List of Courses which focuses on Professional Ethics, Gender, Human Values, Environment & Sustainability and other value framework

Department : *Zoology*

Programme Name : *B. Sc.*

Academic Year : 2022-23

Courses which focuses on Professional Ethics, Gender, Human Values, Environment & Sustainability and other value framework:

Sr. No.	Course Code	Name of the Course
01.	ZOUATA1	Human Health and Sex Education
02.	ZOUBTG1	Vectors, Diseases and Management
03.	ZOUCTG1	Food, Nutrition and Health
04.	ZOUDTT2	Ecology
05.	ZOUDTG1	Global Environmental Issues
08.	LS/ZOO/DSE-601 (B) L	Fish and Fisheries
09.	LS/ZOO/DSE-601 (C) L	Wild Life Conservation and Management

HEAD
Department of Zoology

Scheme and Syllabus

Scheme and Syllabus for UG Courses in Zoology

Department of Zoology, School of Life Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur

Semester	Courses	Name of courses	Number of courses	Level	Credits	Total Credits
I	Major	**Animal diversity of non chordates (Protista to Pseudocoelomate)**	1	2	3	20
		Lab Course			1	
	Minor	**Animal diversity of non chordates (Protista to Pseudocoelomate)** To be offer for students of other departments	1	2	3	
		Lab Course			1	
	Multid.	**Elementary Biology -I** To be offer for student of other disciplines (except Natural and Physical Sciences)	1	1	3	
	SEC	**Aquaculture** To be offer for student of Zoology/other departments at university level	1	1	2	
		Lab Course			1	
	VAC	**History of Indian science (Understanding India)** To be offer for student of Zoology/other departments at university level	2	1	2+2	
	AEC	**Language** To be offered by Hindi/English Department for student of Zoology	1	1	2	
II	Major	**Animal diversity of non chordates (Coelomates)**	1	2	3	20
		Lab Course			1	
	Minor	**Animal diversity of non chordates (Coelomates)** To be offer for student of other departments	1	2	3	
		Lab Course			1	
	Multid.	**Elementary Biology -II** To be offer for student of other disciplines (except Natural and Physical Sciences)	1	1	3	
	SEC	**Apiculture** To be offer for student of Zoology/other departments at university level	1	1	2	
		Lab Course			1	
	VAC	**Food nutrition and health (Health & wellness)** To be offer for student of Zoology/other departments at university level	2	1	2+2	
	AEC	**Language** To be offered by Hindi/English Department for student of Zoology	1	1	2	

The student must complete the 4 credit vocational course/Internship during summer term to get UG Certificate if he wishes to exit the program after first 2 semesters.

