SEMESTER II

PCZOE20 - APPLIED ENTOMOLOGY

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I	II	PCZOE20	Applied Entomology	Theory	Core	5	4	100

Objective:

- This core paper has been designed to understand the biology of Insects, Insect pest management, Integrated Pest Management and biological control.

Course Outcomes:

On completion of the course the student will be able to…

CO1: Identify the pest in different cash crops and the mode of infection.
CO2: Analyze the pest species of vegetables, fruits, stored grains and household pests.
CO3: Categorize the different insect pests and vectors of livestock.
CO4: Explain the classification of insecticides and the mode of action.
CO5: Apply appropriate method of insect pest management and integrated pest management.

CO/PO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	M	H	H	H	H
CO5	H	H	H	H	H	H

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	M	H	M	H
CO2	H	H	M	H	M	H
CO3	H	H	M	H	M	H
CO4	H	M	M	H	M	H
CO5	H	H	M	H	M	H

Unit 1: (15 Hours)

1.1: Causes for insects assuming pest status. (K1, K2, K3, K4, K5)
1.2: Forecasting Pest outbreak. (K1, K2, K3, K4, K5)
1.3: Biology, nature, extent of damage and control measures of insect pests of Sugarcane - *Chiloinfuscatellus, Tryporyzanivella, Chilosacchariphagus*. (K1, K2, K3, K4, K5)
1.4: Biology, nature, extent of damage and control measures of insect pests of Cotton – *Aphis gossypii, Dysdercuskoenigii, Thripstabaci.* (K1, K2, K3, K4, K5)
1.5: Biology, nature, extent of damage and control measures of insect pests of Groundnut – *Aphis craccivora, Aproraemamodicella, Helicoverpaarmigera.* (K1, K2, K3, K4, K5)
1.6: Coconut - *Rhyncophorusferrugineus, Oryctes rhinoceros, Nephantisseiropa.* (K1, K2, K3, K4, K5)

Unit 2: (15 Hours)

2.1: Biology, nature, extent of damage and control measures of insect pests of Vegetable - *Epilachnadodecastigma, Pierisbrassicae, Leucinodesorbonalis.* (K1, K2, K3, K4, K5)

2.2: Biology, nature, extent of damage and control measures of insect pests of Fruits - *Sternochetusmangifera, Cosmopolites sordidus, Papiliodemoleus.* (K1, K2, K3, K4, K5)
2.3: Biology, nature, extent of damage and control measures of insect pests of Stored product - Paddy - *Leptocorisavaricornis, Tryporyzaincertulus, Sitophilusoryzae*. (K1, K2, K3, K4, K5)
2.4: Biology, nature, extent of damage and control measures of insect pests of stored product Wheat - *Triticumvulgare, Mythimnaseparata, Spodopteramauritia.* (K1, K2, K3, K4, K5)
2.5: Biology, nature, extent of damage and control measures of insect pests of Household pest- *Ctenolepismasaccharina, Anthrenapimpinella, Trichophagaabruptella.* (K1, K2, K3, K4, K5)
2.6: Insect resistant crops. (K1, K2, K3, K4, K5, K6)

Unit 3: (15 Hours)

3.1: Insect pest of domestic animals - Cattle- Cattle fly. (K1, K2, K3, K4, K5)
3.2: Insect pest of domestic animals Ox - Warble fly. (K1, K2, K3, K4, K5)
3.3: Insect pest of domestic animals Fowl - Chicken flea, Shaft louse. (K1, K2, K3, K4, K5)
3.4: Insect pest of domestic animals Sheep and Goat - Head Maggot, Sheep Ked, Biting Louse. (K1, K2, K3, K4, K5)
3.5: Insect vectors of Animals – Mites, Ticks. (K1, K2, K3, K4, K5)
3.6: Organic methods of domestic pest management. (K1, K2, K3, K4, K5)

Unit 4: (15 Hours)

