chalk & talk	Black board
2.7	Artificial feed - Feed formulations and management	2	Chalk & talk	Black board
UNIT – III [12 Hrs]				
3.1	Animal husbandry, cum aquaculture	4	Chalk & talk	Black board
3.2	Agriculture cum aquaculture	4	Chalk & talk	Black board
3.3	Bacterial, viral and fungal diseases	4	Chalk & talk	Black board
UNIT – IV [12 Hrs]				
4.1	Fishing Gears	2	Chalk & talk	Black board
4.2	Line fishing (Hand line), Barbet trap	3	Chalk & talk	Black board
4.3	Gillnet, beam trawl. Bull trawl	3	Chalk & talk	Black board
4.4	Modern method-Echo sounding method, Electric fishing.	4	Chalk & talk	Black board
UNIT – V [12 Hrs]				
5.1	Preservation	2	Chalk & talk	Black board
5.2	Drying	1	Chalk & talk	Black board
5.3	Suiting	2	Chalk & talk	Black board
5.4	Smoking	2	Chalk & talk	Black board
5.5	Canning	2	Chalk & talk	Black board
5.6	Refrigeration	1	Chalk & talk	Black board
5.7	Marketing	2	Chalk & talk	Black board

MAPPING OF COs WITH POs

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	2	2	3	2	3
CO3	3	3	2	1	1
CO4	3	2	2	3	2
CO5	3	1	1	3	3

Strong – 3 Medium – 2 Low – 1

COURSE DESIGNER: Dr A.DHANALAKSHMI

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Core Subject **APICULTURE** **Code: 212304404**
SEMESTER II **4 Hrs/Week**
Credits 3

Preamble:

- ***To enhance their knowledge and Attitude towards Apiculture and to encourage the self employability among the students.***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	Have basic knowledge of bee morphology and physiology;	Up to K5
CO2	Understand the importance of honey bees as critical pollinators for both natural environments and crops productions.	Up to K5
CO3	enable the students with the awareness about enemies and disease of honey bee, control and Management	Up to K5
CO4	To impart knowledge about artificial bee hive and construction of apiry Start and maintain an apiary;	Up to K5
CO5	Acquire technical skill of the honey extraction method and its by- products	Up to K5

K1- Knowledge K2 – Understand K3-Apply K4- Analyse K5- Evaluate

UNIT – I: **[12 Hrs]**

Honey Bee:

Organisation of Honey bees and colonization

Anatomy of Honey bees& Bee colony. Functions of the Members . kinds of Bee hive cells.

UNIT – II: **[12 Hrs]**

Biology of Honey bee colony, capping of cells, Honey bee pollinators

Identification and functions Queen, Drone and workers.

UNIT – III: **[12 Hrs]**

Predators of honey bees - Wax Moth & Wasp.

Diseases control and Management – Acarine and Thai sac brood Virus disease. Environmental challenges of Apiculture

UNIT – IV: **[12 Hrs]**

Bee hives & Bee keeping equipments, Apiary Management – Harvesting &Extraction of Honey & Bee Wax

UNIT – V: **[12 Hrs]**

Commercial queen raising- Economic importance of Honey , Pollen & Bee Wax . Uses of propolis . Royal jelly –Nature &uses.

TEXT BOOK:

01.Sardar Singh, Bee keeping in India. KAR, Delhi.

REFERENCES:

01. Superintendent, Bee keeping in South ndia. Govt press, Chennai.
02. Sharma P.D., and Singh S., Hand book of bee keeping, Controller, Printing and stationary, Chandigarh.

WEB RESOURCES:

01. https://www.slideshare.net/RashmiranjanMoharana1/colony-organization-in-honey-bee
02. https://www.slideshare.net/RajuBhatt4/colony-organization-and-life-cycle-of-honey-bee
03. https://www.powershow.com/viewfl/1a827c-ZDc1Z/HONEY_BEE_COLONY_MANAGEMENT_powerpoint_ppt_presentation
04. https://nbb.gov.in/pdf/Pests&DiseasesHoneybees&Management.pdf
05. https://www.slideshare.net/MayuriBhowate/eco-importance1

PEDAGOGY: Chalk and talk, PPT, Discussion.