B.Sc. Hon's (Zoology): LOCF 2021-2022

Department of Zoology, School of Life Sciences

Course Opted	Course Code	Name of the course	Credit	Hour/ week	Internal Assess	End Sem Exam
		Semester I				
CC-1 Theory	ZOUATT1	Systematics and Diversity of Life- Protista to Chordates	3	3	30	70
CC-1 Practical	ZOUATL1	Lab Course	2	4	30	70
CC-2 Theory	ZOUATT2	Developmental Biology and Evolution	3	3	30	70
CC-2 Practical	ZOUALT2	Lab Course	2	4	30	70
GEC-1 Theory	ZOUATG1	Exploring the Brain: Structure and Function	3	3	30	70
GEC-1 Practical	ZOUALG1	Lab Course	2	4	30	70
AEC-1 Theory		To be drawn from the pool of AEC	1	1	30	70
AEC-1 Practical		To be drawn from the pool of AEC	1	2	30	70
SEC-1 Theory		To be drawn from the pool of SEC	1	1	30	70
SEC-1 Practical		To be drawn from the pool of SEC	1	2	30	70
		Additional Credit Course				
		TOTAL	**19**	**27**	**300**	**700**
		Semester II				
CC-3 Theory	ZOUBTT1	Comparative Anatomy and Physiology of Non Chordates	3	3	30	70
CC-3 Practical	ZOUBLT1	Lab Course	2	4	30	70
CC-4 Theory	ZOUBTT2	Cell Biology and Histology	3	3	30	70
CC-4 Practical	ZOUBLT2	Lab Course	2	4	30	70
GEC-2 Theory	ZOUBTG1	Vectors, Diseases and Management	3	3	30	70
GEC-2 Practical	ZOUBLG1	Lab Course	2	4	30	70
AEC-2 Theory		To be drawn from the pool of AEC	1	1	30	70
AEC-2 Practical		To be drawn from the pool of AEC	1	2	30	70
SEC-2 Theory		To be drawn from the pool of SEC	1	1	30	70
SEC-2 Practical		To be drawn from the pool of SEC	1	2	30	70
		Additional Credit Course				
		Total	**19**	**27**	**300**	**700**
		Semester III				
CC-5 Theory	ZOUCTT1	Comparative Anatomy and Physiology of Chordates	3	3	30	70
CC-5 Practical	ZOUCLT1	Lab Course	2	4	30	70
CC-6 Theory	ZOUCTT2	Genetics	3	3	30	70
CC-6 Practical	ZOUCLT2	Lab Course	2	4	30	70
CC-7 Theory	ZOUCTT3	Biochemistry	3	3	30	70
CC-7 Practical	ZOUCLT3	Lab Course	2	4	30	70
GEC-3 Theory	ZOUCTG1	Food, Nutrition and Health	3	3	30	70
GEC-3 Practical	ZOUCLG1	Lab Course	2	4	30	70
AEC-3 Theory		To be drawn from the pool of AEC	1	1	30	70
AEC-3 Practical		To be drawn from the pool of AEC	1	2	30	70
		Additional Credit Course				
		Total	**22**	**31**	**300**	**700**
		Semester IV				
CC-8 Theory	ZOUDTT1	Behaviour and Chronobiology	3	3	30	70
CC-8 Practical	ZOUDLT1	Lab Course	2	4	30	70
CC-9 Theory	ZOUDTT2	Ecology	3	3	30	70
CC-9 Practical	ZOUDLT2	Lab Course	2	4	30	70
CC-10 Theory	ZOUDTT3	Molecular Biology	3	3	30	70
CC-10 Practical	ZOUDLT3	Lab Course	2	4	30	70
GEC-4 Theory	ZOUDTG1	Global Environmental Issues	3	3	30	70
GEC-4 Practical	ZOUDLG1	Lab Course	2	4	30	70
AEC-4 Theory		To be drawn from the pool of AEC	1	1	30	70
AEC-4 Practical		To be drawn from the pool of AEC	1	2	30	70
		Additional Credit Course				
		TOTAL	**22**	**31**	**300**	**700**
		Summer Internship*	6	90*	30	70

Courses which focuses on Professional Ethics, Gender, Human Values, Environment & Sustainability and other value framework

SEMESTER VI						
Core Course-13 Theory	LS/ZOO/CC-601 L	Developmental Biology	4	4	30 (15+15)	70
Core Course-13 Practical	LS/ZOO/CC-601 P	Lab Course	2	4	30 (15+15)	70
Core Course-14 Theory	LS/ZOO/CC-602 L	Evolutionary Biology	4	4	30 (15+15)	70
Core Course-14 Practical	LS/ZOO/CC-602 P	Lab Course	2	4	30 (15+15)	70
Discipline Specific Elective-3 Theory	LS/ZOO/DSE-601(A) L	A. Endocrinology	4	4	30 (15+15)	70
	LS/ZOO/DSE-601(B) L	B. Fish and Fisheries				
Discipline Specific Elective-3 Practical	LS/ZOO/DSE-601(A) P	Lab Course A	2	4	30 (15+15)	70
	LS/ZOO/DSE-601(B) P	Lab Course B				
Dissertation/ Project work / Academic Visit followed by report submission and seminar	LS/ZOO/DW/PW/AV		5+1=6	8	30 (15+15)	70
		TOTAL	24	32		
		TOTAL CREDITS	152 + 4 (SI)			

As per UGC CBCS guidelines, University / departments have liberty to offer GE and SEC courses offered by any department to students of other departments. The No. of GE course is four. One GE course is compulsory in first 4 semesters each. In present scheme it is proposed to have minimum two GE courses (from one subject) in first two semester after which student shall change two GE for another subject in IIIrd and IVth semester, so that all the student can have exposure of one additional subject.

(Subject to approval by the competent authority)

*These two courses will be offered to students depending upon the availability and commencement in the respective semester in MOOCS and syllabus of MOOCS will be followed. In case of unavailability of these two courses, the same will be taught as usual DSE courses.

