DEPARTMENT OF ZOOLOGY

Courses with	Employability	Enterpreneuaryship	Skill development	Significance

List of courses offered in the last five years with focus on Employability

MAJORBASEDELECTIVECOURSE I–(1)

BIOSTATISTICS

Theo				1:1
PracticalHours	: --	Credits	:5	
ExamHours	: 3	Marks	:25+75	

Objectives: Tocomprehendtheknowledgeonmethodsofdatacollectionandanalysisinbiostatistics ,tabulationofdataandtypesofpresentation,measuresthetendencyofdataandhypothesistestingof data.

UNIT-I

Biostatistics: Introduction, Definition and Scope. Methods of data Collection -

UNIT-II

Processing of data: classification and tabulation of data. Presentation of Data. Diagramatic(BarandPie)andgraphicalpresentation(Histogram, Frequencycurve,Frequencypolygon).

UNIT-III

AnalysisofData:Measuresof centraltendency-mean,median,mode.

UNIT-IV

Measuresofdispersion: SD,SE,VarianceandCo-efficient ofVariation-Correlatio n(Karl Pearson) and Regression (Simple Linear).

UNIT-V

Hypothesis testing: Introduction to test of significance - Chi square test, Students t-Test(basedonmeanwithtwosamples,Testingcorrelationco-efficientandpairedt-Test),ANOVA-one way.
Introductiontostatisticalpackages –SPSS.

ReferenceBooks:

1. RamakrishnanP(1996).Biostatistics.Saraspublications,Nagercoil.
2. Dr.GurusamyM.P.,Dr.KamsaMohaideen.MandProf.KamalrajM(2011).14th editionStatistics.Vannan publications, Sivakasi.
3. RamachandranV(2007).Biostatistics.Vol-Iand II.Nithyaasprinters,Chennai.
4. Arora.P.N(1998).Biostatistics.HimalayaPublishingHouse.
5. Sokal.R.JandRohlf.S.J(1981).IntroductiontoBiostatistics,W.H.Freeman,London.

QUESTIONPAPERPATTERN

ExamHours 3 Max.marks:7

PART-I(AnswerALL)20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match thefollowing-5

PART-II(EitherOR)

Q.No:21to25 -One questionfromeach Unit 5X5=2

PART-III(AnsweranyTHREE)

Q.No:26 to30 -One questionfromeach Unit(3outof 5) 3X10=3

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SKILL BASED ELECTIVE COURSE-III

BASICCOMPUTERAPPLICATION

CourseCode	:U215ZOSE3			
PracticalHours	:	2	Credits	:2
ExamHours	:	2	Marks	:40+6

PracticalHours:2hr

List of PracticalMS -word

1. Creating,editing,savingandprintingtext documents.
2. FontandParagraphformatting
3. Simplecharacterformatting
4. Insertingtables,smart art,Pagebreaks,images

MS-Excel

5. Creating,editing,savingandprintingspreadsheets
6. Workingwithfunctions&formulae
7. Modifyingworksheetswithcolor&autoformats
8. Graphicallyrepresentingdata:Charts&Graphs

MS-Powerpoint

9. Opening,Viewing, Creatingand printingSlides
10. Applyingautolayouts
11. Addingcustomanimation
12. Usingslidetransitions
13. Inserting:Charts&Graphs
14. CreatingProfessionalSlideforPresentation

Internetapplications

15. Understandinghowto usesearch engines
16. Bookmarkingandvisitingtoa specificWebsite
17. Downloadinginternetcontents
18. CopyandpasteInternet content intoyourwordandfileandemails

Question Paper

PatternOnemajorPractical=1X30marks

=30Oneminorpractical=1X15marks

=15Record =10 marks

Viva = 5marks

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MAJORBASEDELECTIVECOURSEIII-(1)
HUMANNUTRITION

TheoryHours	:	5	CourseCode	:U21Z6MBE3:1
PracticalHours	:	--	Credits	:5
ExamHours	:	3	Marks	:25+75

Objectives: To incubate the knowledge on the values of nutritive substances for healthy living ofmankind through nutritive foods, balanced diet, gastrotrich nutrition and managing the faculty foodhabitsbytherapeuticdiets.

UNIT-I

waterasnutrient-regulationofwaterbalance.Determinationofenergyvalueoffoods-directandindirectcolorimetry -basalmetabolicrate.

UNIT-III

Nutritional value of foods - cereals, fruits, milk, egg, meat, fish - Nutritional value ofcommonIndian recipes-Balanced diet.

UNIT-IV

Effect of cooking and heat processing on the nutritive value of foods - Nutritionalrequirements:Infants,School children,Pregnant andlactatingmothers-GeriatricNutrition.

UNIT-V

Faultyfoodhabits:obesity,Diabetesandcardiacproblems-Healtheducation-Malnutrition:Marasmusand Kwashiorkor-Therapeutic diets,RoleofFDAandWHO.

ReferenceBooks:

1. BanerjeeG.C(1978).AnimalNutrition.Oxford&IBHpublishingco,New Delhi.
2. Swaminathan M (1978). Advanced text book on Food and Nutrition, Volume II, TheBangaloreprintingand PublishingCo,Ltd.Bangalore.
3. Swaminathan M (1989). Handbook of Food and Nutrition. A Bappco PublicationBangalore.
4. Sheel Sharma (2006). Human Nutrition and Meal Planning. Jnanada Prakashan(P&D),New Delhi.

QUESTIONPAPERPATTER

ExamHours 3 Max.marks:7

PART-I(AnswerALL)20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match thefollowing-5

PART-II(EitherOR)

Q.No:21to25 -One questionfromeach 5X5=2

PART-III(AnsweranyTHREE)

Q.No:26 to30 -One questionfromeach Unit(3outof 5) 3X10=3

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MAJORBASEDELECTIVECOURSEIII-(3)
ECONOMICENTOMOLOGY

TheoryHours	:	5	CourseCode	:U21Z6MBE3:3
PracticalHours	:	--	Credits	:5
ExamHours	:	3	Marks	:25+75

Objectives: Toimbibetheknowledgeonthebeneficialinsectsutilizingthenforeconomicgainthrough pestcontrol, publichealthand roleofhoneybee andsilkwormforlivelihoodoptions.

UNIT– I

ClassificationofInsectsuptoordersandtheirdiagnosticcharacterswithfamiliarandimportant examples. InsectReproduction, Development andMetamorphosis.

UNIT-II

Harmful Insects: Classification of Insects pests; Injuries and Damages caused by Insect pests.Assessment of Insect pest population, Assessment of pest damage. Pest surveillance andforecasting pest outbreak. Methods and principles of pest control - Chemical, MechanicalBiology-IPM.

UNIT– III

Insect pests: Destructive insects; Their bionomics and life cycle. Pest of Cultivated crops –Predominantly occurring pests in Rice (eg.),Sugarcane(eg.), Coconuts(eg.), Cotton(eg.). Pest ofvegetables(brinjal). Pestofstored products(groundnut).

UNIT– IV

Insects in relation to public health and household. Insects associated with human beings.Insectsassociated with household materials.

UNIT– V

Beneficial insects - Their bionomics, life cycleand by products. Honeybees, silkworm andLacinsect.HelpfulInsects:Insectpollinators,predatorsandparasites,soilbuildersandscavengers.

ReferenceBooks:

1. ChapmanRF(1993).TheInsects.StructureandFunctions.ELBS.London.
2. ChandlerACandCPRead(1961).IntroductiontoParasitology.JohnWileyandSons,NewYork.
3. DavidBV,MuraliranganNCandMeeraMuralirangan(1992).HarmfulandbeneficialInsects.PopularbookDepot.
4. DavidBVandKumaraswami(1998).ElementsofEconomicsEntomology.PopularBookDepot.Madras.
5. DavidBV(1992).Pestmanagementandpesticides:IndianScenario.Namruthapublications.
6. KrishnanNT(1993).EconomicsEntomology.JJ Publications,Madurai.
7. ManiMS(1973). GeneralEntomoloogy.Oxford andTEM.
8. NayarKK,AnanthakrishnanTNandVDDavid(1990).GeneralandappliedEntomology.TataMc GrowHillNew Delhi.

QUESTIONPAPERPATTER

ExamHours 3 Max.marks:7

PART-I(AnswerALL)20X1=20

Q.No:1 to 10 –Objective type question :MCQ – 5; Fill up the blanks -5; True or false – 5; Match thefollowing-5

PART-II(EitherOR)

Q.No:11to15 -One questionfromeach 5X5=2

PART-III(AnsweranyTHREE)

Q.No:16to20 -One questionfromeach Unit(3 outof 5) 3X10=3

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MAJOR BASED ELECTIVE COURSE-I

3.BEE KEEPING

THEORY HOURS : 5	COURSE CODE : P21Z1MBE1:3
PRACTICAL HOURS:	CREDITS : 4
EXAM HOURS : 3	MARKS : ESE-75/CIA-25

Objectives

1. To learn the identification keys for honey bees
2. To understand the structure and colony formation of honey bees
3. To acquire the knowledge on handling and maintenance of bee colony
4. To comprehend the importance of disease management and its control
5. To obtain the perspectives on marketing of honey and to motivate for the preparation of projects for funding

UNIT - I

Honey Bee: Systematic position-species of honey bees- embryology and life history of honey bee-behaviour- swarming- pheromone.

UNIT - II

Bee colony, castes, Natural colonies and their yield. Types of beehives-structure location care and Management-Genetic studies –breeding of stocks- winter broods.

UNIT - III

Apiary-care and Management-Artificial beehives-different types-construction of space frames-selection of sites-catching and transforming a Colony-Handling and maintenance of the Colony-Instruments employed in Apiary.

UNIT - IV

Bee foraging: pollen and nectar yielding plants. Natural enemies and diseases of honey bees and their control methods.

UNIT - V

Honey: Extraction and equipment's used-chemical composition - nutritive and medicinal values-honey yield in national and international market. Present status of apiculture in India. prospects of apiculture as self employment venture. Preparing proposals (Layout and budget) for financial assistance and funding agencies.