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No.of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [12 Hrs]				
1.1	Organisation of Honey bees and colonization	3	Lecture	Ppt
1.2	Anatomy of Bees	3	Lecture	Black board
1.3	Bee colony &Functions of the members	3	Lecture	Ppt
1.4	kinds of Bee hive cells	3	Lecture	Black board
UNIT – II [12 Hrs]				
2.1	Biology of Honey bee	4	Lecture	LCD
2.2	capping of cells & Honey bee pollinators	4	Lecture	Black board
2.3	Identification of queen, drone &workers	4	Lecture	Ppt
UNIT – III [12 Hrs]				
3.1	Predators of honey bees	4	Lecture	Ppt
3.2	Diseases of Honey bees and their management	4	Lecture	Ppt
3.3	Environmental challenges of Apiculture	4	lecture	Ppt
UNIT – IV [12 Hrs]				
4.1	Bee keeping: Artificial hives Newton's hive	3	Lecture	Ppt
4.2	Bee keeping equipments	3	Lecture	Ppt
4.3	Arranging an Apiary & Management Space	3	Lecture	Ppt
4.4	Harvesting ang Extraction of honey and Bee wax.	3	Lecture	Ppt
UNIT – V [12 Hrs]				
5.1	Commercial Queen raising	3	Lecture	ppt
5.2	Economic importance of honey,pollen	3	Lecture	Black board
5.3	Uses of bee wax & propolis	3	Lecture	ppt
5.4	Royal jelly nature and uses	3	Lecture	Black board

MAPPING OF COs WITH POs

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	2	2	3	2	3
CO3	3	3	2	1	1
CO4	3	2	2	3	2
CO5	3	1	1	3	3

Strong – 3 Medium – 2 Low – 1

COURSE DESIGNER: Dr. A. Dhanalakshmi

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Core Lab **PRACTICAL - IV** **Code: 212304405**
SEMESTER IV **5 Hrs/Week**
Credits 5

Preamble:

- ***Applications of biotechnological methods in entrepreneurial and remedial activities, evaluate environmental parameters and standards, understand the working principles and their outcomes of biofarming technology.***

Practical-1 APPLIED BIOTECHNOLOGY

1. Installation, operation and maintenance of Bio-gas Plant (visit to biogas Plant)
2. Models a) Typical fermenter b) Culture systems – Batch and continuous culture c) Trickling filter
3. Substrates utilization - a) Starch b) Agricultural waste
4. Commercially important bio-products a)amino acid b) Lactic acid c) Citric acid d) Ethanol e) Enzyme f) Antibiotics g) Vitamins h) Hormones i) Vaccines
5. Study of composting strategies and Vermicomposting methods

Practical- 2ENVIRONMENTAL BIOLOGY

1. Study of morphometry of a Fresh water Pond.
2. Estimation of Primary Productivity in a pond using Dark and Light bottle method.
3. Estimation of Calcium and Magnesium in Water Samples.
4. Estimation of Nitrates and Phosphates in Water samples.
5. Qualitative and quantitative Estimation of Plankton in a pond.
6. BOD- Estimation.
7. Estimation of tolerance limits of Pesticides on an organism.
8. Study of Population density in grassland using quadrate method.
9. Observation of Pollution indicator organisms
10. Estimation of Population size in an Imaginary Pond.