Prof. S K Prasad (External Expert)	Dr. Rohit Seth (Member)	Dr. S K Verma (Member)	Prof. LVKS Bhaskar (HOD)

Value Added Courses:

Semester	VAC	Course Title	Credits
I	VAC-1	History of Indian science	Theory: 02

About the course
The course provides an insight into the status of science in ancient India, its gradual development, innovations and the pioneers in the field of science, reputed research institutions in India and cutting edge research in science.

Course outcomes:
1. The students will feel pride to know the pioneer role of Indians in the development of astronomy, mathematics, engineering and medicine in the World history.
2. Develop understanding of various branches of science during different eras and analyze the role played by different Indian organizations in science.
3. Appraise the contribution of different Indian Scientists.
4. Students will be aware about the modern development of animals, agriculture and biological sciences in republic India.

Course Outcomes and their mapping with Programme Outcomes:

CO	PO						PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	2	1	3	2
CO2	3	3	2	3	2	2	2	3	3
CO3	3	2	2	2	2	1	2	3	2
CO4	3	2	1	2	1	2	2	2	1
CO5	-	-	-	-	-	-	-	-	-

Weightage: 1- Slightly; 2- Moderately; 3- Strongly

Theory

Unit I: Science in ancient and medieval India **10 Lecture**
History of development in astronomy, mathematics, engineering and medicine subjects in Ancient India, Influence of the Islamic world and Europe on developments in the fields of mathematics, chemistry, astronomy and medicine.

Unit 2: Prominent Indian scientists: **12 Lecture**
Eminent scholars in mathematics and astronomy: Baudhayana, Aryabhatta, Brahmagupta, Bhaskaracharya, Varahamihira, and Nagarjuna, Medical science of Ancient India (Ayurveda and Yoga): Susruta, Charak. Scientists of Modern India: Srinivas Ramanujan, C.V. Raman, Jagdish Chandra Bose, Homi Jahangir Bhabha, Vikram Sarabhai etc.

Unit III: Indian science in before and after Independence **13 Lecture**
Introduction of different surveyors, zoologists and doctors as early scientist in Colonial India, Indian perception and adoption for new scientific knowledge in Modern India, Establishment of premier research organizations like CSIR, DRDO and ICAR and ICMR, IIT's, Establishment of Atomic Energy Commission, Launching of the space satellites, ISRO's accomplishments. Zoological survey of India.

Value Added Courses:

Semester	VAC	Course Title	Credits
I	VAC-II	Food, Nutrition and Health	Theory: 02

About the course
The course covers the basic concepts of balanced diet for people of different ages besides focusing on the consequences of malnutrition and the deficiency diseases and the diseases caused due to poor hygiene.

Course outcomes
1. Imparting the basic concept of food and nutrition including the concept of a balanced diet, nutrient needs, and dietary patterns for various groups.
2. Understanding the biochemistry of major food components and the effects of their deficiency on health and evaluating the effectiveness of nutrition interventions when dealing with certain health problems.
3. Understanding the importance of lifestyle-related diseases, their causes, and prevention through dietary and lifestyle modifications.
4. Understand the importance of food and water safety and methods associated with the preservation of food and purification of contaminated water and make students aware of food, nutrition, and health needs.

Course Outcomes and their mapping with Programme Outcomes

COs	POs						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	1	-	3	-	3	-	1
CO2	2	3	-	1	2	-	2	2	1
CO3	1	2	1	1	2	2	2	1	-
CO4	2	1	1	2	2	1	1	2	1

Weightage: 1- Slightly; 2- Moderately; 3- Strongly

Theory

Unit 1: Nutrition and dietary nutrients **08 Lectures**
Basic concept of Food: Components and nutrients. Concept of balanced diet, nutrient requirements and dietary pattern for different groups viz., adults, pregnant and nursing mothers, infants, school children, adolescents and elderly people.

Unit 2: Macro nutrients and micronutrients **09 Lectures**
Nutritional Biochemistry: Macronutrients. Carbohydrates, Lipids, Proteins- Definition, Classification, their dietary source and role. Micronutrients. Vitamins- Water-soluble and Fat-soluble vitamins- their sources and importance. Important minerals viz., Iron, Calcium, Phosphorus, Iodine, Selenium and Zinc: their biological functions.

Unit 3: Malnutrition and nutrient deficiency diseases **10 Lectures**
Definition and concept of health: Common nutritional deficiency diseases:- Protein Malnutrition (e.g., Kwashiorkor and Marasmus), Vitamin A deficiency, Iron deficiency and Iodine deficiency disorders- their symptoms, treatment, prevention and government initiatives, if any. Life style dependent diseases- hypertension, diabetes mellitus, and obesity- their causes and prevention. Social health problems-

smoking, alcoholism, narcotics. Acquired Immuno Deficiency Syndrome (AIDS): causes, treatment and prevention. Other ailments viz., cold, cough, and fever, their causes and treatment.

