SEMESTER - III			
NME I - Basic Biotechnology			
Code :18UZON31	Hrs /Week: 2	Hrs/ Sem : 30	Credits : 2

Vision:

To impart a comprehensive understanding of Biotechnology for successful career in industry and research institutes.

Mission:

To develop basic concepts of modern Biotechnology with an emphasis on tools, techniques for manipulation of genes and molecules.

CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
Co-1	understand the basic principles of Biotechnology	1	Un
CO-2	distinguish between prokaryotic and eukaryotic cells from their structural studies	2	An
CO-3	understand the restriction enzymes and cloning vectors and assess their use in genetic engineering.	4	Un, Ev
CO-4	demonstrate the structure of DNA, its replication, amplification and separation of fragments	4, 5	Un
CO-5	analyse different culture media and techniques to cater the need for cell culture.	6	An
CO-6	evaluate techniques of gene delivery and cloning to adapt in manipulation of genes	5	Ev
CO-7	discuss the preparation and characterization of appropriate nano materials in the field of nanotechnology	7	Cr
CO-8	develop proficiency in aseptic laboratory techniques and standard procedures for cell culture.	8	Cr

SEMESTER - III			
NME I - Basic Biotechnology			
Code :18UZON31	Hrs /Week: 2	Hrs/ Sem : 30	Credits : 2

Unit I Cell

General structure - prokaryotic eukaryotic cells. Structure of DNA, RNA and replication of DNA. (Practical- Spotters - Structure of Bacteriophage, DNA model, tRNA)

Unit II Tools of Recombinant DNA Technology

Restriction Modification Systems – enzymes - polymerase I, II, III, DNA ligase and Type II restriction enzymes in genetic engineering. Cloning vectors - *E. coli* – Plasmid vectors – pBR 322 and M13 and Cosmids. (Practical- Spotters - Southern blotting, pBR322)

Unit III Animal Cell Culture

Cell culture media – natural and synthetic. Cell culture – primary culture, secondary culture, continuous cell lines, cryopreservation of cultures.(Practical:Sterilization of glass wares for cell culture & Preparation of culture media)

Unit IV Techniques and Applications of Biotechnology

Cloning – steps involved. Gene delivery – microinjection, electroporation, biolistic method (gene gun), liposome and retro viral mediated delivery. Gene amplification by PCR technique - Agarose Gel Electrophoresis.(Practical- Agarose Gel Electrophoresis& SDS -PAGE)

Unit V Nanobiotechnology

Classification of nanoparticles, synthesis of nanoparticles - RF plasma, chemical method, thermolysis. Properties and applications of nanofluids and nanocrystals. (Practical-Spotters -Dendrimer)

Text Book :

Kumaresan, V. 2012. *Biotechnology*. 6th edition, Saras publication, Kottar P.O, Nagercoil.

Books for Reference :

1. Dubey, R.C. 2009. A Textbook of Biotechnology. S.Chand and Company Ltd.

2. Rastogi, S.C. 2012. *Biotechnology Principles and Applications*. Reprint 2012, Narosa Publishing House. Chennai.

3. Singh, B.D. 2015. Biotechnology. Kalyani Publishers. New Delhi.

4. Sathyanarayana, V. 2013. *Biotechnology*. 8th Edition. Books and Allied (P) Ltd. Kolkatta.

5. Harisha S. 2007. *Biotechnology Procedures and Experiments Hand Book*. Infenity Science Press, LIC, Hinghum, Massachusett, New Delhi, India

6. Asish Verma, Surajit Das, Anchal Singh. 2008. *Laboratory Manual for Biotechnology*. S.Chand and Company, Ltd., New Delhi.

SEMESTER - IV			
NME II Applied Biotechnology			
Code :18UZON41	Hrs /Week: 2	Hrs/ Sem :30	Credit : 2

Vision: To provide quality education and to construct excellent bio entrepreneurship for self reliance with societal development

Mission: To impart strong theoretical as well as practical knowledge to students in the field of Biotechnology so that they will be able to apply this multidisciplinary knowledge to field situation

To impart knowledge and skills in students to equip themselves to be ready to face the emerging challenges in the knowledge area

CO.No	Upon completion of this course, students will be	PSO	CL
	able to	addressed	
CO-1	understand the production of different Bio-products	1	Un
CO-2	examine the nature and feature of SCP and aerobic	3,5	An
	and anaerobic digestion		
CO-3	apply the techniques to clean up the environment	2,6	Ар
	through various treatment methods		
CO-4	create awareness to cure cancer	7	Cr
CO-5	understand the importance of biosafety and IPR	2	Un
CO-6	evaluate the synthesis and applications of bio-	8	Ev
	products		
CO-7	adapt appropriate tools and techniques in	7	Cr
	biotechnological manipulation		
CO-8	apply the experimental procedures to the spectrum of	8	Ар
	fields making use of Biotechnology		

SEMESTER - IV			
NME II Applied Biotechnology			
Code :18UZON41	Hrs /Week: 2	Hrs/ Sem :30	Credits : 2

Unit I : Food and Beverage Biotechnology

Fermented food – cheese production – microbial biomass – nutritive value of Single Cell Protein and mushroom cultivation (White button mushroom) - wine and beer. (Practical- Mushroom cultivation & Microbial production of wine)

Unit II : Fuel Biotechnology

Biogas - production - applications; Biodiesel - production - applications.