Practical-3BIOFARMING TECHNOLOGY

Practical, demonstration and field visit

1. Maintenance of mulberry farm – study on the biology of mulberry plant – pests (any five) – Chawki leaves (Tender leaves).
2. Morphology of silkworms – male and female identification in the larva, pupa and adult stages.
3. Rearing of silkworm from disease free laying – harvesting of cocoons
4. Morphology of Earthworm – segmentations – pores – ecotypes
5. Visit to Vermicomposting unit – observation for precomposting – composting
6. Observation of vermicast – Qualitative analysis of vermicast
7. Preparation of vermiwash - Qualitative analysis of vermiwash
8. Study on the identification of Honey bees
9. Study of structure of bee hive – parts
10. Study on the identification of poultry breeds
11. Study on the identification of any three edible fishes (Morphology)
12. Study on the identification of any three ornamental fishes(Morphology)

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Elective – III Major **NANOBIOLOGY** **Code: 212304406**

SEMESTER IV **3 Hrs/Week**

Credits 3

Preamble:

- ***To emphasis the new emerging area in the field of science coverage and the novel approach for research.***

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	To aware of the inherent properties of nucleic acids like DNA to create useful materials is a promising area of modern research.	Up to K5
CO2	To acquire the knowledge of protein that self assemble to generate functional materials could be used as a novel approach for the large scale production of nano materials	Up to K5
CO3	To understand protein folding is of high importance and could prove fruitful for nanobiology in future	Up to K5
CO4	To inculcate the knowledge for applying nanotools to relevant medical/biological probe and refining these applications.	Up to K5
CO5	To develop their research orientated skills for better future in the nanomedicine	Up to K5

K1- Knowledge K2 – Understand K3-Apply K4- Analyse K5- Evaluate

UNIT –I : **[9 Hrs]**

Nanoscicnce and Nanotechnology: Biotechnology, Emergence of nanotechnology, Nanotechnology & bionanotechnolgy; fields, scope; advantages of nanoscale molecules; Bio inspired nano structures: Molecular self assembly; Bionano materials – nano tubes; nano adhesives; nano motors; nano switches; biologically inspired optics.

UNIT –II : **[9 Hrs]**

Nano techniques: Atomic force microscopy (AFM), Cryo electron microscopy (CEM), Confocal microscopy, Scanning probe microscopy , imaging single mRNA - using DNA Optomers; electro spinning.

Nanomolccular tools: Quantum dots - fabricating QD. properties, Nanoshells, Nanoparticles; Nanofibers- Dendrimers, Lipid Nanoparticles, Fullerenes, Viral Vectors and Virus-Like Particles (VLPs).

UNIT –III : **[9 Hrs]**

Nanoparticles and Nanostructures: biology as model system for building nanoscale devices - microbial systems for assembling nanostructures & bioapplications of Nanostructures; Novel Nanostructures as Molecular Nanomotors - DNA hybridization-based nanomotor - DNA tweezer; single DNA nanomotors. application; Nano Electro Mechanical Systems (NEMS) and Micro Electro Mechanical Systems (MEMS).

UNIT –IV: **[9 Hrs]**

Applications of bionanotechnology in research and diagnosis: Nanoscale Biosensors - classes of biosensors, Method of Biological Signaling - Antibody/antigen, enzymes based, Nucleic acids, Cells and viruses & Biomimetic materials based; Types - Cantilever-Based Biosensors, Cell and Protein Arrays. Applications of bionanotechnology in therapy: Nanostructures for Tissue Engineering/Regenerative Medicine - Scaffolds for Tissue Engineering, nanofibrous scaffolds, Nanostructures for Cancer Diagnostics and Therapy; drug delivery, Nanocontaniner, liposome nanocontainers, biopolymer nanocontainers, nanocapsules, - applications in drug and gene - target delivery.

UNIT –V: **[9 Hrs]**

Bionanoproducts: Nanogels, nanosponge - stypro, collplant; bionanofabrics - casein peptides-milk silk, soya silk, spider silk; bioelectricity - nonowires, biobatteries - soil lamps; DNA light, single cell biofuels, algal-hydrogen bioreactor & recent bionanoproducts.

TEXT BOOK:

01. Kenneth E. Gonsalves et al. (2008) Biomedical nanostructu nanostructures, John Wiley & Sons, Inc.. Hoboken, New Jersey.