Unit 4: Diseases caused by microorganisms **10 Lectures**

Food hygiene: Potable water- sources and methods of purification at domestic level. Food and Water-borne infections: Bacterial diseases: cholera, dysentery; typhoid fever, viral diseases: Hepatitis, Poliomyelitis etc., Protozoan diseases: amoebiasis, giardiasis; Parasitic diseases: teeniasis and ascariasis their transmission, causative agent, sources of infection, symptoms and prevention. Causes of food spoilage and its prevention.

Suggested readings:

1. Mudambi, S.R. and Rajagopal, M.V. (2007). Fundamentals of Foods, Nutrition and Diet Therapy; Fifth Ed:; New Age International Publishers
2. Srilakshmi, B. (2002). Nutrition Science; New Age International (P) Ltd.
3. Srilakshmi, B. (2007). Food Science; Fourth Ed; New Age International (P) Ltd.
4. Swaminathan, M. (1986). Handbook of Foods and Nutrition; Fifth Ed; BAPPCO.
5. Bamji, M.S.; Rao, N.P. and Reddy, V. (2009). Text Book of Human Nutrition; Oxford & IBH Publishing Co. Pvt Ltd.
6. Wardlaw, G.M. and Hampl, J.S. (2007). Perspectives in Nutrition; Seventh Ed; McGraw Hill.
7. Lakra, P. and Singh M.D. (2008). Textbook of Nutrition and Health; First Ed; Academic Excellence.
8. Manay, M.S. and Shadaksharaswamy, M. (1998). Food-Facts and Principles; New AgeInternational (P) Ltd.
9. Gibney, M.J. et al. (2004). Public Health Nutrition; Blackwell Publishing.

Generic Elective Courses (GEC): ZOUCTG1 and ZOUCLG1

Semester	Core Course	Course Title	Credits
III	GEC-III	Food, Nutrition and Health	Theory: 03; Practical: 02

About the course

The course covers the basic concepts of balanced diet for people of different ages besides focusing on the consequences of malnutrition and the deficiency diseases and the diseases caused due to poor hygiene.

Learning outcomes

After successfully completing this course, the students will be able to:

- Understand the role of food and nutrients in health and disease.
- Provide culturally competent nutrition services for diverse individuals.
- Implement strategies for food access, procurement, preparation, and safety that are relevant for the culture, age, literacy level, and socio-economic status of clients and groups.
- Perform food system management and leadership functions that consider sustainability in business, healthcare, community, and institutional arenas.

Theory

Unit I: Nutrition and dietary nutrients — **12 Lectures**

Basic concept of Food: Components and nutrients. Concept of balanced diet, nutrient requirements and dietary pattern for different groups viz., adults, pregnant and nursing mothers, infants, school children, adolescents and elderly people.

Unit II: Macro nutrients and micronutrients — **12 Lectures**

Nutritional Biochemistry: Macronutrients. Carbohydrates, Lipids, Proteins- Definition, Classification, their dietary source and role. Micronutrients. Vitamins- Water-soluble and Fat-soluble vitamins- their sources and importance. Important minerals viz., Iron, Calcium, Phosphorus, Iodine, Selenium and Zinc: their biological functions.

Unit III: Malnutrition and nutrient deficiency diseases — **15 Lectures**

Definition and concept of health; Common nutritional deficiency diseases- Protein Malnutrition (e.g., Kwashiorkor and Marasmus), Vitamin A deficiency, Iron deficiency and Iodine deficiency disorders- their symptoms, treatment, prevention and government initiatives, if any. Life style dependent diseases- hypertension, diabetes mellitus, and obesity- their causes and prevention. Social health problems- smoking, alcoholism, narcotics. Acquired Immuno Deficiency Syndrome (AIDS): causes, treatment and prevention. Other ailments viz., cold, cough, and fever, their causes and treatment.

Unit IV: Diseases caused by microorganisms — **13 Lectures**

Food hygiene: Potable water- sources and methods of purification at domestic level. Food and Water-borne infections: Bacterial diseases: cholera, dysentery; typhoid fever, viral diseases: Hepatitis, Poliomyelitis etc., Protozoan diseases: amoebiasis, giardiasis; Parasitic diseases: taeniasis and ascariasis their transmission, causative agent, sources of infection, symptoms and prevention. Causes of food spoilage and its prevention.