4.1: Classification of Insecticides - Chemical nature – Inorganic - Arsenic and Fluorine compounds. (K1, K2, K3, K4, K5)
4.2: Organic compounds- Animal origin – Nereistoxin. (K1, K2, K3, K4, K5)
4.3: Plant origin - Nicotinoids, Pyrethroides, Rotenoids. Hydrocarbons. (K1, K2, K3, K4, K5)
4.4: Synthetic organic compounds - DDT, BHC, Parathion. (K1, K2, K3, K4, K5)
4.5: Mode of action - Physical Poison, Protoplasmic Poison, Respiratory Poison. (K1, K2, K3, K4, K5)
4.6: Nerve Poison. Mode of Entry - Stomach Poisons, Contact Poison, Fumigants. (K1, K2, K3, K4, K5)

Unit 5: (15 Hours)

5.1: Biological control of plant pest. (K1, K2, K3, K4, K5)
5.2: Viral insecticides, Bacterial insecticides, Fungal insecticides. (K1, K2, K3, K4, K5)
5.3: Integrated Pest Management. (K1, K2, K3, K4, K5, K6)
5.4: Use of insect pathogens in control of pest. (K1, K2, K3, K4, K5)
5.5: Non-conventional pest control- Insect Attractants, Repellents, Antifeedants, Genetic radiations. (K1, K2, K3, K4, K5)
5.6: Plant protection appliances- Duster, Sprayers and Fumigators. (K1, K2, K3, K4, K5)

Books for study and Reference:

Textboks:

1. Vasantharaj V.B, Kumaraswami. T- 1998-Elements of Economic Entomology- Popular Book Depot.
2. NalinaSundari, Santhi R- 1962- Entomology- MJP Publishers.

Reference Books:

3. JawaidAhsan, Subhas Prasad Sinha 1981- A handbook on Economic Zoology- S. Chand and Company limited.

4. B.S Tomar 2004-Introduction to Economic Zoology-EMKAY Publications.
5. ChinmoyGoswami, B.D Panaik 2011- Handbook of Entomology- Wisdom press.
6. M. R Ghosh 1995-Concepts of Insect control- New Age International Publishers.
7. C.L Metcalf, W.P Flint 1962- Destructive and useful insects their habits and control 4ed- Tata McGraw Hill Publications.
8. United Stated Department of Agriculture Washington DC 1952- The Yearbook of Agriculture – Oxford and IBH Publishing Co.
9. David B.V, Muralirangan, M.C, MeeraMuralirangan 1992- Harmful and Beneficial Insects- Popular Book Depot.
10. Saxena A.B 1996 - Harmful Insects- Anmol Publications.

E-Resources:

http://www.entosocindia.org
https://www.entsoc.org
https://entomology.cals.cornell.edu

SEMESTER II

PIZOD20 - INDEPENDENT ELECTIVE II B- ECO ENERGETICS AND ECOLOGICAL METHODS

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/ W	Credits	Marks
I	II	PIZOD20	Eco Energetics And Ecological Methods	Theory	Independent Elective	-	2	100

Objectives:

- To promote environment, friendly, socially and sustainable model of energy
- To promote the concept of energy efficiency
- To understand the soil population estimation by using techniques
- To understand the methods of wildlife population estimation
- To gain the knowledge about zooplankton and phytoplankton.

Course Outcomes:

On completion of the course the student will be able to…

CO1: Explain the structure and functions of ecosystem.
CO2: Discuss the productivity and methods of measuring productivity.
CO3: Summarize about sampling and extraction techniques.
CO4: Describe the methods of wild life population studies.
CO5: Categorize the planktons, method of collection, preservation and morphological identification.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	L	M
CO2	H	H	M	H	M	M
CO3	H	H	M	H	L	M
CO4	H	H	H	H	M	M
CO5	H	H	M	H	L	M

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	H	H	M	M
CO2	H	M	H	H	M	M
CO3	H	M	H	H	M	L
CO4	H	H	M	H	H	L
CO5	H	H	M	H	H	L