Reference Books

1. Morse, R.A., (1990).The ABC and XYZ of Bee culture 40th edn. A.I.Root& co., Ophio.
2. Rare, S., (1998), Introduction to bee keeping. vikas publishing House.
3. Sharma, P.andsingh, L.(1987). Hand book of bee keeping. controller printing and stationery, Chandigarh.
4. Dewey M. Caron, (2013). Honey Bee Biology and Beekeeping, Revised Edition. Wicwas Press, Kalamazoo.
5. Alison Benjamin, By (author) Brian McCallum, 2008. Keeping Bees and Making Honey. David & Charles, Newton Abbot.KimPezza, 2013.
6. Backyard Farming: Keeping Honey Bees: From Hive Management to Honey Harvesting and More. Hatherleigh Press, U.S.

QUESTION PAPER PATTERN

Exam Hours : 3 **Max.marks: 75**

PART-I (Answer ALL) **20X1=20**

Q.No:1 to 20 –Objective type question: MCQ – 20

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

PART-III (Answer any THREE out of FIVE)

Q.No:26 to 30- One question from each Unit **3X10=30**

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MAJOR BASED ELECTIVE COURSE II

2. COMPUTER APPLICATIONS IN BIOLOGY

THEORY HOURS : 5	**COURSE CODE : P21Z2MBE2:2**
PRACTICAL HOURS:	**CREDITS : 4**
EXAM HOURS : 3	**MARKS : ESE-75/CIA-25**

UNIT I

Fundamentals of Computers: Block diagram of computer (input and output devices), Generations, Advantages and limitations of Computers; Basics of operating system: DOS, Windows NT & XP, UNIX and Application Software.

UNIT II

Communication Technology: Networking- LAN, WAN & MAN - Internet & Intranet - Data transfer, storage & retrieval via network- Email, DNS, WEB servers and browsers.

UNIT III

Fundamentals of database: Database models (Hierarchical, Network, Relational, Object- Oriented Models), RDBMS, Database System applications and Security.

UNIT IV

Introduction to M.S. office package: word- creating a new document - templates and wizards- scientific data representation and basic calculations with EXCEL- Creating Tables and databases using Access - interactive presentations using Power Point.

UNIT V

Basics of Biological databases: Types of data using in biological databases - Literature Databases and searches – Pub med Central – Medline – OMIM – SCOPUS – Science direct – Elsevier

.

TEXT BOOKS:

1. Fundamentals of Computers- Pradeep K. Sinha, PritiSinha
2. Principles of database systems- Jeffery O. Ullma

QUESTION PAPER PATTERN		
Exam Hours : 3	**Max.marks: 75**	
	PART-I (Answer ALL)	**20X1=20**
Q.No:1 to 20 –Objective type question: MCQ – 20		
	PART-II (Either OR)	
Q.No:21 to25 - One question from each Unit		
	PART-III (Answer any THREE out of FIVE)	
Q.No:26 to 30- One question from each Unit		**3X10=30**

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CORE COURSE X- BIOTECHNOLOGY AND BIOINFORMATICS

THEORY HOURS : 6	**COURSE CODE : P21ZC310**
PRACTICAL HOURS:	**CREDITS : 5**
EXAM HOURS : 3	**MARKS : ESE-75/CIA-25**

UNIT-I

Basic Tools for Gene Manipulation

Cloning vectors: Plasmids, Cosmids, Phagemids, Lambda Bacteriophage, M13, BAC, YAC, MAC and Expression vectors (characteristics). Restriction enzymes: Nomenclature, Types. **Transformation techniques**: Calcium chloride method, electroporation and biolistic method. Construction of genomic and cDNA libraries and screening by colony and plaque hybridization

UNIT-II

Advance Tools and Techniques

Southern, Northern and Western blotting DNA sequencing: Sanger method, Polymerase Chain Reaction, DNA Finger Printing and DNA micro array.

Genetically Modified Organisms

Production of cloned and transgenic animals: Nuclear Transplantation, Retroviral Method, DNA microinjection; Applications of transgenic animals: Production of pharmaceuticals, production of donor organs, knock out mice.

UNIT-III

Applications of biotechnology in agriculture (Agrobacterium-mediated transformation. Applications of transgenic plants: insect and herbicide resistant plants, Biopesticides and Biofertilizers) medicine (insulin) and food science. Genetically modified organism (GMO'S) - GM foods.

Bioremediation - bioremediation of hydrocarbons - Industrial wastes - Heavy metals - Xenobiotics - bioleaching - biomining - biofuels.

UNTI-IV

Introduction to Bioinformatics, Databases-Nucleic acid databases, Protein sequence databases, Databases of structures, Specialized databases, Bibliographic databases. Outline of Genomics and Proteomics.

Steps involved in Drug Discovery.

UNTI-V

Structure based Protein classification, Protein structure databases-PDB, NCBI. Visualization databases - Rasmol, Swiss-PDB and PDBsum. Structure visualization database

Recommended Text Books:

1. Dubey R.C (2008). A text Book of Biotechnology. S. Chand and Company, New Delhi.
2. Sathyanarayana U (2005). Biotechnology. Books and Allied P. Ltd. Kolkata.
3. B.D.Singh(2003).Biotechnology,Kalyanipublishers.Ludhiana,New Delhi
4. Prakash.S.Lohar(201`7),Bio informatics,MJP Publishers,Chennai.

References Books:

1. Brown C.M., Campbel I and F.G Priest (1988). Introduction to Biotechnology. Blackwell Scientific Publications, UK.
2. Primrose S.B (2000). Modern Biotechnology. Blackwell Scientific Publications, Oxford, London.

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3. KeshavTrehan (1996). Biotechnology. New Age International Pvt. Ltd. Publishers, New Delhi.
4. Watson *et.al*., (1999). Recombinant DNA. Freeman and Company, New York
5. Ignacimuthu S (1998). Basic Biotechnology. Tata McGraw Hill Publishing Co., New Delhi.
6. Sharma.Munjal.Shanker(2016) Text book of Bioinformatics, Rastogi publication, Meerut.
7. Arthur M.Lesk(2003).Introduction to Bioinformatics, University of Cambridge, Oxford University Press

QUESTION PAPER PATTERN	
Exam Hours : 3	**Max.marks: 75**
PART-I (Answer ALL)	**20X1=20**
Q.No:1 to 20 –Objective type question: MCQ – 20	
PART-II (Either OR)	
Q.No:21 to25 - One question from each Unit	
PART-III (Answer any THREE out of FIVE)	
Q.No:26 to 30- One question from each Unit	**3X10=30**

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MAJOR BASED ELECTIVE COURSE III
1. BIOSTATISTICS AND RESEARCH METHODOLOGY

THEORY HOURS : 6	**COURSE CODE : P21Z3MBE3:1**
PRACTICAL HOURS:	**CREDITS : 4**
EXAM HOURS : 3	**MARKS : ESE-75/CIA-25**

UNIT-I

Introduction to biostatistics - scope and definition, functions and limitations .Collection, organization (classification and tabulation of data) and presentation (graphical representations) of data. Measures of central tendency - mean, median and mode. Measures of dispersion - range, inter quartile range, mean deviation, standard deviation and Standard error.

UNIT - II

Skewness and kurtosis, measures of skewness, Karl-Pearson's coefficient of skewness, Bowley's measures of skewness, types of coefficient of skewness, types of kurtosis, Correlation analysis (Karl-Pearson's)- types and methods, Regression analysis - regression line and regression equation.

UNIT – III

Hypothesis testing, Chi-square test, One-way Analysis of variance, Student's t-test. Probability theory - Normal, Binomial and Poisson distributions (theory only).

UNIT-IV

Literature collection: Sources, Details of books, edited volumes, peer reviewed journals, e-journals, biological abstracts and Magazines. Online browsing of research articles: infonet and inflibnet .Preparation of research dissertation -components of thesis, proof reading, preparation of bibliography. Preparation of Scientific paper for publication in a peer reviewed Journal.Web of science, SCOPUS, SCI Index,Thompson Rheutter, Details of impact factor, citation index and h-index.

UNIT -V

Principles and their application of Electron Microscope (SEM and TEM), Centrifuge (Ultracentrifuge), Electrophoresis (SDS-PAGE), Chromatography (TLC, GCand HPLC) Spectroscopy (UV, Infrared and NMR).

Text Books:

BIOSTATISTICS

1. Milton J.S(1992). Statistical methods in Biological and Health Sciences. McGraw Hill Inc., New York.
2. Gupta S.P (1988). An easy approach to statistics. Chand and Co., New Delhi.

RESEARCH METHODOLOGY

1. Gurumani N (2006). Research Methodology for Biological Sciences MJP Publishers.
2. Daniel M. Basic Biophysist - student Edition.
3. Prescott. Harley. Klein. Microbiology
4. Jain J.L., Sanjay Jain and Nitin Jain. Fundamentals of Biochemistry. S. Chand publication.

Reference Books:

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1. Anderson, Durston and Polle (1970). Thesis and Assignment writing. Wiley Eastern Ltd., New Delhi.
2. Comir and Peter Wood Ford (1979). Writing scientific papers in English. Pitman Medical Publishing Co., London.
3. Day R.A (1994). How to write and publish a scientific paper. Cambridge University Press, London.
4. Palanichamy S and M. Shanmugavelu (1997). Research methods in biological sciences.Palani Paramount Publications, Tamil Nadu, India.
5. Wilson and Walker (2000). Practical biochemistry - principles and techniques. Cambridge University Press.

QUESTION PAPER PATTERN

Exam Hours : 3 **Max.marks: 75**

PART-I (Answer ALL) **20X1=20**

Q.No:1 to 20 –Objective type question: MCQ – 20

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

PART-III (Answer any THREE out of FIVE)

Q.No:26 to 30- One question from each Unit **3X10=30**

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List of courses offered in the last five years with focus on Entrepreneurship

NMEC II – APICULTURE

Objectives: To comprehend the knowledge on the apiculture (culture of honeybees)-their species diversity, natural and artificial lives, handling and, maintenance of colony and possible prospects of apiculture as self employment venture.

UNIT - I

Honey Bee: Systematic position – species of honey Bees. Bee Colony, Castes. Natural colonies.

UNIT - II

Types of Bee hives – Structure of natural beehive. Artificial beehive – different types.

UNIT - III

Apiary care and Management – selection of sites – Catching and transforming a colony – Handling and maintenance of the colony – Natural enemies and diseases of honey bees and control methods.

UNIT - IV

Instruments employed in Apiary. Newtan's hive, honey extractors and smokers.
Honey: Extraction and apiculture used – Chemical composition – nutritive and medicinal values.

UNIT - V

Present studies of apiculture in India. Prospect of apiculture as self employment venture. Preparing proposal (Layout and budget) for financial assistance of funding agencies.