REFERENCES:

01. Albert Shawn (2009) A-Z nanobiology, First edn. Centrum Press, New Delhi. Christof M. Nieineyer and Chad A. Mirkin (2004) Nanobiotechnology I: Concepts, Applications and Perspectives. WILEY-VCH Verlag GmbH & Co.. Weinheim.
02. Chad A. Mirkin and Christof M. Niemeyer (2007) Nanobiotechnology II: more Concepts and Applications, by WILEY-VCH Verlag GmbH & Co., Weinheim.
03. Michael A. Stroscio and Mitra Dutta, (2004) Biological Nanostructures and Applications of Nanostructures in Biology, Kluwer Academic Publishers, New York, Boston, Dordrecht, London, Moscow.
04. David S. Goodsell, (2004) Biotechnology : lessons from nature,Wiley-Liss, Inc.. Hoboken, New Jersey
05. Ehud Gazit (2007) Plenty Of Room For Biology At The Bottom: An Introduction to Bionanotechnology, Imperial College Press London
06. Tuan Vo-Dinh (2007) Nanotechnology in biology and medicine : methods, devices, and applications, CRC Press Taylor & Francis Group, Florida
07. http://materials.globalspec.com/LearnMore/Materials_Chemicals_Adhesives/Electricai_Optical_Specialty_Materials/Nanomaterials_Nanotechnology_Products

WEB RESOURCES:

01. http://www.ewh.ieee.org/tc/nanotech/
02. http://www.library.ualberta.ca/subject/nanoscience/guide/index.cfm
03. http://pubs.acs.org/cen/nanofocus

PEDAGOGY: Chalk and talk, PPT, Discussion.

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No.of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [9 Hrs]				
1.1	Biotechnology, Emergence of nanotechnology, Nanotechnology & bionanotechnolgy;	3	Chalk & talk	Black board

1.2	fields, scope; advantages of nanoscale molecules;	2	Chalk & talk	Black board
1.3	Bio inspired nano structures: Molecular self assembly; Bionano materials	2	Chalk & talk	Black board
1.4	nano tubes; nano adhesives; nano motors; nano switches; biologically inspired optics.	2	Chalk & talk	Black board
UNIT – II [9 Hrs]				
2.1	Nano techniques: Atomic force microscopy (AFM), Cryo electron microscopy (CEM), Confocal microscopy	3	Chalk & talk	Black board
2.2	Scanning probe microscopy, imaging single mRNA - using DNA Optomers; electro spinning.	2	Chalk & talk	Black board
2.3	Quantum dots - fabricating QD. properties, Nanoshells, Nanoparticles; Nanofibers-Dendrimers	2	Chalk & talk	Black board
2.4	Lipid Nanoparticles, Fullerenes, Viral Vectors and Virus-Like Particles (VLPs).	2	Chalk & talk	Black board
UNIT – III [9 Hrs]				
3.1	biology as model system for building nanoscale devices - microbial systems for assembling nanostructures & bioapplications of Nanostructures	3	Chalk & talk	Black board
3.2	Novel Nanostructures as Molecular Nanomotors	2	Chalk & talk	Black board
3.3	DNA hybridization-based nanomotor - DNA tweezer; single DNA nanomotors. application	2	Chalk & talk	Black board
3.4	Nano Electro Mechanical Systems (NEMS) and Micro Electro Mechanical Systems (MEMS).	2	Chalk & talk	Black board
UNIT – IV [9 Hrs]				
4.1	Nanoscale Biosensors - classes of biosensors, Method of Biological Signaling - Antibody/antigen, enzymes based, Nucleic acids, Cells and viruses & Biomimetic materials based	3	Chalk & talk	Black board
4.2	Types - Cantilever-Based Biosensors, Cell and Protein Arrays. Applications of bionanotechnology in therapy:	2	Chalk & talk	Black board
4.3	Nanostructures for Tissue Engineering/Regenerative Medicine - Scaffolds for Tissue Engineering, nanofibrous scaffolds, Nanostructures for Cancer Diagnostics and Therapy; drug delivery	2	Chalk & talk	Black board