Recommended reading

1. Mudambi, S.R. and Rajagopal, M.V. (2007). Fundamentals of Foods, Nutrition and Diet Therapy; Fifth Ed;; New Age International Publishers
2. Srilakshmi, B. (2002). Nutrition Science; New Age International (P) Ltd.
3. Srilakshmi, B. (2007). Food Science; Fourth Ed; New Age International (P) Ltd.
4. Swaminathan, M. (1986). Handbook of Foods and Nutrition; Fifth Ed; BAPPCO.
5. Bamji, M.S.; Rao, N.P. and Reddy, V. (2009). Text Book of Human Nutrition; Oxford & IBH Publishing Co. Pvt Ltd.

Core Courses (CC): ZOUDTT2 and ZOUDLT2

Semester	Core Course	Course Title	Credits
IV	CC-IX	Ecology	Theory: 03; Practical: 02

About the course

This course will take students on a journey through the physical workings of the Earth, the interactions between species and their environments. The course highlights on some of the important aspects viz. growth and survival of populations and communities in different habitats, energy flow in the ecosystems, interactions between the communities, exclusion of niches and consequences of changing environment on the biodiversity.

Learning outcomes

After successfully completing this course, the students will be able to:

- Know the evolutionary and functional basis of animal ecology.
- Understand what makes the scientific study of animal ecology a crucial and exciting endeavour.
- Engage in field-based research activities to understand well the theoretical aspects taught besides learning techniques for gathering data in the field.
- Analyse a biological problem, derive testable hypotheses and then design experiments and put the tests into practice.
- Solve the environmental problems involving interaction of humans and natural systems at local or global level.

Theory

UNIT I: An overview of Ecology, Ecosystems and Biomes **13 Lectures**

Introduction and scope of Ecology. Structure and function of ecosystem. Abiotic factors affecting survival and sustenance of organisms e.g., water, temperature, light, pH and salinity. Role of limiting factors in survival of biotic components. Major ecosystems of the world: Ecological features, limiting factors, zonation and classification of organisms of fresh water and marine ecosystems. Introduction to Biome: Ecological features of Tundra, Desert, Savannah and Tropical Rain forest Biomes.Energy flow in ecosystem, food chain and food web. Productivity. Mineralization and recycling of nutrients: C, N, P & S.

UNIT II: Population ecology; Human population growth **13 Lectures**

Ecology of populations. Unique and group attributes of population: Density, natality, mortality, life tables, fecundity tables, survivorship curves, age ratio, sex ratio, dispersal. Factors regulating population dispersal and growth: Exponential and logistic growth. Population regulation: density-dependent and independent factors; r and K strategies. Ecological efficiencies. Human population growth: Impacts on environment, carrying capacity, human health and welfare.

UNIT III: Biotic community, characteristics and attributes **13 Lectures**

Community characteristics: stratification; Dominance, diversity, species richness, abundance, Evenness, Similarity. Diversity and food-web indices. Ecotone and edge effect; Types of interaction: Positive interactions: commensalism, proto-cooperation, and mutualism. Negative interactions: parasitism and allelopathy; predation and predator-prey dynamics; herbivory. Interspecific competition and coexistence, Inter and intra-specific; abundance. Niche overlap and segregation. Gause's Principle with laboratory and field examples. Ecological succession: Definition, Process, types, theories of succession.

UNIT IV: Environmental degradation; Environmental movement etc. **13 Lectures**

Environmental ethics; Pollution: Air, water and noise pollution and their control; Natural resources: Mineral, water and forest, their significance and conservation; Types of biodiversity, Hotspots; Biodiversity: status, monitoring and documentation; major drivers of biodiversity change; Biodiversity mapping using GPS, GIS and remote sensing. Ecosystem and biodiversity services: Ecological,

Generic Elective Courses (GEC): ZOUDTG1 and ZOUDLG1

Semester	Core Course	Course Title	Credits
IV	GEC-IV	Global Environmental Issues	Theory: 03; Practical: 02

About the course

This course focuses on the diversity of living forms particularly animals with a detailed inference on the loss of species due to various reasons and the need of their conservation.