Reference Books:

1. Cherian R and K. Ramanathan (1992). Bee Keeping in India.
2. Mishra R.C (1985). Honey bees and their management in India. ICAR.
3. Morse R.A (1990). The ABC and XYZ of Bee culture. 40th edn. A. I. Root and Co., Ohio.
4. Rare S (1998). Introduction to Bee keeping. Vikas Publishing House.
5. Singh S (1982). Bee keeping. ICAR.
6. Sharma P and Singh L (1987). Hand book of bee keeping. Controller printing and Stationer, Chandigarh.

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SKILL BASED II (1) AQUACULTURE

UNIT-I

Aquaculture – Importance and scope - cultivable species of fish (IMC).

UNIT-II

Types of farming: extensive, intensive and semi intensive culture, Integrated farming, induced breeding.
Construction and Management of fish farm.

UNIT-III

Culture of common carp species - Catla, Rohu, Mirgal, Freshwater prawn culture.
Ornamental fish culture - Gold fish, Angel, Guppy.

UNIT-IV

Types of feed: Feeding schedule.
Fish disease management: Common bacterisl and diseases - their symptoms and treatment (Any three in each).

UNIT-V

Harvesting and transport - Marketing: Marketing the fish to local market and for export.
Quality control and norms of MPEDA for export of fishes.
Fish processing - Canning and Freezing.

Reference Book

1. Bardasch JE., RYTHER and Mc Larrey WO (1972). Aquaculture: The farming and husbandry of Freshwater and marine organisms. Wiley interscience.
2. Jhinngran VG (1982). Fish and fisheries of Indian. Hindustand Publishing.
3. Pillai T.V.R (1995). Aquaculture principles and practices. Fishing new Books, Blackwell Science Ltd., Oxford.
4. Ramasamy P (1992). Diseases of Shrimp in aquaculture systems. Vanitha Publications.
5. Santhanam R (1987). Fisheries Science. Data publishing house.
6. Santhanam R (1997). Manual of Fresh water Aquaculture. Oxford and 1BH Pub. co. Ltd., New Delhi.

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PART-IV-VERMICULTURE–NMECI

TheoryHours	:	2	Course Code	:U21Z3NME1:1
PracticalHours	:	--	Credits	:2
ExamHours	:	3	Marks	:25+75

UNIT-I

Earthworms - Morphological and anatomical characteristics - Ecological Classification -Saprophages,Geophages,Epigeic,EndogeicandAnaecicforms.

UNIT–II

Selectionofsuitableearthwormspeciesforvermicomposting-Biologyofcompostingearthworms-*Eudriluseugeniae*and*Lampitomauritii.*

UNIT-III

Soil organic matter decomposition - earthworms and humus formation - Sources of organicwastes-problemsintraditionalcomposting-Importanceofvermicomposting.

UNIT-IV

VermicultureandVermicomposting-smallscaleandlargescalevermicomposting-requirements - phases - methods: Pit, Box, Heap and windrow - collection of vermicompostandvermicast-Principles-Precautions-Factorsaffectingvermicomposting.

UNIT-V

Applications of vermicompost in agricultural and horticultural practices - Economics ofvermicomposting-Financialsupports-Eligibilityforfinancialsupport.

ReferencesBooks:

1. RamalingamR(2006).ManpuzhuvalarppuTamilNaduHigherEducationBoard,Chennai.
2. EdwardsC.AandP.J.Bohlen(1996).EcologyofEarthworms.3rdEdition.ChapmanandHall.
3. IsmailS.A(1970).Vermicology.TheBiologyofEarthworms.OrientLongman,London.
4. LeeK.E(1985).Earthworms-TheirecologyandRelationshipwithsoilandLanduse.AcademicPress.Sydney.

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NMECII –APICULTURE

TheorvHours	: 2	Course Code:U21Z4NME2:1	

SKILL BASED ELECTIVE COURSE II
AQUARIUMFISHKEEPING

PracticalHours	: --	Credits	:2
ExamHours	: 3	Marks	:25+75

UNIT– I

HoneyBee:Systematicposition-speciesofhoneyBees.BeeColony,Castes.Naturalcolonies.

UNIT-II

TypesofBeehives -Structureofnatural beehive.Artificialbeehive-differenttypes.

UNIT-III

Apiary care and Management - selection of sites - Catching and transforming a colony -Handling and maintenance of the colony - Natural enemies and diseases of honey bees andcontrol methods.

UNIT-IV

Instruments employed in Apiary. Newtan's hive, honey extractors and smokers.Honey: Extraction -Chemicalcomposition -nutritiveand medicinal values.

UNIT-V

PresentstatusofapicultureinIndia.Prospectusofapicultureasselfemploymentventure.Preparingproposal(Layoutandbudget) forfinancialassistancefromfundingagencies.

ReferenceBooks:

1. MishraR.C(1985).Honeybeesandtheirmanagement inIndia.ICAR.
2. MorseR.A(1990).The ABCand XYZof Beeculture.40thedn. A.I.Rootand Co., Ohio
3. RareS(1998).IntroductiontoBeekeeping.VikasPublishingHouse.
4. SinghS(1982).Beekeeping. ICAR.
5. SharmaP and L Singh (1987). Hand book of bee keeping. Controller printing andStationery,Chandigarh.

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SKILL BASED ELECTIVE COURSE II
AQUARIUMFISHKEEPING

	COURSECODE: U215ZOSE2		Credits 2Marks		TOTAL
	Instructio nHours	Examhours	Internal	External	
Theory	1	2	20	-	100
Practical	1	2	20	60	

(1HourTheory and1HourPractical)

Objectives: To learn the culture practices and methods in ornamental fishes along with popularornamentalfishes,massproductionthroughbreedingtechniques,foodandfeedinganddisea semanagement.

UNIT-1

Importance and scope of the ornamental fish culture - commercial and potential values ofornamental fish farming in the world and in India. Significance features of ornamental fishes(ZebraFish, Gold Fish, Angelfish, Mollyand Guppy),

UNIT-II

Feeding recruitment for ornamental fishes, Mass production of fancy fishes through fishfarming- Preparation for breeding, Live feed culture: rotifers, tubifex, artemia and artificialfeedproduction:ingredients, pelletizer.

UNIT– III

Aquarium design, construction and preparation- Size, Shape, Substrate, Ornamental aquaticplants, hood and lights, nets, suction tube and maintenance of water quality: controllingammonia, pH, Disease management: common viral (lymphocytosis), bacterial (fin rot, fishdropsy, pop eye), fungal (saprolegnia) and parasites (velvet disease, head and lateral lineerosion) infectionsandtheirtreatmentandcontrol.

PRACTICAL

UNIT- IV

1. Identificationofhatchlingandfingerlingsofornamentalfishspecies.
2. Identificationofmaleandfemaleofornamentalfishspecies.
3. Reproduction:inducedbreeding
4. Techniquesoflivefeedculture:rotifers,tubifex,artemia.
5. Formulatedfeedpreparations–pellet.

UNIT- V

1. Aquariumtankdesigning.
2. Waterqualityparameters:temperature,DO,salinity,pHandammonia.
3. Identificationofdiseasedfisheswithmorphologicalchanges.
4. Control measuresfordiseases.
5. Reportsubmissionbasedonfieldvisit–Fishfarm/Feedmill

ReferencesBooks:

2. RathR.K (2000).Freshwater aquaculture.ScientificPublishers(India).P)OBox 91,Jodhpur.
3. JhingaranAVG(1991).FishandfisheriesofIndia.HindustanPublication Company.
4. Jameson,JDandRSanthanam(1996).Manualofornamentalfishesandfarmingtechnology. FisheriesCollege and Research Institute,Thoothukudi
5. MichaelBeazley(1998).Completeguidetotropicalaquariumfishcare.Readandconsumebo okLtd. London.

QUESTIONPATTERN

THEORY -5 X 2=10 MARKS, 2 X 5=10 MARKS(TWO OUT OF FIVE)PRACTICAL– 60 MARKS

ONEMAJORPRACTICALFOR20MARKSAND

ONE MINOR PRACTICAL FOR 10 MARKS +RECORD 10+VIVA-5 +SUBMISSION OFREPORT=15

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TheoryHours	:	6	CourseCode		:U21Z6MBE2:3
PracticalHours	:	--	Credits		:5
ExamHours	:	3	Marks		:25+75

Objectives: Tounderstandthemethodsoffishprocessingtechniquesthroughthenutritionalproperties, role of microbes on the spoilage of fishes, fresh fish handling preservation and canningmethodsduringfish preservation.

UNIT– I

Fish Biochemistry – nutritive components of fish. Nutritive enzymes and their role in fi
fi

UNIT– I

Fish Microbiology - Microbial spoilage of fish - plant sanitation - importance - regulatorymeasures, Microbial spoilage of fish - pant sanitation - importance - regulatory measures,microbial flora invarious type of semi-processedandprocessed fisheryproducts.

UNIT– III

Freshfishhandlingandpreservation:Mechanismofspoilage-(Fishanalysis,bacterialchemicalreactions).Handlingoffishonboardandshore-useoficeandsalt,useofantibioticsand chemicals.

UNIT– IV

Freezing of fishes - different techniques -physico chemical changes and nutritional changesduringfreezing-spoilage of frozen fish.

UNIT-V

Preservation of fishes - Canning of fishes - preservatives, additives and pickle salting - saltingoffish-Indian curing-smokingof fish-hotand coldsmoking-smokingmethods.

ReferenceBooks:

1. BiswasKP(1980). Atextbookof fish, fisheriesandTechnology. Narendrapublishinghouse.
2. GopakumarK(2000).Tropicalfisheryproducts.OxfordandIBH.
3. GovindanTK(1992).Fishprocessingtechnology.OxfordandIBH.
4. Mpeda(1995). Driedfishandfisheryproducts.
5. SanthanamR(1987).Fisheriesscience. DayapublishingHouse.
6. WintonALandWintonKB(1993).Fishandfishproducts.AgroBotanicalPublishers.