Unit III : Environmental Biotechnology

Sewage treatment – primary, secondary and tertiary treatments – Bioremediation - use of immobilized microbes.

Unit IV : Health Care Biotechnology

Gene therapy methods – germline and somatic cell line – gene therapy for cancer

Unit V : Regulations in Biotechnology

Biosafety - guidelines - Intellectual Property Right

Text Book :

Kumaresan, V. 2012. *Biotechnology* - 6th edition. Saras publication, Kottar, Nagercoil.

Books for Reference :

- 1. Dubey, R.C. 2009. *A textbook of Biotechnology* eds, S.Chand and Company Ltd, New Delhi.
- 2. Rastogi, S.C. 2012. *Biotechnology, principles and applications*. Narosa Publishing House, Chennai.
- 3. Singh, B.D. 2015. Biotechnology edition. Kalyani Publishers, New Delhi.
- 4. Sathyanarayana, V. 2013. *Biotechnology* 8th edition. Books and Allied (P) Ltd. Kolkatta.
- 5. Harisha S. 2007. *Biotechnology Procedures and Experiments Hand Book*. Infenity Science Press, LIC, Hinghum, Massachusett, New Delhi, India
- Asish Verma, Surajit Das. Anchal Singh. 2008. Laboratory Manual for Biotechnology, S. Chand and Company, New Delhi.

SEMESTER – III			
	Core Skill Based	: Fishery Products	
Code: 18UZOS31	Hrs/Week :4	Hrs/Sem : 60	Credits: 4

Vision

Towards proper usage of the products and by-products of the fisheries industry.

Mission

To obtain knowledge on value addition of products of fisheries industry and their preservation processes.

		PSO	CL
CO.No.	Upon completion of this course, the graduates	addressed	
	will be able to		
CO -1	acquire knowledge on products and by-products of fisheries.	1	Un
	interpretation of the various processing and	7	Ap
CO - 2	preservation of fisheries products.		
CO - 3	attain information on the usage of fish by-	7	Un
	products for industrial and domestic purposes.		
CO - 4	carry out study on seaweeds and their various	7	Ev
	usages in pharmaceutical and therapeutic		
	industries.		
CO - 5	practice the processing and preservation of	1	Cr
	various fish products.		
CO - 6	implementation of sanitation and quality control	7	Cr
	techniques.		
CO - 7	use the knowledge of preservation and	7	Ev
	processing techniques in day to day life.		
CO- 8	comprehend and synthesize advanced	8	Un
	knowledge on the outcomes of fisheries.		

SEMESTER – III			
	Core Skill Based	: Fishery Products	
Code : 18UZOS31	Hrs/Week :4	Hrs/Sem : 60	Credits: 4
		·	

Unit I Processing and Preservation of Fish products Fish pickles and sauce, fish cutlets, fish balls, fish noodles, fish soup powder, fish sausage and fish protein concentrate. Battered and braided products-fish finger, fish cutlet, fish wafer.

Unit II Processing and Preservation of Fish Byproducts

Fish glue – isinglass – chitosan – pearl essence – shark fins – fish leather – fish maws.

Unit III Seaweed Products

Preparation of agar, algin and carrageenan. Use of seaweeds as food for human consumption and disease treatment –Preparation of therapeutic drugs

Unit IV Techniques of Preservation and processing

Freezing - Canning - Smoking - Pickling - Fermentation - Drying - Salting.

Unit V Quality Control and Sanitation

Quality control of fish and fishery products – pre-processing control, control during processing and control after processing - Sanitation in processing – Environmental hygiene and personal hygiene in processing.

Text Book

Dr. Surekha Gupta, 2010. Textbook of Fishery, Ane Books Pvt. Ltd., New Delhi.

Books for Reference

- 1. Gopakumar, K. 2002. A Textbook of Fish Processing Technology. ICAR, New Delhi.
- 2. Gupta, S.K. and P.C Gupta. 2006. *General and Applied Ichthyology* [*Fish and fisheries*] S.Chand and Company Ltd.Ram nagar,New Delhi
- 3. K.R .Ravindranathan 2013. *A Textbook of Economic Zoology*. Wisdom press, New Delhi.
- 4. Ayyapar, S. 2010. Handbook of Fisheries and Aquaculture. ICAR, New Delhi.
- 5. Srivastava, C.B.L. 2006. *A Textbook of Fishery Science- Indian Fisheries*. KitabMahal, New Delhi.

SEMESTER – III		
Self-study – Dairy Management		
Code : 18UZOSS1	Credits : +2	

Vision

To equip the students to become entrepreneurs.

Mission

To obtain knowledge on different strategies to manage dairy farm.