Unit 1:

1.1: Concept of ecosystem- Define terms -ecosystem, habitat, ecological niche. (K1, K2, K3, K4, K5)
1.2: Energy flow in an ecosystem – model of energy flow. (K1, K2, K3, K4, K5)
1.3: Food Chain-Types of food chains. (K1, K2, K3, K4, K5)
1.4: Food webs. (K1, K2, K3, K4, K5)
1.5: Efficiency of energy transfer between trophic levels, ecological pyramids. (K1, K2, K3, K4, K5)
1.6: Law of thermodynamics. (K1, K2, K3, K4, K5)

Unit 2:

2.1: Productivity. (K1, K2, K3, K4, K5)
2.2: Primary productivity and Secondary productivity. (K1, K2, K3, K4, K5)
2.3: Fundamentals of productivity, aspects of productivity. (K1, K2, K3, K4, K5)
2.4: Productivity rate, ecological efficiency. (K1, K2, K3, K4, K5)
2.5: Methods of measurement - harvest method, oxygen method. (K1, K2, K3, K4, K5)
2.6: pH method, disappearance of raw materials. (K1, K2, K3, K4, K5)

Unit 3:

3.1: Population Estimates by Sampling. (K1, K2, K3, K4, K5)
3.2: Unit of Soil or Litter Habitat. (K1, K2, K3, K4, K5)
3.3: Extraction Techniques; Bulk staining. (K1, K2, K3, K4, K5)
3.4: Mechanical methods of extraction, Dry sieving, Wet sieving. (K1, K2, K3, K4, K5)
3.5: Soil arthropod collection- Tullgrenfunnel series. (K1, K2, K3, K4, K5)
3.6: Soil washing and flotation. (K1, K2, K3, K4, K5)

Unit 4:

4.1: Wildlife Population Estimates by Census and Distance Measuring Techniques. (K1, K2, K3, K4, K5)
4.2: Census methods. (K1, K2, K3, K4, K5)
4.3: Point and line survey methods. (K1, K2, K3, K4, K5)
4.4: Indices of abundance using transects. (K1, K2, K3, K4, K5)
4.5: Methods based on flushing. (K1, K2, K3, K4, K5)
4.6: Line transect methods: the Fourier series estimator, Point transects. (K1, K2, K3, K4, K5)

Unit 5:

5.1: Planktons- types, characters and ecology. (K1, K2, K3, K4, K5)
5.2: Phytoplankton-Marine. (K1, K2, K3, K4, K5)
5.3: Phytoplankton – Freshwater. (K1, K2, K3, K4, K5)
5.4: Method of Collection. (K1, K2, K3, K4, K5)
5.5: Preservation and morphological Identification of Marine Zooplankton. (K1, K2, K3, K4, K5)
5.6: Preservation and morphological Identification of fresh water zooplankton. (K1, K2, K3, K4, K5)

Books for Study and References:

Textbooks:

1. Dr. Verma and Dr. Agarwal Environmental Biology(principle of ecology).
2. Eugene P.Odum Fundamentals of ecology.

Reference Books:

3. P.B. Nagaraj- Basic Thermodynamics Paperback – 1 Jan 2005.
4. O.L. Lange P.S Nobel C.B Osmond and H. Ziegler Physiological plant ecology IV .
5. ODarryl I. MacKenzie, James D. Nichols, J. Andrew Royle , Kenneth H. Pollock, Larissa Bailey, James E. Hines- Occupancy Estimation and Modeling: Inferring Patterns and Dynamics of Species Occurrence 1st Edition 2015.
6. Arvind Kumar-Ecology of Plankton.
7. GiriKattel - Zooplankton and phytoplankton – types characteristic and ecology 2011.