Courseoutcomes

MAJORBASEDELECTIVECOURSEII-(3)

VALUEADDITIONOFFISHPRODUCTSAND PROCESSING

QUESTIONPAPERPATTER

ExamHours 3 Max.marks:7

PART-I(AnswerALL)20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match thefollowing-5

PART-II(EitherOR)

Q.No:21to25 -One questionfromeach 5X5=2

PART-III(AnsweranyTHREE)

Q.No:26 to30 -One questionfromeach Unit(3outof 5) 3X10=3

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MAJORBASEDELECTIVECOURSEIII- (2)POULTRY FARMING

TheoryHours	:	5	CourseCode		:U21Z6MBE3:
PracticalHours	:	--	Credits		:5
ExamHours	:	3	Marks		:25+75

Objectives: Tofamiliarizethestudentsinlearningthepoultrysciencethroughidentificationofstocks,poultryhousing, manure preparation,and managementaspects.

UNIT– 1

Introduction - Progress of Poultry industry in South India. Some common types of poultrybirds- Plymouth rock, Light Sussex, Minorca, Rhode island Red and White leghorn, theiradvantageous features - choosing commercial laying stock - Poultry housing - The deep littersystem-Poultrymanure.

UNIT– II

Management-practicalaspectsofchickrearing-Managementofgrowers,layersandbroilers -Lightingand temperature-Summer and WinterManagement-Debeaking.

UNIT– III

PoultryNutrition-Requirements -Food additives -Food stuffsfor Poultry-Feed ingredients.

UNIT-IV

Factors affecting egg size - storage, preservation methods, marketing - grading - economics ofpoultryproduction-maintenanceoffarmrecordsand accounts.

UNIT–V

Diseasesofpoultrybirdsandtheircontrolmeasures–etiology,symptoms.

Referencebooks:

1. Bioster S(1989).DiseasesofpoultryOxfordandIBH.
2. FelwelandFox(1992).Practical Poultryfeeding.ELBSEdition.
3. JullMA(1972).PoultryHusbandry.TataMcGrawHill
4. GanamaniK.(1997).ModernaspectsofPoultrykeeping.HytonePublishers,Madurai.
5. Sastry, Thomas and Sigh (1982). Farm Animals Management and poultry production. VikasPublishinghouse.
6. SighJandMoreEN(1982).Livestockandpoultryproduction.PrenticeHall ofIndia.

QUESTIONPAPERPATTER

ExamHours 3 Max.marks:7

PART-I(AnswerALL)20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match thefollowing-5

PART-II(EitherOR)

Q.No:21to25 -One questionfromeach 5X5=2

PART-III(AnsweranyTHREE)

Q.No:26to30 -One questionfromeach Unit(3 outof 5) 3X10=3

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List of courses offered in the last five years with focus on Skill Development

Core-V-CELLBIOLOGY

TheoryHours	:	6	CourseCode		:U21ZC305
PracticalHours	:	--	Credits		:5
ExamHours	:	3	Marks		:25+75

Objectives: Tounderstandthestructureandfunctionsofcellularorganelles-theirultrastructureandapplicationsof microscopefor better understandingofmolecularstructure of cells.

UNIT-I

The cell - Definition, Cell theory, types of cells, size, shape, volume and number.Detailedstudyof cellstructure. Prokaryoticandeukaryotic cells. Microscopes- Compound, fluorescent and Electron.CentrifugeandElectrophoresis.Principleandapplicati ons.

UNIT-II

Plasma membrane - Ultra structure & Functions.Cytoplasm - Composition and physicochemical properties.Golgi complex-Ultra structureand Functions.

UNIT-III

UltrastructureandfunctionsofEndoplasmicreticulum,ribosomes-mitochondriaandLysosome.

UNIT-IV

Interphase nucleus-Ultrastructureandfunctions.
Chromosomes-Ultrastructure,typesandfunctions-Giantchromosomes.

UNIT-V

Cellcycle-celldivision-Amitosis,MitosisandMeiosis.
Cancer:TypesandCharacters.

ReferenceBooks:

1. VermaP.SandAgarwal,V.K(2016).CellbiologyS.Chandand&CompanyPVT,LTD,NewDel hi.
2. Power,C.P.(1983).Cellbiology.Himalayapublishinghouse,PVT,LTD,Mumbai.
3. Gupta,P.K.(2018).Cellbiology,RastogiPublications,Meerut.
4. Rastogi,S.C.(2011).CellandMolecularbiology,NewAgeInternational(P),LTD,Publishers, New Delhi.
5. RobertM.Dowben(1971).Cellbiology,Harper andRow,Publishers,London.
6. GeofereyM.CooperandRobertE.Hausman,(2007).Thecell,Amolecularapproach,Fourthedit ion, ASM Press, Washington, D.C.
7. SundaraRajan.S,(1998).Introductiontocellbiology,VikasPublishingHouse,PVT,LTD,New Delhi.

QUESTIONPAPERPATTER

ExamHours 3 Max.marks:7

PART-I(AnswerALL)20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match thefollowing-5

PART-II(EitherOR)

Q.No:21to25 -One questionfromeach 5X5=2

PART-III(AnsweranyTHREE)

Q.No:26 to30 -One questionfromeach Unit(3 outof 3X10=3

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Core-VI–CELLBIOLOGYPRACTICAL

CourseCode	:U21ZC306P			
PracticalHours	:	3	Credits	:2
ExamHours	:	3	Marks	:40+60

MajorPractical

1. Onionroottip-Squashpreparationandstudyofmitoticstages
2. Mountingofpolytenechromosomeinchironomouslarva.
3. Measurementofcellsusingstageandocularmicrometers.

Minorpractical

1. Handlingofdissectionandcompoundmicroscopes
2. Preparationandobservationofsquamousepithelialcells.
3. Seperationofcellsfromchickenliver tissueorbloodusingcentrifugation.

Spotters: Epithelial (3 types), muscular (3 types), Vascular (2 types) and nervous tissues.Centrifuge,Electrophoresis, Cellcycle,USBCamera.

Courseoutcomes

CO1:Acquire knowledge ofhandle microscopes.
CO2: Familiarize with cellular structure and functions.
CO3: Understandthe eventsin cell division.
CO4:Understandthedifferent structureandfunctionsofvarioustissues.
CO5:Update the knowledge ofprinciple and application ofdifferentequipmentsused in cellbiologylabs.

QUESTIONPAPERPATTER

ExamHours 3	Max.marks:6
QUESTIONNO.I–	15Marks
QUESTIONNO.II–	10Marks
QUESTIONNO.IV–4Spotters	5X4 MARKS=20Marks
Recor	10Marks
Viv	5Marks

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SKILLBASED I (1) AGRICULTURAL PEST MANAGEMENT

UNIT – I

Introduction – Types of damage to plants by Insects – Direct and indirect effects – Types of insect pest – Assessment of insect population.

UNIT – II

Insect pests of crops – paddy, sugar cane, Coconut and Cotton.

UNIT – III

Methods used in pest control – Physical, mechanical, chemical and Biological methods used to control insect pests, IPM, -Biological pesticides NPV, CVP-Predators Bell.

UNIT – IV

Birds: Damage causing birds - Parakeet, Munia, sparrow, Pigeon, teals biological control measures – Beneficial birds: bee –eater, drango and owls.

UNIT – V

Filed Rodents – Biology and control measures of Bandicoot, soft fured filed rat, Filed mouse, Indian gerbil and house rats.

Reference Books:

1. Chapman R.F (1993). The Insects. Structure and Functions. ELBS. London
2. Chandler A.C and Read C.P (1961). Introduction to Parasitology. John Wiley and Sons, New York.
3. David B.V., Muralirangan N.C and Meera Muralirangan (1992). Hamful and beneficial Insects. Popular book Depot.
4. David B.V and T. Kumaraswami (1998). Elements of Economic Endomology. Popular Book Depot., Chennai.
5. David B.V (1992). Pest management and Pesticides. Indian Scenario Namrutha publications.
6. Krishnan N.T (1993). Ecolomic Entomology. J.J. Publications, Chennai.
7. Mani M.S (1973). General Entomology. Oxford and Delhi.
8. Nayar K.K., Ananthakrishnan T.N and David, V.D (1990). General and applied Entomology. Tata Mc Grow Hill. New Delhi.

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Core Course X- PRACTICAL

EVOLUTION, DEVELOPMENTAL BIOLOGYAND IMMUNOLOGY, ANIMAL PHYSIOLOGY

Evolution

1. Animal of evolutionary significance - Peripatus, Archaeoptergys.
2. Homologous organ - Fore Limb modification.
3. Analogous organ - Wings of insect and bird.
4. Colouration - Chameleon, Lycodon and Krait.
5. Mimicry - Leaf insect, Stick insect, Monarch and Viceroy Butterfly.

Developmental Biology

1. Observation of prepared microslides to study the following.

Frog: Egg, Cleavage, Blastula, Yolk Plug stage.
Chick: Egg, Developmental stages 24, 48, 72, 96, Yolk sac placenta.

Animal Physiology

1. Salivary amylase activity of human saliva in relation to Temperature.
2. Qualitative tests for Ammonia, Urea and uric acid.
3. Enumeration of RBC.
4. Enumeration of WBC.
5. Haemoglobinometer, Kymograph, Sphygmomanometer (Spotters).
6. Models of haemoglobin and ATP.

Immunology

Dissections – Immunological Organs in fish (demonstration only).
ABO Blood grouping.
Spoters: IgG,Thymus.

Biostatistics

1. Calculation mean, median, mode, standard deviation, Standard error for any one animal data.
2. Diagramatic representation (Pie and Bar) of data collected among class students (Hb, Height, Weight).

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ECOLOGY

UNIT - I

Ecology: Definition, scope and branches. Abiotic factors: water, soil, temperature, light. Biotic factors: Animal relationship - symbiosis, commensalism, mutualism, antagonism, antibiosis, parasitism, predation and competition.

UNIT - II

Ecosystem: Definition, ecological hierarchy, A typical ecosystem: Pond ecosystem, Primary production, Secondary production, food chains, food web, Trophic levels, energy flow, pyramids of biomass and energy - Biogeochemical cycles- nitrogen and phosphorus.

UNIT - III

Community ecology: Types and characteristics - stratification - community interdependence - ecotone - edge effect - ecological niche - ecological succession. Population ecology: Definition, density, natality, mortality, age distribution, age pyramids, population growth, population equilibrium, biotic potential, dispersion and fluctuation.

UNIT - IV

Habitat Ecology: Habitat characteristics and fauna and its adaptation in rivers, muddy, rocky, mangroves, estuaries and deep sea, forest, desert, cave.