Learning outcomes

At the end of the course the students will be able to:

- Understand the fundamental issues of environment.
- Analyze different sources of environmental problems and methods of measurement of pollution.
- Examine economic growth and quality of life.
- Examine the microbiology of waste water treatment and its various schemes.

Theory

Unit I: Environment and Environmental Problems **13 Lectures**

Basic concepts and issues, global environmental problems - ozone depletion, UV-B, greenhouse effect and acid rain due to anthropogenic activities, Fisheries depletion, Eutrophication, their impact and biotechnological approaches for management.

Unit II: Environmental Pollution **11 Lectures**

Environmental pollution - types of pollution, Air, water and land pollution, sources of pollution, measurement of pollution, fate of pollutants in the environment, Ocean acidification, Bioconcentration, bio/geomagnification.

Unit III: Environmental Economics **12 Lectures**

Environmental Economics : Basic concept; methods of evaluation; Economic growth, Gross National Productivity and the quality of life, Tragedy of Commons, Economics of Pollution control, Cost-benefit ratio and cost effectiveness analysis.

Unit IV: Use of Microbes in Waste Water Treatment **15 Lectures**

Aerobic decomposition process - activated sludge, oxidation ponds, trickling filter, towers, rotating discs, rotating drums, oxidation ditch. Anaerobic decomposition process - anaerobic filters, up- flow anaerobic sludge blanket reactors. Treatment schemes for sewage from dairy, distillery, tannery, sugar and pharma industries.

Recommended readings

1. Frances, H. (2012). Global Environmental Issues (2nd edition) Willey-Blackwell
2. Mahesh, R. (2007) Environmental Issues in India: A Reader. Pearson-Longman.

Practical

There are no structured class lab experiments involved. However the students are expected to visit various sites on the web, make teams for group-discussion indulge in debates, collect justifiable information from various sources, make historical report on major global environmental issues:

1. Atmosphere Management: Pollution, global warming/climate change, Stratospheric ozone depletion its impact and possible solutions.
2. Fresh water Management: Pollution, reasons, severity of problem, impact for the present and the future, its impact and possible solutions.
3. Marine Ecosystem: Pollution of marine ecosystem, its impact and possible solutions.
4. Soil degradation and Desertification
5. Solid Waste Management

Department of Zoology, School of Life Sciences, GGV, Bilaspur (CG)

DISCIPLINE SPECIFIC ELECTIVE COURSE

LS/ZOO/DSE-601(B) L

FISH AND FISHERIES

THEORY **(Credits 4)**

Unit 1: Introduction and Classification **6**
General characters of fish; Account of systematic classification of fishes (upto classes); Classification based on feeding habit, habitat and manner of reproduction. Ornamental and weed fishes; Fin formula.

Unit 2: Morphology and Physiology **16**
Different types of fins and scales; Use of scales in classification and determination of age of fish; Gills and gas exchange; Swim Bladder: types and role in respiration, buoyancy; Osmoregulation and ionic balance in fishes; Reproductive strategies (special reference to Indian fishes); Electric organs; Bioluminiscience; Schooling; Parental care; Migration.

Unit 3: Fisheries **10**
Inland Fisheries; Marine Fisheries; Fishing crafts and Gears; Depletion of fisheries resources; Application of remote sensing and GIS in fisheries; Fisheries law and regulations.

Unit 4: Aquaculture **16**
Sustainable Aquaculture; Qualities of culturable species of fishes; Types of pond in a fish farm; Pen and cage culture; Integrated fish farming; Composite fish culture; Brood stock management; Induced breeding of fish; Hatchery, Preparation of compound diets for fish; Role of water quality in aquaculture; Fish by-products.

Unit 5: Fish Pathology and Cure **8**
Sign of sickness in fishes, defensive devices in fishes against diseases, diseases of fishes: Nutritional diseases, bacterial disease (Infectious dropsy, Tail rot or fin rot), Fungal diseases (Dermatomycoses, Branchiomycosus) and protozoan diseases (Ichthyophthiriusiasis, Costiasis).

Unit 6: Fish in research **4**
Transgenic fish, Zebra fish as a model organism in research.

Course Objectives:
To know about the diversity of fishes
To know about the edible and non-edible fish
To fulfill the great demands of nutritious food
To promote the fish industry basically based on fish byproducts
Course Outcomes:
Class Pisces is the largest group of the vertebrates. This group provides us highly nutritious food at the low cost. Fish byproducts are also used for various purposes. Therefore, it is utmost need in the present era to involve more and more people in the fish industry.

-40-