E-Resources:

http://www.enviroindia.net
http://aelsindia.com
http://environment-ecology.com

SEMESTER III

PEZOE20 -ELECTIVE III A: CLINICAL LABORATORY TECHNIQUES

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II	**III**	**PEZOE20**	**Clinical Laboratory Techniques**	**Theory**	**Elective**	**5**	**5**	**100**

Objective:

To imbibe the knowledge in the laboratory techniques which are applied to humans in day to day life.

Course Outcomes:

On completion of the course the student will be able to…

CO1: Develop technical knowledge in laboratory practices and apparatus maintenance.
CO2: Examine blood composition and basic hematological techniques.
CO3: Justify the pathology of diseases caused by parasites, virus, bacteria & fungus.
CO4: Discuss experimental techniques and methods of urine analysis.
CO5: Analyze the results of physical, microscopic and biochemical analysis of body fluids.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

Unit 1:(15 Hours)

1.1: Scope of Clinical laboratory technique (CLT). (K1, K2, K3, K4, K5)
1.2: Management and administration. (K1, K2, K3, K4, K5)
1.3: First aid in Laboratories. (K1, K2, K3, K4, K5)
1.4: General lab apparatus and general procedures, glass wares used in CLT studies. (K1, K2, K3, K4, K5)
1.5: Sterilization. (K1, K2, K3, K4, K5)
1.6: Disposal of infected materials. (K1, K2, K3, K4, K5)

Unit 2:(15 Hours)

2.1: Hematology – Blood. Haemopoesis. (K1, K2, K3, K4, K5)
2.2: Collection – Capillary and venipunture. Anticoagulants. (K1, K2, K3, K4, K5)

2.3: Basic hematology techniques - TC, DC, PCV, ESR, RBC fragility test. (K1, K2, K3, K4, K5, K6)
2.4: Clotting time, bleeding time, prothrombin time, GOD/POD. (K1, K2, K3, K4, K5, K6)
2.5: Blood grouping. (K1, K2, K3, K4, K5)
2.6: Platelets and its importance - blood coagulation. (K1, K2, K3, K4, K5)

Unit 3:(15 Hours)
3.1: Common Parasites of Man, life cycle and their Clinical diagnosis in body fluids- Blood- *Plasmodium vivax.* (K1, K2, K3, K4, K5)
3.2: Lymph - *Wuchereriabancrofti*. (K1, K2, K3, K4, K5)
3.3: CSF- toxoplasma, Perinicious malaria. (K1, K2, K3, K4, K5)
3.4: Clinical diagnosis of bacterial diseases – Typhoid. (K1, K2, K3, K4, K5)
3.5: Clinical diagnosis of viral disease - Hepatitis B. (K1, K2, K3, K4, K5)
3.6: Clinical diagnosis of Fungal Infections – Candidiasis. (K1, K2, K3, K4, K5)

Unit 4:(15 Hours)
4.1: Urine analysis – Physical - volume, appearance, colour, order. (K1, K2, K3, K4, K5)
4.2: Microscopic examinations for deposits, RBC, casts, pus cells. (K1, K2, K3, K4, K5)
4.3: Biochemical analysis - Estimation of sugar, albumin, bile pigments, bile salt and ketone bodies. (K1, K2, K3, K4, K5)
4.4: Semen analysis - Physical examinations. (K1, K2, K3, K4, K5)
4.5: Microscopic examinations - motility of sperms – sperm counting(K1, K2, K3, K4, K5)
4.6: Vaginal analysis - Microscopic examinations – Pap smear. (K1, K2, K3, K4, K5)

Unit 5:(15 Hours)
5.1: CSF - Collection, Physical examinations; Microscopic examinations; Biochemical analysis. (K1, K2, K3, K4, K5)
5.2: Gastric juice – Collection - Test for resting gastric content, Detection and estimation of gastric juice secretions. (K1, K2, K3, K4, K5)
5.3: Liver function test - Liver functions, estimation of serum bilirubin, serum enzymes, serum proteins. (K1, K2, K3, K4, K5, K6)
5.4: Estimation of cavity fluids - Pericardial, Pleural, peritoneal, Amniotic and for physical, chemical, cytological examination. (K1, K2, K3, K4, K5)
5.5: Stool analysis - Appearance, Composition, Collection, Physical, Chemical, microscopical examinations. (K1, K2, K3, K4, K5)
5.6: Examination for intestinal parasites. (K1, K2, K3, K4, K5)