4.4	Nanocontaniner, liposome nanocontainers, biopolymer nanocontainers, nanocapsules, - applications in drug and gene - target delivery.	2	Chalk & talk	Black board
UNIT – V [9 Hrs]				
5.1	Nanogels, nanosponge - stypro, collplant; bionanofabrics - casein peptides-milk silk, soya silk, spider silk;	3	Chalk & talk	Black board
5.2	bioelectricity - nonowires, biobatteries - soil lamps; DNA light, single cell biofuels, algal	3	Chalk & talk	Black board
5.3	hydrogen bioreactor & recent bionanoproducts.	3	Chalk & talk	Black board

MAPPING OF COs WITH POs

	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	2	2	2	3	2
CO3	2	3	3	1	1
CO4	2	1	2	2	1
CO5	1	1	1	3	3

Strong – 3 Medium – 2 Low – 1

COURSE DESIGNER: Dr. P. Murali

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Elective – III Major **FORENSIC SCIENCE** **Code: 212304407**

SEMESTER IV **3 Hrs/Week**

Credits 3

Preamble:

The student will be able to describe the fundamental principles and functions of forensic science and its significance to human society.

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	The student will be able to explain the importance of criminology and causes of criminal behavior.	Up to K3
CO2	The student will be able to analyze the significance of criminal profiling in alleviating crimes	Up to K3
CO3	The student will be able to know the significance of criminal profiling in alleviating crimes	Up to K3
CO4	Able to illustrate the divisions in a forensic science laboratory.	Up to K3
CO5	The student will understand the working of the forensic establishments in India and abroad	Up to K3

K1- Knowledge K2 – Understand K3-Apply

UNIT – I: **[10 Hrs]**

Forensic Science: Definition of Forensic Science, The Role of the Forensic Laboratory, History and Development of Forensic Science in India & Abroad, Pioneers in Forensic Science, Multidisciplinary nature, Forensic Technology solving crimes with advanced technology, Forensic intelligence

and Interviews. Forensic Evidences: Concise of Forensic Physical, Biological, Chemical and Psychological evidences, Medico-Legal Cases. Laws and Principles of Forensic Science: Law of Exchange. Law of Individuality, Law of Comparison, Law of Progressive Changes and Law of Probability, Branches of Forensic Science..

UNIT – II: **[10 Hrs]**

Administration and Organizational Setup: DFSS, CFSL, GEQD, SFSL, RFSL, MFSL, FPB, NICFS, CDTS, NCRB, BPR&D, Qualifications and duties of Forensic Scientists Academic centres of education and research: Indian and Academy of Forensic Science, American Board of Forensic Odontology, Interpol and FBI, Australian Academy of Forensic Sciences. Education and Employment systems of Forensic Science in India: Teaching Courses and Research fields in Forensic Science, Scope and jobs in Forensic Science.

UNIT – III: **[8 Hrs]**

Police and Forensic Science: Relationship between police and forensic expert, Role of Police at the Crime scene, scientific help at crime scene, handling of various types of crime scenes by police, forensic teaching of police personals, and forensic case documentation by Police, Technological Advance and Police. Admissibility of Forensic Evidence in Court: Admissibility of Expert Testimony and Evidence in Court, Frye and Daubert standards. Forensic Report: Forensic Expert, Forensic Report, Formats of Forensic Report, Court Testimony, Pre Court Preparations & Court appearance.

UNIT – IV: **[8 Hrs]**

Examination in chief, Cross Examination and Re-examination, Ethics in Forensic Science. Recent Trends in Forensic Science- Environmental Forensics: Definition, Legal processes involving environmental forensic science. Geo-forensics and Global Positioning System; Basic principles and applications. Biometrics in Personal Identification: Introduction, Concepts of Biometric Authentication, Role in person Identification,

UNIT – V: **[9 Hrs]**

Techniques and Technologies (Finger Print Technology, Face Recognition, IRIS, Retina Geometry, Hand Geometry, Speaker Recognition, Signature Verification and other forensic related techniques). Bioterrorism: Definition, Concepts of Bio security and microbial forensics, Weapons of mass destruction (WMD), mass-casualty weapons (MCW), NBC and CBRNE, Dirty Bombs.