UNIT - V

Environmental pollution - sources, effects of air, water, soil and noise pollution.
Bio accumulation, bio magnification and bio remediation.
Wild life and conservation - IUCN categorization, *in situ* and *ex situ* conservation.

Reference Books:

1. Bernis Anandharaj and Soolnilaiyiyal. Chrisolite publications. Adyar, Chennai.
2. Odum E.P (1971). Fundamentals of ecology. W.B Saunders Company, Philadelpnia.
3. Kendeigh S.C (1961). Animal ecology. Prentice Hall.
4. Clarks GL (1954). Elements of Ecology. John Wiley and sons Newyork.
5. Purohit S.S., Shami DH and Agarval A.K (2004). Environmental sciences - A new approach. Agrobi, Jodhpur.
6. Krishnamurthy K.V (2003). Introduction to Biodiversity. Oxford and IBH.

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Core-VI–CELLBIOLOGYPRACTICAL

CourseCode	:U21ZC306P			
PracticalHours	:	3	Credits	:2
ExamHours	:	3	Marks	:40+60

MajorPractical

4. Onionroottip-Squashpreparationandstudyofmitoticstages
5. Mountingofpolytenechromosomeinchironomouslarva.
6. Measurementofcellsusingstageandocularmicrometers.

Minorpractical

4. Handlingofdissectionandcompoundmicroscopes
5. Preparationandobservationofsquamousepithelialcells.
6. Seperationofcellsfromchickenliver tissueorbloodusingcentrifugation.

Spotters: Epithelial (3 types), muscular (3 types), Vascular (2 types) and nervous tissues.Centrifuge,Electrophoresis, Cellcycle,USBCamera.

CORE COURSE XI- BIOTECHNOLOGY

Objectives: To acquire knowledge as the application of biotechnology as various fields – gene cloning, gene transfer technique, cell culture, fermentation and bioremediation for the industrial wastes.

UNIT-I

Scope and achievements in Biotechnology
Gene cloning - the basic steps - various types of restriction enzymes - ligase, linkers and adaptors - Selection of recombinants. Hybridization techniques chemical synthesis of oligonucleotides. cDNA and Genomic library.
Gene probe - Molecular finger printing (DNA finger printing) - RFLP - the PCR techniques - Blotting techniques - Southern blotting - Northern blotting - Western blotting. Nucleic acid sequencing - Maxim and Gilbert method.

UNIT-II

Plasmid biology - cloning vector based on *E.coli*, PBR 322, bacteriophage yeast Artificial Chromosome, *Agrobacterium tumefaciens*, Simian virus 40 - Gene transfer technology - Particle bombardment - Micro injection techniques.

UNIT-III

Basic principles of Cell culture, Tissue culture and Organ culture. Whole embryo culture - Embryo transfer in human. Transgenic animals - mice, fishes and Dolly - Gene therapy - Cryopreservation.

UNTI-IV

Fermentation - bioreactor - Microbial products - Primary and Secondary Metabolites - enzyme technology - single cell protein (SCP). Biopolymers,Biopesticides and Biofertilizers.

UNTI-V

Bioremediation - bioremediation of hydrocarbons - Industrial wastes - Heavy metals - Xenobiotics - bioleaching - biomining - biofuels.
Applications of biotechnology in agriculture, medicine and food science. Genetically modified organism (GMO'S) - GM foods.
Biotechnology and biosafety – Ethics and Intellectual Property Rights (IPR).

Recommended Text Books:

5. Dubey R.C (2008). A text Book of Biotechnology.S.Chand and Company, New Delhi.
6. Sathyanarayana U (2005). Biotechnology.Books and Allied P.Ltd. Kolkata.

References Books:

8. Brown C.M., Campbel I and Priest F.G (1988). Introduction to Biotechnology. Blackwell Scientific Publications, UK.
9. Primrose S.B (2000). Modern Biotechnology. Blackwell Scientific Publications,Oxford, London.
10. KeshavTrehan (1996). Biotechnology. New Age International Pvt. Ltd.Publishers, New Delhi.
11. Watson *et.al*., (1999). Recombinant DNA. Freeman and Company, New York
12. Ignacimuthu S (1998). Basic Biotechnology. Tata McGraw Hill Publishing Co., New Delhi.

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CORE COURSE X - MICROBIOLOGY

UNIT - I

Scope and history of microbiology - Classification of microorganisms - Microbial diversity, general methods of classifying bacteria, fungi, algae and virus. Morphology and fine structure of bacterial cells - cell wall and peptidoglycan in Gram positive and Gram negative bacteria - Reproduction of bacteria, and viruses (lytic and lysogeneic cycles).

UNIT- II

Bacterial growth and nutritional requirements, nutritional media and growth conditions; methods for culturing microbes - culture media - microbial growth; Isolation of pure culture. SPC and MPN techniques.

UNIT - III

Industrial microbiology - Biochemistry of fermentation, fermentation products, , production of ethanol, Pharmaceuticals - antibiotic, vitamins, microbial enzymes and vaccines.

Food microbiology - Food spoilage and food preservation techniques.

UNIT- IV

Environmental microbiology - nitrogen fixation (symbiotic and non-symbiotic) mechanism of nitrogen fixation, carbon, nitrogen, sulphur and phosphorous cycle.

Water microbiology - bacteriological examination of domestic water, purification of water, sewage and its disposal, Aeromicroflora of hospitals.

UNIT - V

Medical microbiology - Microorganisms and infectious diseases Epidemiology, symptoms, clinical types and therapy of Fungal (Mycoses and Mycotoxicoses), Bacterial (Tuberculosis, typhoid) and viral (Dengue, Hepatatitis, HIV) diseases.

Recommended Text Books:

1. Pelczer M.J., Reid R.D and Chan E.C.S (1996). Microbiology. V Ed., TataMcGraw Hill Publishing Company Ltd., New Delhi.
2. Ananthanarayanan T and Jayaram Paniker C.K (2000). Text Book of Microbiology. VI Ed., Orient Longman Ltd., Madras.

References Books:

1. David Freifelder (1998). Microbial Genetics. Narosa Publishing House, NewDelhi.
2. Powar C.B and Diginawala H.F (1982). General Microbiology. Volume I and II, Himalaya Publishing House, Bombay.
3. Michael T. Madigan, John M. Martinkl and Jack Parker (1997). Biology of Microorganisms. VIII Ed., Prentice Hall International Inc., USA.

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CORE COURSE XII - PRACTICAL– III

DEVELOPMENTAL BIOLOGY AND EVOLUTION, MICROBIOLOGY, BIOTECHNOLOGY, BIOSTATISTICS AND RESEARCH METHODOLOGY

A.DEVELOPMENTAL BIOLOGY

1. Whole mount of chick embryo – 24hrs, 36 hrs, 72hrs and 96 hrs
2. Observation of prepared slides for developmental stages
3. Effect of thyroxine on metamorphosis of tadpoles
4. Observation of regeneration in tail of tadpoles

B. EVOLUTION

1. Observation of forelimbs or hind limbs of vertebrates (Frog, Calotes, Bird and Mammal) to demonstrate the common pattern of pentadactyl limb and common ancestry of vertebrates.
2. Report on evidences for evolution based on your observation.
3. Observation of leaf insects and stick insects in the museum to demonstrate adaptation by cryptic colouration and natural selection.
4. Observation of Monarch and Viceroy butterflies to demonstrate Batesian mimicry.
5. Spotters: Archeoptery, Grand Canyon, Limulus, peripatus and fossils.

C. BIOTECHNOLOGY

1. Isolation of genomic DNA
2. Agarose gel electrophoresis of DNA

Spotters: PCR, southern blotting, vectors, transgenic animals

D. MICROBIOLOGY

1. Culture techniques – culture of bacteria
2. Bacterial growth curve
3. Enumeration of bacteria by serial dilution
4. Enumeration of bacteria by counting method
5. Antibiotic susceptibility test.
6. Milk purity test by MBR method

Spotters: Laminar air flow, inoculation needle, Autoclave, Incubator

F. BIOSTATISTICS

1. Collection of data (Height, Weight, Blood group, Hb, BMI) from class,
2. Analysis of data using Microsoft excel

G. RESEARCH METHODOLOGY

1. Preparation of bibliography for research paper

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ELECTIVE COURSE III - BIOSTATISTICS AND RESEARCH METHODOLOGY

A. BIOSTATISTICS

UNIT-I

Introduction - scope and definition, functions and limitations of statistics. Collection, organization (classification and tabulation of data) and presentation (graphical representations) of data. Measures of central tendency - mean, median and mode. Measures of dispersion - range, inter quartile range, mean deviation, standard deviation and Standard error.

UNIT - II

Skewness and kurtosis, measures of skewness, Karl-Pearson's coefficient of skewness, Bowley's measures of skewness, types of coefficient of skewness, types of kurtosis, Correlation analysis (Karl-Pearson's) - types and methods, Regression analysis - regression line and regression equation.

UNIT - III

Hypothesis testing, Chi-square test, One-way Analysis of variance, Student t-test. Probability theory - Normal, Binomial and Poisson distributions (theory only).

B. RESEARCH METHODOLOGY

UNIT-IV

Literature collection: Source, preparation of Index card, Details of books, edited volumes, peer reviewed journals, e-journals, biological abstracts and Magazines. Online browsing of research articles: infonet and inflibnet. Preparation of research dissertation - components of thesis, proof reading, preparation of bibliography. Preparation of Scientific paper for publication in a peer reviewed Journal. Details of impact factor, citation index and h-index.

UNIT -V

Principles and their application of Electron Microscope (SEM and TEM), Centrifuge (ultracentrifuge), Electrophoresis (SDS-PAGE), Chromatography (TLC, GC and HPLC) Spectroscopy (UV, Infrared and NMR).

Recommended Text Books:

BIOSTATISTICS

3. Milton J.S(1992). Statistical methods in Biological and Health Sciences. McGraw Hill Inc., New York.
4. Gupta S.P (1988). An easy approach to statistics. Chand and Co., New Delhi.

RESEARCH METHODOLOGY

5. Gurumani N (2006). Research Methodology for Biological Sciences MJP Publishers.
6. DanielM. Basic Biophysist - student Edition.
7. Prescott. Harley. Klein. Microbiology

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8. JainJ.L., Sanjay Jain and Nitin Jain. Fundamentals of Biochemistry. S. Chand publication.