Books for Study and Reference:
Textbooks;
1. Kanai, L. Mukerjee, Medical laboratory technology, Vol I, II, III Tata McGraw Hill, Publishing Co., New Delhi, 1988.
Reference Books:
2. Arumugam N. Microbiology (General and Applied) Saras Publication, Nagercoil. 2013
3. John Bernard Henry Clinical Diagnosis & Management - W.B. Saunders Company. 1986
4. A Text Book of Microbiology, P. Chakraborty, New Central Book Agency (P) Ltd. Kolkata, India. 1995.
E-Resources:
https://www.indiaeducation.net
https://www.encyclopedia.com
https://medicallabtechnicianschool.org

SEMESTER III

PEZOF20 -ELECTIVE III B: FISHERIES SCIENCE

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II	**III**	**PEZOF20**	**Fisheries Science**	**Theory**	**Elective**	**5**	**5**	**100**

Objective:

- The aim of the paper is to understand the morphology, classification and identification of fishes and the fisheries and fishery resources of India.

Course Outcomes:

On completion of the course the student will be able to…

CO1: Explain the morphology and physiology of Indian fishes.
CO2: Analyze the environmental and nutritional requirements of fishes.
CO3: Understand the types, distribution and scope of inland fisheries.
CO4: Impart theoretical knowledge on surveying methods of fishery resources.
CO5: Acquire knowledge on various threats and conservation strategies of Indian fishes.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

Unit 1:(15 Hours)

1.1: General morphology and outline classification of fish. (K1, K2, K3, K4, K5)
1.2: Major groups of fish and their characteristics – morphometric and meristic characters of elasmobranchs and teleost fishes. (K1, K2, K3, K4, K5)
1.3: Basic anatomy of fish – digestive, circulatory, respiratory, nervous and reproductive system. (K1, K2, K3, K4, K5)
1.4: Food and feeding habits. (K1, K2, K3, K4, K5)
1.5: Maturity, fecundity, spawning. (K1, K2, K3, K4, K5)
1.6: Survival of Indian fish. (K1, K2, K3, K4, K5, K6)

Unit 2:(15 Hours)

2.1: Length-weight relationship. (K1, K2, K3, K4, K5)
2.2: Factors influencing growth condition factor, age determination. (K1, K2, K3, K4, K5)
2.3: Theory of fishing. (K1, K2, K3, K4, K5)
2.4: Unit stock, recruitment. (K1, K2, K3, K4, K5)
2.5: Growth, mortality, migration. (K1, K2, K3, K4, K5)

2.6: Fish tagging and marking. (K1, K2, K3, K4, K5)

Unit 3:(15 Hours)

3.1: Fishery zones in India. (K1, K2, K3, K4, K5)
3.2: Types of fisheries in India – Riverine, Estuarine, Coldwater, Reservoir and Pond fisheries. (K1, K2, K3, K4, K5)
3.3: Present status and scope of inland capture fisheries – their fishery characterizes, distribution and importance. (K1, K2, K3, K4, K5)
3.4: Present status and scope of marine capture fisheries – crustaceans (Prawn/shrimp, lobster and crabs). (K1, K2, K3, K4, K5)
3.5: Present status and scope of marine capture fisheries Molluscs (clam, cockle, mussel, oyster, cephalopods). (K1, K2, K3, K4, K5)
3.6: Present status and scope of marine capture fisheries Fishes – their fishery characteristics, distribution and importance. (K1, K2, K3, K4, K5)

Unit 4:(15 Hours)