TEXT BOOKS:

01. Nanda, B.B. and Tewari, R.K. (2001) Forensic Science in India: A vision for the twenty first century Select Publisher, New Delhi.
02. James, S.H and Nordby, J.J. (2003) Forensic Science: An introduction to scientific and investigative techniques CRC Press,.

REFERENCES:

01. Deforest, Gansellen & Lee : Introduction to Criminalistics.
02. Sharma, B.R. (1974) Forensic Science in Criminal Investigation and Trials,
03. Central Law Agency, Allahabad, (1974).
04. Hess, A.K. and Weiner, I.B. (1999) Handbook of Forensic Psychology 2nd Ed. John wiley & sons.
05. Bruce A. Arrigo (2000) Introduction to Forensic Psychology Academic Press, London

06.J A Siegel, P.J Saukko (2000) Encyclopedia of Forensic Sciences Vol. I, II and III, Acad. Press
07.Hand Book of Forensic Psychology – O' Donohue Levensky

WEB RESOURCES:

01.http://www.istl.org ›
02.https://forensicresources.org ›

PEDAGOGY: Chalk and talk, Group Discussion, PPT, and Charts

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No. of Lectures	Content Delivery Method	Teaching Aids
UNIT – I [10 Hrs]				
1.1	Forensic Science: Definition of Forensic Science	1	Chalk & Talk	Black Board
1.2	The Role of the Forensic Laboratory, History and Development of Forensic Science in India & Abroad, Pioneers in Forensic Science	1	Chalk & Talk	Black Board
1.3	Multidisciplinary nature, Forensic Technology solving crimes with advanced technology, Forensic intelligence and Interviews.	2	PPT	LCD
1.4	Forensic Evidences: Concise of Forensic Physical, Biological, Chemical and Psychological evidences, Medico-Legal Cases.	3	Chalk & Talk	Black Board
1.5	Laws and Principles of Forensic Science: Law of Exchange (Locard), Law of Individuality, Law of Comparison, Law of Progressive Changes and Law of Probability, Branches of Forensic Science..	3	Chalk & Talk	Black Board
UNIT – II [10 Hrs]				
2.1	Administration and Organizational Setup: DFSS, CFSL, GEQD, SFSL, RFSL, MFSL, FPB, NICFS, CDTS, NCRB, BPR&D,	2	PPT	LCD
2.2	Qualifications and duties of Forensic Scientists Academic centers of education and research:	2	Chalk & Talk	Black Board
2.3	Indian and Academy of Forensic Science, American Board of Forensic Odontology,	2	PPT	LCD
2.4	Interpol and FBI, Australian Academy of Forensic Sciences. Education and Employment systems of Forensic Science in India:	2	PPT	LCD
2.5	Teaching Courses and Research fields in Forensic Science, Scope and jobs in Forensic Science.	2	Chalk & Talk	Black Board
UNIT – III [8 Hrs]				
3.1	Police and Forensic Science: Relationship between police and forensic expert	1	Chalk & Talk	Black Board
3.2	Role of Police at the Crime scene,	1	Chalk &Talk	Black board
3.3	Scientific help at crime scene, handling of various types of crime scenes by police,	1	PPT	LCD
3.4	Forensic teaching of police personals, forensic case documentation by Police, Technological Advance and Police. Admissibility of Forensic	2	PPT	LCD