Reference Books:

6. Anderson, Durston and Polle (1970). Thesis and Assignment writing. Wiley Eastern Ltd., New Delhi.
7. Comir and Peter Wood Ford (1979). Writing scientific papers in English. Pitman Medical Publishing Co., London.
8. Day R.A (1994). How to write and publish a scientific paper. Cambridge University Press, London.
9. Palanichamy S and M. Shanmugavelu (1997). Research methods in biological sciences.Palani Paramount Publications, Tamil Nadu, India.
10. Wilson and Walker (2000). Practical biochemistry - principles and techniques. Cambridge UniversityPress.

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CORE COURSE XIII - ECOLOGY AND ETHOLOGY

UNIT- I

Ecology: Scope of Ecology - kinds of Ecosystem; Structure of Ecosystem - Abiotic (Temperature and Soil) and Biotic component. Liebig's law of Minimum, Shelford law of Tolerance. Ecological pyramids - Pyramids of numbers, biomass, energy. Function of an Ecosystem - productivity of Ecosystem, Food chain, Food webs - Energy flow in Ecosystem. Biogeochemical cycle – Carbon and Nitrogen.

UNIT- II

Population Ecology: Density, Dispersion, Age structure, Natality, Mortality, Dispersal, Dispersion, Regulation of population density, Population interactions - Animal associations.

Community Ecology: Structure, Stratification, Periodicity, Interdependence, Ecological niche, Ecotone, Edge effect, Succession, Climax.

UNIT –III

Pollution - Ecological Aspects of Pollution, kinds of pollution - (Air,water,Soil,Noise, Thermal, Radiation, Plastics and Pesticides,) and their source, effects and control measure. Acid Rain- Green house effect- Ozone and its importance- Global warming. Environmental Impact Assessment – Need, Methods.

UNIT – IV

Animal behavior: Definition of Ethology - Approaches to behavioral study (Field and Laboratory methods). Types of behavior: Innate - Reflexes, Taxes Instincts, Acquired behavior- Habituation, Imprinting, learning (Conditioning , trial and error, insight or reasoning).

UNIT-V

Animal behaviour: Feeding and Anti predator behaviour, Aggressive behaviour, Sexual behaviour and Selection, Family and group behaviour, Dominance behaviour.

Animal Communication: Visual, Olfactory, Auditory, Tactile and Chemicals.

Reference Books:

1. Veer BalaRastogi and Jayaraj M.S. Animal Ecology and distribution of animals - Eighth edition-KedarNath Ramnath Publications, Meerut.
2. Gundevia H.S and Hare Govind Singh (1998). A text book of Animal Behaviour - S. Chand and Company Ltd, New Delhi.
3. Sharma P.D (2008-2009). Ecology and Environment-Rastogi Publications. New Delhi.
4. Verma P.S and Dr.Agarwal .V.K (1983). Environmental Biology- S. Chand and Company Pvt. Ltd – New Delhi.
5. MathurReena (1998). Animal behavior. Rastogi Publications, Meered.

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COURSE XIV - PRACTICAL – IV

ECOLOGY, ETHOLOGY AND BIODIVERSITY

APPLIED ECOLOGY

1. Maintenance of microcosms.
2. Determination of pH, dissolved oxygen, salinity, and free CO2 in water.
3. Determination of carbonates and bicarbonates in water.
4. Estimation of chlorides in water.
5. Estimation of dissolved solids in water, plankton and Insects.
6. Visit to drinking water treatment plants.
7. Visit to nearest Forest ecosystem.
8. Study of a Pond ecosystem - Mahamaham tank and write a report on its biodiversity.
9. Effect of pollutants on primary productivity.

SPOTTERS

Secchi disc, Water analyzer.

ETHOLOGY

1. Observation of habituation in Pila.
2. Observation of taxis in earthworms.

BIODIVERSITY

1. calculation of shanon index.
2. calculation of plankton biodiversity.

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ELECTIVE COURSE –IV BIODIVERSITY AND CONSERVATION

UNIT - I

Biodiversity: Concept and definition - Scope of Biodiversity science -Types of biodiversity - Genetic, Species, Ecosystem and Agrobiodiversity. Biodiversity values and uses - Ethical, Asthetic, Ecological, Cultural Benefits. Methodologies for valuation of Biodiversity (Changes in productivity method, Contingent valuation method and Hedonic pricing method), diversity assessment (Shannon Weiner Index).

UNIT-II

Loss of Biodiversity: Genetic diversity - Factors causing for loss, Founder effects, Demographic Bottlenecks, Genetic Drift, Inbreeding depression. Species diversity-extinction, population size. Ecosystem diversity- Factors affecting Ecosystem degradation and loss. Agrobiodiversity – loss of Biodiversity as an Economic process-Hot spots of Biodiversity.

UNIT -III

Conservation of Biodiversity: Current practice in conservation -*In -Situ* Conservation; Sanctuary, National parks and Biosphere reserves. Ex-Situ Conservation: Zoological park, Botanical Garden, Germplasm collections (Seed banks, Test-tube Gene banks, Pollen banks, Field Gene bank, DNA Bank). *in-vitro* Conservation methods – Ecosystem restoration. Social Approaches to conservation - Sacred Groves, Sthalavrikshas, Chipko movement. Role of Educational Institution in Biodiversity and Conservation.

UNIT –IV

Management of Biodiversity: IUCN, UNEP, UNESCO, WWF, ICSU, FAO, CAB International WCMC, ISBI, GEF, WHF. Biodiversity Legislation and Conservations (International and National-Laws) CITES, Ramsar Conservation, UPOV, ITTA and ITTO. IUCN threat categories. Red data book. Remote sensing-basic concepts and applications in environmental conservation.

UNIT –V

Biotechnology and its role and impacts in Biodiversity - Ecoterrorism, Data and Information Relating to Biodiversity of India, Protected areas in India- The silent valley movement- Biopiracy-Biodiversity information networks in India. Problems and prospects in participatory management of Biodiversity.

Recommended Text Books:

1. Krishnamoorthy K.V (2004). An Advanced text Book on Biodiversity. Oxford and IBH Publishing Co.Pvt.Ltd New Delhi
2. Sharma P.D (2008-2009). Ecology and Environment- Rastogi Publications, New Delhi.
3. Verma P.S and Agarwal V.K (1983). Environmental Biology. S. Chand and Company Pvt. Ltd, New Delhi.

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1.FISHERIES AND AQUACULTURE

THEORY HOURS : 5	**COURSE CODE : P21Z1MBE1:1**
PRACTICAL HOURS:	**CREDITS : 4**
EXAM HOURS : 3	**MARKS : ESE-75/CIA-25**

Objectives:

1. To gain the current perspectives on the aquaculture principles and practices,
2. To give knowledge on water quality management and fish harvest technology.
3. To understand the capture fisheries and culture fisheries.

UNIT-I

Inland Fisheries: Present status and scope of Inland fisheries - commercially important fishes - Food and feeding habits of Indian major carps - Age and growth - Scale methodand length - weight relationship.

UNIT-II

Culture Fisheries: Present status and scope of culture fisheries – criteria for selection of cultivable species - Biology of important cultivable fishes - *Catlacatla, Labeorohita, Cirrhinusmrigala, Channastriatus,* and*Latescalcarifer*. Marketing of cultured fishes-Major diseases (Viral, Bacterial, Fungal and Parasites)causes, symptoms and treatments.

UNIT-III

Aquaculture Principles and Practices: Aquaculture-types of culture - fish farm - types of ponds – preparation of ponds, maintenance and management – types of feed - live feed(rotifers, artemia) - predators -induced breeding -hypophysation - factors of induced spawning-transport of fish seed.

UNIT-IV

Water Quality Management: Physical Factors– Transperancy, temperature-Chemical Factors - dissolved oxygen,Carbondioxide, Salinity and pH, Biological oxygen Demand - Biological Factor - Plankton - Nutrients - Assessment of water Quality - Discolouration of water –Bloom crash, Mass mortality of fishes.

UNIT-V

Fish Harvest Technology: Inland Fishing gears and crafts, handling,Processing and preservation of fish - fishery by-products - marketing and economics.

TEXT BOOKS:

1. RamasamySanthanam, N.Sugumaran and P. Natarajan (1987). A Manual of Fresh water Aquaculture. Oxford& IBH PublishingCompany Ltd., New Delhi.
2. C.B.L.Srivastava,Sushmasrivastava,(2006),A text book of Fishery Science& Indian Fisheries,KitabMahat Publishers.
3. ICAR(2006),Handbook of Fisheries and Aquaculture Indian Council of Agricultural Research,New Delhi.

REFERENCES:

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1. Pillay T.V.R (2005).Aquaculture principles and practices. Fishing new Books, Blackwell Science Ltd.,Oxford.
2. Jhingran, V.G.,(1991). Fish and Fisheries of India.Hindustan Publishing Corporation,

NewDelh

QUESTION PAPER PATTERN	
Exam Hours : 3	**Max.marks: 75**
PART-I (Answer ALL)	**20X1=20**
Q.No:1 to 20 –Objective type question: MCQ – 20	
PART-II (Either OR)	
Q.No:21 to25 - One question from each Unit	
PART-III (Answer any THREE out of FIVE)	
Q.No:26 to 30 - One question from each Unit	**3X10=30**

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2.REPRODUCTIVE ENDOCRINOLOGY

THEORY HOURS : 5	**COURSE CODE : P21Z1MBE1:2**
PRACTICAL HOURS:	**CREDITS : 4**
EXAM HOURS : 3	**MARKS : ESE-75/CIA-25**

Objectives:

To gain the knowledge on structure and functions of male and female reproductive endocrine glands and their hormonal regulation.

UNIT – I

General endocrinology: Structure of endocrine glands - secretion of pituitary, thyroid, pancreas, adrenal, ovary and testis – factors influencing secretion – endocrine disorders.

UNIT- II

Male reproductive system: Testis – structure, spermatogenesis, spermiogenesis, steroidogenesis, endocrine, paracrine and autocrine regulation.
Epididymis: structure and function and regulation**.**
Accessory sex organs – prostate, seminal vesicles, bulbo urethral gland - structure, function and regulation.

UNIT- III

Ovary: Structure, folliculogenesis, ovulation – Sources of ovarian hormones, ovarian androgen, inhibit – endocrine regulation of ovarine – functions.
Uterus and fallopian tube – Structure, function and hormonal regulation, reproductive cycles.
Mammary gland - Structure, function and regulation.