4.1: Methods of surveying the fishery resources- Acoustic method. (K1, K2, K3, K4, K5, K6)
4.2: Methods of surveying the fishery resources - Aerial method. (K1, K2, K3, K4, K5)
4.3: Survey of fish eggs and larvae. (K1, K2, K3, K4, K5)
4.4: Analyzing population features. (K1, K2, K3, K4, K5)
4.5: Growth mortality selection. (K1, K2, K3, K4, K5)
4.6: Collection of eggs. (K1, K2, K3, K4, K5)

Unit 5:(15 Hours)

5.1: Principle methods of exploitation of fish. (K1, K2, K3, K4, K5)
5.2: Indigenous and modern gears and crafts. (K1, K2, K3, K4, K5)
5.3: Principle methods of fish preservation and processing in India. (K1, K2, K3, K4, K5)
5.4: Types of spoilage, causative factors. (K1, K2, K3, K4, K5)
5.5: Marketing. (K1, K2, K3, K4, K5)
5.6: Economics. (K1, K2, K3, K4, K5)

Books for Study and Reference:

Textbooks:

1. Day F. 1981 – Fishes of India, Vol. I and Vol. II – William Sawson&Sons Ltd., London.
2. Jhingran C.G. 1981 – Fish and Fisheries of India – Hindustan Publishing Co., India.

Reference Books:

3. Maheswari K. 1993 – Common Fish Diseases and Their Control – Institute of Fisheries Education, Powakads, M.P.
4. Santhanam R. 1980 – Fisheries Science – Daya Publishing House, New Delhi.
5. Yadav B.N. 1997 – Fish and Fisheries - Daya Publishing House, New Delhi
6. Bal. D.V, Rao K.V. 1990 – Marine Fisheries of India – Tata McGraw Hill Publishing Co. Ltd., New York.
7. Biswas K.P.1996 – A Textbook of Fish, Fisheries and Technology – Narendra Publishing House, Delhi.
8. Srivastava C.B.L. 1999 – Fish Biology – Narendra Publishing House, Delhi.

E-Resources:

https://aimlta.org
https://www.mccc.edu
https://researchguides.austincc.edu

SEMESTER III

PIZOE20 - INDEPENDENT ELECTIVE III A- RADIATION BIOLOGY

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II	**III**	**PIZOE20**	**Radiation Biology**	**Theory**	**Independent Elective**	**-**	**2**	**100**

Objective:

- To understand the radiation protection.
- To learn about the application of radiation in treatments.

Course Outcomes:

On completion of the course the student will be able to…

CO1: Apply the fundamentals of radiation biology.
CO2: Explain the effects of Radiation on DNA and its effects.
CO3: Analyze the radiation exposure and response.
CO4: Asses the role of radiation in carcinogenesis.
CO5: Explain radio therapy, protection and precaution in using radioisotopes.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	L	M
CO2	H	H	M	H	L	H
CO3	H	H	H	H	M	M
CO4	H	H	M	H	M	H
CO5	H	H	H	H	M	H

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	L	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	M
CO4	H	H	H	H	M	H
CO5	H	H	M	H	M	M

Unit 1:

1.1: Definition, scope and significance of radiation biology. (K1, K2, K3, K4, K5)
1.2: General classification of radiation. (K1, K2, K3, K4, K5)
1.3: Ionizing radiation, linear energy transfer. (K1, K2, K3, K4, K5)
1.4: Radiation dose and units. (K1, K2, K3, K4, K5)
1.5: Principles of radiation dosimetry. (K1, K2, K3, K4, K5)
1.6: Direct and indirect effects. (K1, K2, K3, K4, K5)

Unit 2:

2.1: Radiations lesions in DNA, radiobiological effect on cell. (K1, K2, K3, K4, K5)
2.2: Radiation sensitizers and protectors. (K1, K2, K3, K4, K5)
2.3: Effect of Radiation on Human Health. (K1, K2, K3, K4, K5)
2.4: Long term radiation risks from low radiations doses. (K1, K2, K3, K4, K5)
2.5: Radiation induced cancer. (K1, K2, K3, K4, K5)
2.6: Radiation effects in the developing embryo and fetus, radiation induced heritable diseases. (K1, K2, K3, K4, K5)