CO		PSO	CL
	Upon completion of this course, the students will be	addressed	
INU	able to		
CO-1	understand general management of dairy animals.	1	Un
CO-2	explain the various management techniques of breeding	1,2	Un
	and lactating cattle and goat.		
CO-3	analyse the different kinds of feed for dairy animals.	7	An
CO-4	aware of the various feeding practices for dairy animals	1, 2	Un
CO-5	identify the various diseases affecting dairy animals.	6	Ар
CO-6	analyse the nutritive value of milk and factors affecting	7	An
	quality of milk		
CO-7	aware of the importance and types of milk products	2	Un
CO-8	develop skills and acquire knowledge for self	6, 8	Ар
	employment.		

SEMESTER – III		
Self-study – Dairy Management		
Code : 18UZOSS1 Credit : +2		

Unit I Dairy Management

General management practices of dairy animals : Grooming, Drying off, control of bad habits, castration, dehorning, deworming and identifications marks.

Unit II Cattle and Goat Management

Calf raising, heifer management, management of pregnant, parturient, lactating and dry cows. Management of lambs and kids - Management of breeding and lactating doe and Ewe.

Unit III Food and Feeding

Classification of feeds - balanced food ratio for dairy animals - general feeding practices with regard to management.

Unit IV Diseases in Dairy Animals

Diseases of calf : Pneumonia, calf scours, diarrhoea, joint ill, naval ill, worm infestation. Parasitic and protozoan diseases: theilariasis, babesiosis, trypansomiasis, trichomoniasis. Diseases of Goat: PPR, blue tongue.

V Dairy Products

Nutritive value of milk- pasteurization of milk - factors affecting yield of milk. Colostrum-significance. Milk products- butter, cheese, ice cream, condensed and evaporated milk, milk powder.

Books for Reference

Unit V

- 1. Banerjee, G.C. 2011. *Textbook of Animal Husbandary*. Eighth edition, Oxford and IBH Publishing Co.Pvt.Ltd, New Delhi.
- 2. Danjyaganj, *Handbook of Animal Husbandary*. ICAR edition, Sangam Book Depot, New Delhi.
- 3. Prasad Jayadish, 2016. *Principle and Practices of Dairy Farm*. Kalyani Publisher, New Delhi

SEMESTER IV		
Self Study Course – Aquarium Fish Keeping		
Code: 18UZOSS2	Credits : +2	

Vision

To impart knowledge on fish keeping

Mission

To provide information on setting up and maintenance of of an aquarium

CO No	Upon completion of this course, the students will be able to	PSO addressed	CL
CO-1	acquire knowledge about home aquarium	1	Un
CO-2	identify common aquarium fishes	1,2	Un
CO-3	explain the different kinds of instruments used in setting up of an aquarium	6	Un
CO-4	critically analyse the different kinds of fish feed and aquarium plants	5	Un
CO-5	examine the common diseases, symptoms and management of aquarium fishes	7	Ap
CO-6	demonstrate skills in maintenance of water quality parameters	5	An
CO-7	develop the hobby of having an aquarium at home	8	Cr
CO-8	Promote self employment opportunities	8	Ар

SEMESTER IV		
Self Study Course – Aquarium Fish Keeping		
Code: 18UZOSS2	Credits : +2	

Unit I Construction of Home Aquarium

Construction of home aquarium - materials needed - wooden and metal frames - frameless tanks, sealants and gums - Design and construction

Unit II Setting up of an Aquarium

Setting up an aquarium - requirements - important aquarium fishes - aquarium accessories - hood and light, nets suction tube, aerators, thermostat, heater, filter, gravel, siphon tube and scrapper tool.

Unit III Maintenance of an Aquarium

Maintenance of aquarium - water quality management - pH, temperature - salinity - oxygen - carbon dioxide - waste removal.

Unit IV Fish feed and Aquarium plants

Different kinds of feed - live feed - artificial feed -feeding methods - feeding devices - balanced diet for aquarium fishes. Morphology of aquarium plants - vallisneria, Hydrilla.

Unit- V Fish diseases and Management

Common diseases of aquarium fishes. bacterial diseases, viral diseases, fungal diseases - parasitic diseases - Argulus, lernea and ligula.

Books for Reference

- 1. Yadav, B.N. 2002. Fish and Fisheries, Daya Publishing House New Delhi
- 2. Bal, D.V. and K.V. Rao. 1984. *Marine Fisheries of India*. Tata Mc Graw Hill Publishing Company Limited New Delhi.
- 3. Biswas K.P. 2009. Fishes Around Indian Ocean. Daya Publishing House New Delhi.
- 4. Jayashree, K. V., Thara Devi, C.S. and N. Arumugam. 2015. *Home Aquarium and Ornamental Fish Culture*. Saras Publication. Nagercoil.
- 5. Jamson, D. and R. Santhanam. 1996. *Manual of ornamental fishes and farming technologies*. Department of Fisheries Environment Fisheries college and Research department Tuticorin.