UNIT –IV

Conception: Fertilization, conception, parturition, maternal-foetal placental hormones.

UNIT – V

Sterility: Male and female sterility – regulation of male and female fertility – surgical method – hormonal and non-hormonal methods.

Text books

1. Turner C.D. (1966). General endocrinology. 4th Ed., W.B.Saunders Co., London.
2. Barrington E.J.W. (1968). An introduction to general and comparative endocrinology.
Academic press, London.
3.Bentley P.J. (1985). Comparative vertebrate endocrinology. S.Chand and Co., Newyork.

Reference books

1. Barrington (1979). Hormones and evolution, Vol.I&II, Academic press, Newyork.
2. Wiliaimas R.H. (1974).Text book of endocrinology V.Ed. Saunders Press, London.
3. E.K. Nobil and JU. D. Neil (1988). The physiology of reproduction V. I& II E.K. Nobil and JU. D. Neil, Raven press, Newyork.

QUESTION PAPER PATTERN

Exam Hours : 3 **Max.marks: 75**

PART-I (Answer ALL) **20X1=20**

Q.No:1 to 20 –Objective type question: MCQ – 20

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

PART-III (Answer any THREE out of FIVE)

Q.No:26 to 30 - One question from each Unit **3X10=30**

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SKILL ENHANCEMENT THEORY

ENGLISH GRAMMAR FOR COMMUNICATION AND SCIENTIFIC WRITING

COURSE CODE: P21Z1SE1	Hours/work	Credit	Exam hours		Marks	
Theory	1	2	-	CIA	ESE	TOTAL
Practical	1		2	20	-	100
				20	60	

UNIT-I

Sentence: Types (Assertive, Interrogative, Imperative and Exclamatory), Subject, verb and object & predicate.

UNIT-II

Parts of speech: Noun, pronoun, verb, adverb, adjectives, preposition, conjunction, and interjunction

UNIT-III

Tense – Present, past and future application of present and past participle

UNIT-IV

Active voice and passive voice, degrees of comparison.

Synthesis of sentences – simple, compound and complex.Punctuation.

UNIT-V

Letter writing, Scientific report writing, Research article writing.

REFERENCES

1.Ref: Wren & Martin, 2017, High school, English Grammar & Composition, (Revised by N.D.V. Prasad rao)S. Chand Publication

2. Madras Rajan, 2014. Basic English Grammar, Leo Book publisher

QUESTION PATTERN

THEORY → 5 QUESTIONS X 15 MARKS (EITHER OR PATTERN) = 75 MARKS

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MAJOR BASED ELECTIVE COURSE II

1.ENTOMOLOGY

THEORY HOURS : 5	**COURSE CODE : P21Z2MBE2:1**
PRACTICAL HOURS:	**CREDITS : 4**
EXAM HOURS : 3	**MARKS : ESE-75/CIA-25**

UNIT – I

Insect taxonomy up to orders level – Salient features with suitable examples of the insect orders – Thysanura, Odonata, Isoptera, Orthoptera, Hemiptera, Coleoptera, Lepidoptera,hymenoptera and Diptera. Morphology of typical insect –integument system and mouthparts.

UNIT – II

Mouth parts of Insects- biting and chewing type, chewing and lapping type, piercing and sucking type, sponging type, siphoning type

Classification of insects based on types of metamorphosis, hormonal control of metamorphosis

Respiration in insects: tracheal, integumental, blood gills, spiracular gills.

Reproduction in Insects: Reproductive cycle, other types of reproduction – parthenogenesis, viviparity, polyembryony; life span of insects.

UNIT – III

Medical Entomology – direct effects of medical pests, indirect effects of medical pests; Insects affecting health of man – damage and control of mosquitoes, house flies, bed bug, lice and fleas.

UNIT – IV

Agricultural pests- nature of damage and control measures of major pests of rice, cotton, sugarcane

and coconut. storage pests – grain moth, grannery weevil, red flour beetle, rice mean moth, pulse beetles, curative methods, Rodent control. (Specify pest name)

UNIT – V

Principles of Insect control – bio control, artificial control and chemical control. Pesticides and the environment, Integrated pest management (IPM).

TEXTBOOKS

1. M.S. NalinaSundari and R.Shanthi (2017) Entomology.MJP Publishers, Chennai.

REFERENCE BOOKS

1.Temphare, D.B. (2009). Modern Entomology. Himalaya Publishing, Mumbai.
2.Vasantharaj David. B and v.v. Ramamurthy (2011). Elements of Economic Entomology, Namrutha publications, Chennai 600116.
3.Temphare D.B. 1984. A Text book of Insect Morphology , Physiology and Endocrinology.S.Chand and Co., New Delhi.

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4. Srivastava,K.P. (1993). A Text Book of Applied Entomology. Wiley Eastern Ltd. Delhi
5. Snodgrass, R.E. (1973). Principles of insect morphology, Publisher- Tata MCGRAW Hill, Bombay.
6.Ambrose, D.P, (2004). The insects: structure, function and biodiversity. Kalyanipublishers, New Delhi.
7.Romoser, W S. (1982) .The science of Entomology. 2nd edition). Publisher Macmillan, New York.
8.David, B.V. And Ananthakrishnan.(2004). General and Applied Entomology. 2nd edition
9.Boudreaux, H. B. Arthropod phylogeny with special reference to insects, (1979).Publisher-John Willey and Sons New York.
10.Chapman R.F. 9182. The insect structure and functions. English Language Book Society

QUESTION PAPER PATTERN

Exam Hours : 3 **Max.marks: 75**

PART-I (Answer ALL) **20X1=20**

Q.No:1 to 20 –Objective type question: MCQ – 20

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

PART-III (Answer any THREE out of FIVE)

Q.No:26 to 30 - One question from each Unit **3X10=30**

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MAJOR BASED ELECTIVE COURSE II

3.FISH PROCESSING TECHNOLOGY

THEORY HOURS : 5	**COURSE CODE : P21Z2MBE2:3**
PRACTICAL HOURS:	**CREDITS : 4**
EXAM HOURS : 3	**MARKS : ESE-75/CIA-25**

UNIT – I

Fish Biochemistry –Majorcomponents of fish.Nutritive enzymes and their role in fish spoilage - Nutritive value of protein - General character of fish fat, spoilage of fish at different stages.

UNIT – II

Fish Microbiology - Microbial spoilage of fish - plant sanitation - importance - regulatory measures, Microbial spoilage of fish - microbial flora in various type of semi - processed and processed fishery products.

UNIT – III

Fresh fish handling and preservation: Mechanism of spoilage - (Fish analysis, bacterial chemical reactions). Handling of fish on board and shore - use of ice and salt, use of antibiotics and chemicals.

UNIT – IV

Freezing of fishes - different techniques -physico chemical changes and nutritional changes during freezing - spoilage of frozen fish.

UNIT - V

Canning of fishes - principles of canning - preservation, additives and pickle salting - salting of fish - Indian curing - Bacteriology of salted fish - smoking of fish - hot and cold smoking - smoking methods.

Reference Books:

1. Biswas KP (1980). A text book of fish, fisheries and Technology. Narendra publishing house.
2. Gopakumar K (2000). Tropical fishery products. Oxford and IBH.
3. Govindan TK (1992). Fish processing technology. Oxford and IBH.
4. Mpeda (1995). Dried fish and fishery products.
5. Santhanam R (1987). Fisheries science. Daya publishing House.
6. Winton AL and Winton KB (1993). Fish and fish products. Agro Botanical Publishers.

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QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks: 75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question: MCQ -20

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

PART-III (Answer any THREE out of FIVE)

Q.No:26 to 30 - One question from each Unit 3X10=30

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EXTRA DISCIPLINARY COURSE (EDC)
DIET FOR HEALTHY LIFE

THEORY HOURS : 2	**COURSE CODE : P21Z2EDC**
PRACTICAL HOURS:	**CREDITS : 2**
EXAM HOURS : 3	**MARKS : ESE-75/CIA-25**

UNIT-I

Healthy life style, Balanced diet-need for balanced Diet - Types of food, according to their function (Energy rich, Bodybuilding and protective).

Processed and ready to eat food: Processed food, instant foods, fast foods, street food, junk foods.

UNIT-II

Diet during different stages of Life-Diet for infant-Diet for growing child-Diet for pregnant and lactating mother

UNIT-III

Role of different kinds of food materials on health

a) Vegetables and fruits in diet
b) Different kinds of fats/oils (Animal fat, Vegetable fat, visible and nutritive fats, Vanaspati)
c) Salt intake
d) Sugars
e) Whole grains
f) Water &Beverages
g)Milk & Soft drinks, Tea, Coffee, Energy drinks, Tender coconut water, Alcohol.

UNIT-IV

1.Best practices for storage-Handling of Perishable foods-Dairy, Fresh fruits and Vegetables, egg, Non vegetarian foods
2. Personal hygiene
3.Removal or reduction of pesticides-washing, balancing, peeling, cooling
4. Beware of adulterants-common adulterants.

UNIT-V

Healthy cooking practices pre cooling preparation, washing and cutting of raw food, cooling methods

Diet and weight management-Healthy foods, Tips to reduce body weight - Naturopathy

Learning materials:

Health diet-Published in Nation Health portal, Ministry of Health and family welfare validated by Nutritional IDD cell, DGHS, MOHFW,GOI.

REFERENCES:

www.indianmedicine.nic.in

http://ninindia.org/DietaryguidelinesforIndians-Finaldraft.pdf

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http://readynutrition.com/resources/are-you-ready-series-best-practices-for-long-term-food-storage_03042011/

https://www.ava.gov.sg/docs/default-source/tools-and-resources/resources-for-businesses/(english)-good-storage-practices

http://www.fda.gov/Food/ResourcesForYou/Consumers/ucm114299.htm

QUESTION PAPER PATTERN

Exam Hours : 3 **Max.marks: 75**

PART-I (Answer ALL) **20X1=20**

Q.No:1 to 20 –Objective type question: MCQ – 20

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

PART-III (Answer any THREE out of FIVE)

Q.No:26 to 30 - One question from each Unit **3X10=30**

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SKILL BASED ELECTIVE COURSE II
TAXONOMY OF FISHES
PRACTICAL

COURSE CODE: P21Z2SE2	Hours	Credit	Exam hours	Marks		Total
Practical	2	1	2	CIA	ESE	100
				40	60	

Major Practical

1. Measure the morphometric characters of the given fish
2. Count the spines and soft rays of the given fish
3. Find out the mean values and percentage contribution of morphometric parameters of the given fish samples

Minor practical

1. Mounting of scales: cycloid and ctenoid
2. Identify the following features:

a) Mouth type b) Body type c) Tail type

Spotters

Identify and write down the classification of the spotters

1. Marine fishes (Any five important fishes)
2. Estuarine fishes (Any five important fishes)
3. Freshwater fishes (Any five important fishes)
4. Ornamental fishes (Any five important fishes)

Field Visit

Visit to fish landing centers and fish markets to identify commercially important fishes. Preparation of documents record for the identified fishes based on taxonomy during field visit.