Unit 3:

3.1: Radiation Quantities Exposure, Absorbed Dose. (K1, K2, K3, K4, K5)
3.2: Equivalent Dose, Effective Dose. (K1, K2, K3, K4, K5)
3.3: Cellular Response To Radiation Indirect and direct action. (K1, K2, K3, K4, K5)
3.4: Time scale of radiation effects. (K1, K2, K3, K4, K5)
3.5: DNA damage and chromosomal aberrations. (K1, K2, K3, K4, K5)
3.6: Radioprotectors and Radiosensitizers. (K1, K2, K3, K4, K5)

Unit 4:

4.1: Time-scale of effects in Radiation Biology. (K1, K2, K3, K4, K5)
4.2: Response of normal and malignant tissues to radiation exposure. (K1, K2, K3, K4, K5)
4.3: Radiation Carcinogenesis. (K1, K2, K3, K4, K5)
4.4: Risk estimates for radiation-induced cancer. (K1, K2, K3, K4, K5)
4.5: Radiation-induced sterility. (K1, K2, K3, K4, K5)
4.6: Hereditary effects of radiation. (K1, K2, K3, K4, K5)

Unit 5:

5.1: Whole-Body Radiation Effects Acute radiation syndrome. (K1, K2, K3, K4, K5)
5.2: Treatment of radiation accident victims. (K1, K2, K3, K4, K5)
5.3: Radiation Protection. (K1, K2, K3, K4, K5)
5.4: Radio therapy. (K1, K2, K3, K4, K5)
5.5: Risk estimates in Humans. (K1, K2, K3, K4, K5)
5.6: Precautions and safety measures in handling radioisotopes. (K1, K2, K3, K4, K5)

Books for Study and reference:

Textbooks:

1. Physics and Radiobiology of Nuclear Medicine - Gopal B. Saha. – Springer IIIrdedition 2006. 2. Radiation and Man - H. C. Jain - National Book trust, India. – 1994.

Reference Books:

3. Essentials of Radiation Biology and Protection – Steve Forshier II nd edition 2. Life Sciences and Radiation – J. Kiefer - Springer 2004.
4. An Introduction to Radiobiology, 2nd edition (1998), A. H. W. Nias, Wiley Blackwell, ISBN13: 978-0471975908.
5. Radiation Biology 3.1. Fliedner, T. M., Friesecke, I. &Beyrer, K., 2001.
6. Medical management of radiation accidents– manual on the acute radiation syndrome.British Institute of Radiology Supplement.
7. Hall, E. J, Giaccia A. J. 2006. Radiobiology for the radiologist, Philadelphia, Pa: Lippincott Williams & Wilkins.
8. INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION, 2006: Low dose extrapolation of radiation-related cancer risk, ICRP publication.

E-Resources:

https://www.utoledo.edu
https://www.ncbi.nlm.nih.gov
https://www.astro.org

SEMESTER III

PIZOF20 - INDEPENDENT ELECTIVEIII B- DAIRYING

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II	**III**	**PIZOF20**	**Dairying**	**Theory**	**Independent Elective**	**-**	**2**	**100**

Objective:

- To learn the techniques in improved milk production.
- To know the preservation and processing of milk.

Course Outcomes:

On completion of the course the student will be able to…

CO1: Discuss the development and management of dairying.

CO2: Explain properties of milk and its composition.

CO3: Describe various periods of milking, variations in compositions and equipments used in milking.

CO4: Discuss entry of bacteria into milk and types of bacteria.