3.5	Evidence in Court: Admissibility of Expert Testimony and Evidence in Court, Frye and Daubert standards. Forensic Report:	1	Chalk &Talk	Black Board
3.6	Forensic Expert, Forensic Report, Formats of Forensic Report, Court Testimony, Pre Court Preparations & Court appearance.	2	Chalk & Talk	Black Board
UNIT – IV [8 Hrs]				
4.1	Examination in chief, Cross Examination and Re-examination Science- Introduction, ,	2	Chalk & Talk	Black Board
4.2	Ethics in Forensic Science. Recent Trends in Forensic	1	Chalk &Talk	Black Board
4.3	Definition, Legal processes involving environmental forensic science. Geo-forensics Global Positioning System;	2	Chalk & Talk	Black Board
4.4	Environmental Forensics: Basic principles and applications. Biometrics in Personal Identification:	2	Chalk &Talk	Black Board
4.5	Concepts of Biometric Authentication, Role in person Identification	1	Chalk & Talk	Black Board
UNIT – V [9 Hrs]				
5.1	Techniques and Technologies (Finger Print Technology, Face Recognition, IRIS, Retina Geometry, Hand Geometry, Speaker	3	LCD	LCD
5.2	Signature Verification and other forensic related techniques).	2	LCD	LCD
5.3	Bioterrorism: Definition, Concepts of Bio security and microbial forensics,	2	LCD	LCD
5.4	Recognition, Weapons of mass destruction (WMD), mass-casualty weapons (MCW), NBC and CBRNE, Dirty Bombs.	2	LCD	LCD

MAPPING OF COs WITH POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	1	2	2
CO2	3	1	3	3	1
CO3	3	2	1	3	2
CO4	2	3	1	2	2
CO5	3	1	3	3	1

3 - Strong 2 - Medium 1- Low

COURSE DESIGNER: Dr. P. Murali

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Elective Major **PROJECT** **Code: 212304408**

SEMESTER IV **Credits 5**

Post Graduate students of Zoology will do projects under the guidance of staff members of Zoology during IV semester. The projects will be on Zoology and Zoology related fields. The project diary signed by the project guide and HOD must be submitted in the month of April. The Viva on Project will be conducted jointly by the guide, external examiner and the HOD.

	INTERNAL	EXTERNAL
Project	*30:10	*50:10

*Report 40; Viva 10

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Self–Learning Course HUMAN DISEASEAS AND CONTROL Code: 218004423
SEMESTER IV

Addl. Credits 3

Preamble:

- ***This course aims to give a broad understanding of various diseases, their occurrence, causative agents, pathogenesis and preventive measures. Emphasis will be given to a few important bacterial, fungal, viral, parasites.***

UNIT – I:

Bacterial diseases: Etiological agents, pathogenesis and preventive measures of Tuberculosis, dysentery and syphilis.

Fungal disease: Superficial and systemic infections of common fungi in man, causative agents, infectious status and control measures of coccidiomyeosis, Aspergilloxis and Candidiasis

UNIT – II:

Viral disease: Viruses, pathogenesis and their preventive measures of HIV, SARS and Sarcoma in man.

Parasitic disease: Outbreak of common protozoan diseases, pathogenesis and preventive measures of Amoebiasis, malaria and filariasis.

UNIT – III:

Nosocomial disease: Status of hospital borne infections, Transmission enterotoxigenic. enteroinvasive, entero pathogenic and enterohaemorrhagic, infections between hospital staff and patients with their preventive measures.

Food-borne diseases: Types of food conditions of unsterile foods, causative agents, pathogenesis and control measures of Salmonellosis, otulism and Diarrhea.

UNIT – IV:

Zoonotic diseases: Transmission of disease, causative agents and control measures of Rabies, Anthrax and Tick borne infections.

UNIT – V:

Genetic disease: Health status, immunity types, symptoms and control measures of diabetes, Haemophilia and Thalassemia.

TEXT BOOK:

01. Park, K, (2007) Park's Textbook of Preventive and Social medicine, 19 ed, M/s.Bnarsidas Bhanot Publishers, Jabalpur, 768 pp.

REFERENCES:

01. Bedi and Yaspal (1988) Handbook of Social and Preventive Medicine. Anand Pub and Co, Delhi.
02. Bailey and Scott (1978) Diagnostic microbiology, The CV Mosby Co.

Course Designer: Mrs. R. Latha

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