Reference books:

1.J.S. Nelson (2016) Fishes of the world
2.K.C. Jayaraman (2002) Fundamental of fish taxonomy.

QUESTION PATTERN	
PRACTICAL	60 MARKS
ONE MAJOR PRACTICAL FOR	20 MARKS
ONE MINOR PRACTICAL FOR	10 MARKS
SPOTTERS	10X2=20 MARKS
RECORD	5 MARKS
FIELD VISIT REPORT	5 MARKS

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MAJOR BASED ELECTIVE COURSE III
2. NUTRITION AND DIETICS

THEORY HOURS : 6	**COURSE CODE : P21Z3MBE3:2**
PRACTICAL HOURS:	**CREDITS : 4**
EXAM HOURS : 3	**MARKS : ESE-75/CIA-25**

the faculty food habits by therapeutic diets.

UNIT - I

Food as a source of nutrition, Physiological importance of carbohydrates, Proteins, Lipids, Vitamins and Minerals

UNIT - II

Water as nutrient - regulation of water balance.Determination of energy value of foods - direct and indirect colorimetry - basal metabolic rate.

UNIT - III

Nutritional value of foods - cereals, fruits, milk, egg, meat, fish - Nutritional value of common Indian recipes - Balanced diet.

UNIT - IV

Effect of cooking and heat processing on the nutritive value of foods - Nutritional requirements: Infants, School children, Pregnant and lactating mothers - Geriatric Nutrition.

UNIT - V

Faulty food habits: obesity, Diabetes and cardiac problems - Health education - Malnutrition: Marasmus and Kwashiorkor - Therapeutic diets.

Reference Books:

1. Banerjee G.C (1978). Animal Nutrition. Oxford & IBH publishing co, New Delhi.
2. Swaminathan M (1978). Advanced text book on Food and Nutrition, Volume II, The Bangalore printing and Publishing Co, Ltd. Bangalore.
3. Swaminathan M (1989). Handbook of Food and Nutrition. A Bappco Publication Bangalore.
4. Sheel Sharma (2006). Human Nutrition and Meal Planning. JnanadaPrakashan (P&D), New Delhi.

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.QUESTION PAPER PATTERN

Exam Hours : 3	Max.marks: 75
PART-I (Answer ALL)	20X1=20
Q.No:1 to 20 –Objective type question: MCQ – 20	
PART-II (Either OR)	
Q.No:21 to25 - One question from each Unit	
PART-III (Answer any THREE out of FIVE)	
Q.No:26 to 30 - One question from each Unit	3X10=30

MAJOR BASED ELECTIVE COURSE III

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3.DAIRY SCIENCE

THEORY HOURS : 6	**COURSE CODE : P21Z3MBE3:3**
PRACTICAL HOURS:	**CREDITS : 4**
EXAM HOURS : 3	**MARKS : ESE-75/CIA-25**

UNIT I

Dairy farming-Definition-Scope-Role of Co-operative societies in milk production and marketing

UNIT II

Dairy breeds of India and its Classification-Exotic Cow Breeds-Jersey and Red sindhi. Indian breeds-Kangayam, Buffalo-Murrah

UNIT III

Common cattle feed and their nutritive value-Balanced ration for cattle

UNIT IV

Milk-composition-Nutitive value and Pasteurization of milk. Milk products - Butter, Ghee, Cheese

UNIT V

Bacterial diseases - Anthrax, Mastitis, Viral disease - Foot and mouth disease, Non – contagious disease, Milk fever

REFERENCES:

1. Shivasharayasingh (2013) Dairy technology vol- 01: Milk and milk processing
2. Shivasharayasingh (2013) Dairy technology vol-02: Dairy products and quality assurance
3. Y.H.Hui (1992) Dairy science and technology Handbook.
4. Jadish Prasad (2016) Principles and practices of Dairy farm management

COURSE OUTCOMES:

QUESTION PAPER PATTERN	
Exam Hours : 3	**Max.marks: 75**
PART-I (Answer ALL)	**20X1=20**
Q.No:1 to 20 –Objective type question: MCQ – 20	
PART-II (Either OR)	
Q.No:21 to25 - One question from each Unit	
PART-III (Answer any THREE out of FIVE)	
Q.No:26 to 30 - One question from each Unit	**3X10=30**

BASED ELECTIVE COURSE IV

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2.SILKWORM CULTURE TECHNIQUES AND MARKETING MANAGEMENTS

THEORY HOURS : 6	**COURSE CODE : P21Z4MBE4:2**
PRACTICAL HOURS:	**CREDITS : 4**
EXAM HOURS : 3	**MARKS : ESE-75/CIA-25**

UNIT – I

Scope, silk worm types and soil management for mulberry cultivation: Scope of sericulture of India; classification of silkworms; life history, growth stages of mulberry silkworm; climatic condition and site suitability for mulberry cultivation, soil management: types of soil, physic-chemical properties of soil and preparation of land for mulberry cultivation.

UNIT – II

Pre-requisite for rearing, egg incubation &Chawki rearing and late age silk worm rearing: silk worm breeds for rearing, estimation of mulberry leaf yield and quality, estimation of brushing capacity for rearing, disinfection for silkworm; egg incubation, black boxing, hatching, brushing of larvae, chawki rearing, leaf quality for chawki rearing and commercial chawki rearing; Characteristics of late age silkworms methods of rearing: tray, shelf, floor rearing, environment condition for silkworm rearing.

UNIT – III

Silk worm seed and silk technology: egg production, embryonic development diapause and non diapause eggs, acid treatment for incubation; brief introduction to natural and synthetic fibers for silk industry, assessment of cocoon properties , silk reeling, stiffing and storage of cocoon in silk reeling unit, cocoon cooking, reeling and re-reeling, raw silk testing, silk weaving.

UNIT – IV

Mulberry and non mulberry silk worm disease and pest management: common disease of mulberry silk worm, grasserie, flacherie, muscardine, pebrine diseases: Ommon disease of Non mulberry silkworm, tasar, oak tasar, muga and eri silkworm diseases, Diseases management. Mulbery identification of pest, life cycle of uzi fly, uzi fly - management and economics dermest beetles, Non mulberry silk worm Pest of tasar silkworm and oak tasar silkworm, pest of muga silkworm, pest of eri silkworm

UNIT-V

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Seri culture harvesting and marketing of cocoons, economics. Time of Harvest, Method of Harvest, De flossing, sorting, assessment transportation and marketing of cocoons, Economic of different scales of rearing and cost benefit ratio, Classification of cost, Relationship of fixed and variable cost to greater profits. Economics of seed cacoon, economics of silk production, Extension education.

REFERENCES:

1. Tazima, Y. (1978); The Silkworm an Important Laboratory tool, Hodansha publication, Tokyo.
2. Anonymous (1972); Hand Book of Silk rearing, Agriculture Techniques manual, Fuji publication. Tokyo.
3. Strunnikov. V.A (1983); Control of silkworm reproduction, development and sex MIR publications, Mascow.
4. Problamatic soils of Tropical mulberry garden and their management, technical publication, central sericulture Research& Training institute, Mysore.
5. Tips of successful silkworm cocoon Crops, Technical publication, central

COURSE OUTCOMES

QUESTION PAPER PATTERN

Exam Hours : 3 **Max.marks: 75**

PART-I (Answer ALL) **20X1=20**

Q.No:1 to 20 –Objective type question: MCQ – 20

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

PART-III (Answer any THREE out of FIVE)

Q.No:26 to 30 - One question from each Unit **3X10=30**

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MAJOR BASED ELECTIVE COURSE-IV
3.TOOLS AND TECHNIQUES IN BIOLOGY

THEORY HOURS : 6	**COURSE CODE : P21Z4MBE4:3**
PRACTICAL HOURS:	**CREDITS : 4**
EXAM HOURS : 3	**MARKS : ESE-75/CIA-25**

UNIT-I

Microscopy: Principle and application of different types of microscopes-light microscope, phase contrast microscopes, fluorescence microscope, and confocal microscopes. Electron microscopes: TEM and SEM

UNIT-II

Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, CsCl gradient, analytical centrifugation, ultracentrifugation and marker enzymes.

UNIT-III

Chromatography: Principles and application of paper chromatography, column chromatography, TLC, GLC, HPLC, Ion exchange and affinity chromatography.

UNIT-IV

Spectroscopy: Principles and application of Uv/visble, fluorescence, FT-IR, NMR, ESR spectroscophy.

UNIT-V

Demonstration: Demonstration of the working of PCR thermocycler, HPLC system and SDS-PAGE system, visit to bioinstrumentation lab/facility and submission of the observation report.

REFERENCES

1. Sharma, V.K. (1991): Techniques in microbiology and cell biology Tata McGraw Hill, New Delhi.
2. Wilson &Walker, (2000): Principles and techniques of Practical Biochemistry (4th ed.), Cambridge Univ. Press.UK.
3. Wilson &Walker, 2010.Principles and techniques of Biochemistry and Molecular biology, Cambridge Univ. Press.UK.
4. Jayaraman, (2015) Laboratory manuals in biochemistry.New Age International (P) Ltd, New Delhi.
5. Bisen&Mathw, (2016). Tools and techniques in life sciences-CBS Publishers &Distributors. New Delhi.
6. Khandpur, R.S., (2004). Biomedical instrumentation, Tata McGraw Hill, New Delhi.
7. Plumber D.S (1971). An introduction to practical biochemistry. Tata McGraw Hill Co., New Delhi.

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QUESTION PAPER PATTERN

Exam Hours : 3 **Max.marks: 75**

PART-I (Answer ALL) **20X1=20**

Q.No:1 to 20 –Objective type question: MCQ -20

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

PART-III (Answer any THREE out of FIVE)

Q.No:26 to 30 - One question from each Unit **3X10=30**

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