CO5: Explain various methods of pasteurization.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	H	M
CO2	H	H	M	H	H	M
CO3	H	H	M	H	H	M
CO4	H	H	M	H	H	M
CO5	H	H	M	H	H	M

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	M	H	M	H
CO2	H	H	M	H	M	H
CO3	H	H	M	H	M	H
CO4	H	H	M	H	M	H
CO5	H	H	M	H	M	H

Unit 1:

1.1: Development of dairying.(K1, K2, K3, K4, K5)

1.2: Cattle population and production of milk.(K1, K2, K3, K4, K5)

1.3: Dietary requirements of milk, milk intake and income levels.(K1, K2, K3, K4, K5)

1.4: Milk production-cost relationship. (K1, K2, K3, K4, K5)

1.5: Utilisation of milk.(K1, K2, K3, K4, K5)

1.6: Nutritive value of milk.(K1, K2, K3, K4, K5)

Unit 2:

2.1: Lactation, milk as food. (K1, K2, K3, K4, K5)

2.2: Udder, secretion of milk, let-down of milk. (K1, K2, K3, K4, K5)

2.3: Factors affecting secretion-individuality, feeding, environment and maintenance. (K1, K2, K3, K4, K5)

2.4: Properties of milk. (K1, K2, K3, K4, K5)
2.5: Composition of milk-proteins, fat, lactose, ash and water, vitamins.(K1, K2, K3, K4, K5)
2.6: Thermal stability of milk.(K1, K2, K3, K4, K5)

Unit3:
3.1: Variations in composition-period preceding milking.(K1, K2, K3, K4, K5)
3.2: Time of milking, portion of milk tested. (K1, K2, K3, K4, K5)
3.3: Stage of lactation, age of cow, and feed.(K1, K2, K3, K4, K5)
3.4: Food value of milk. (K1, K2, K3, K4, K5)
3.5: Enzymes in milk.(K1, K2, K3, K4, K5)
3.6: Colostrum pre-milking, slimy or ropy milk.(K1, K2, K3, K4, K5)

Unit 4:
4.1: Entry of bacteria into milk, water-supply, attendants. (K1, K2, K3, K4, K5)
4.2: Unhealthy animals; types of bacteria in milk. (K1, K2, K3, K4, K5)
4.3: Effects of bacteria on milk; reducing number of bacteria in milk. (K1, K2, K3, K4, K5)
4.4: Milk borne diseases.(K1, K2, K3, K4, K5)
4.5: Dairy utensils, cleaning.(K1, K2, K3, K4, K5)
4.6: Sterilising utensils and equipment.(K1, K2, K3, K4, K5)

Unit 5:
5.1: Pasteurisation of milk in India.(K1, K2, K3, K4, K5)
5.2: Holder method of pasteurisation.(K1, K2, K3, K4, K5)
5.3: H.T.S.T. method, pasteurising bottled milk.(K1, K2, K3, K4, K5)
5.4: Cooling after pasteurisation.(K1, K2, K3, K4, K5)
5.5: Homogenisation, grading milk.(K1, K2, K3, K4, K5)
5.6: Packing of milk(K1, K2, K3, K4, K5)

Books for Study and Reference:
Textbooks:
1. The technology of milk Proceesing – Ananthakrishnan, C.P., Khan, A.Q. and Padmanabhan, P.N. – Shri Lakshmi Publications.
2. Dastur, N. N. and Banerji, B. N Manufacture and Storage of Ghee. Ind. FarminR, IX (7), pp. 78. 1948.
Reference Books:
3. International lnst. of Agric., Rome, Dairy Cow Testing throughout the World, 1938.
4. Owe, L. T. and Goldie, J. M., The Student's Handbook of Milk and Milk Products. Worcestershire, Little bury and Company, 1947.
5. HL Rangappa, K. S. and Achayya, K. T., Chemistry and Manufacture of Indian Dairy Products. The Bangalore Printjng and Publishing Co., Ltd., Bangalore, 1948.
6. Report on the Marketing of Milk in the Indian Union, lndia Government Publication, New Delhi, 1950.
E-Resources:
http://www.asci-india.com
https://dgt.gov.in
http://www.dahd.nic.in