SURESH GYAN VIHAR UNIVERSITY

Accredited 'A' Grade by NAAC

SCHOOL OF APPLIED SCIENCES

SYLLABUS

I, II& III Year

B. Sc. Zoology Hons

SEMESTER SYSTEM

(Session 2018-19)

Program Aims and Objectives:

The B.Sc. (Zoology Hons) program of Suresh Gyan Vihar University, Jaipur is designed keeping in view the latest trends in the field of Zoology. The students are given an overview of the various subjects of all the three disciplines during the tenure of their program. The various papers that are put to study during the program include study of animals in details. Therefore after completion of the biology program, the students are well versed with the entire area of all the three disciplines and their application in the current scenario.

Undergraduate Programmes:

Undergraduates majoring in Biological Sciences will develop a broad base of general knowledge, focused primarily in the biological sciences, and capped with in-depth knowledge specific to their particular major program.
Biological Sciences majors will also obtain broad knowledge in mathematics, Biological sciences, and natural sciences, coupled with analytical, oral and compositional skills, to promote good citizenship and the capacity for life-long learning.
Our students are expected to demonstrate a breadth of knowledge across the sub-disciplines that comprise Biological Sciences. The curriculum for biology majors meets the needs of students with three post-graduation ambitions: graduate school, professional school, or work in industry or government without further training.

Learning Objectives:

As Biological Sciences is an integrative discipline, students are required to demonstrate appropriate proficiency in Zoology in order to apply this knowledge to the study of animal diversity.
Students will acquire a breadth of knowledge in Biology (genetics, physiology, anatomy, ecology, evolution, cell- or biochemistry, and microbiology).
Students will acquire a broad knowledge in biological sciences, and natural sciences, coupled with analytical, oral and compositional skills, to promote good citizenship and the capacity for life-long learning.
Students will develop and apply oral and written skills, problem-solving skills in developing experimental design and analysis, and participate in individualized hands-on field and laboratory exercises.
Students will be prepared with a sufficient depth of knowledge in their specific major program to assure their admission to graduate or professional school or be prepared for entry-level employment.
The study of biology can have a multitude of aims and objectives. Largely, it is studied to allow a person to enter a specific field of employment. Other aims for studying biology are intellectual, ethical and pragmatic: to increase knowledge about all aspects of organisms, to encourage greater benevolence in the relationship between humans and the natural environment and to implement biological factors into various technologies or management techniques.

Understanding Living Systems and Critical Thinking:

The study of biology aims to increase understanding of living systems and to allow you to consider the systems in relationship to the self and other organisms in the natural environment. The goal is to be able to test theories developed about living things by utilizing the scientific method and then to apply the new information in a beneficial way.
Field Biology, Health Care and Education
Biology has many applications, both in the natural environment and the environment of health and education. Studying biology allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous

SURESH GYAN VIHAR UNIVERSITY
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Teaching and Examination Scheme
To commence from the Academic year: 2018-19

Department: School of Applied Sciences **Program: B.Sc. Zoology Hons: Semester: I**

S.No.	Course Code	Course Name	Type of Course Core/Elective	Credit	Contact Hrs/Wk.			Exam Hours	Weightage (in%)	
					L	T	P		CIE	ESE
1	EN 101	**English Language 1**	**University Core**	2	2	0	0	3	40	60
2	PC 101	**Proficiency in co-curricular activities**	**University Core**	2	0	0	0	0	100	0
3	CP 101	**Elementary Computer**	**University Core**	3	3	0	0	3	40	60
4	FD102	**Foundation Course-I**	**University Core**	1	1	0	0	3	25	75
5	ES 101	**Environmental Studies**	**University Core**	2	2	0	0	3	40	60
6a	ZH 111	**Systematics and Animal Diversity**	**Program Core**	4	4	0	0	3	40	60
6b	ZH 161	**Systematics and Animal Diversity Lab**	**Program Core**	1	0	0	2	3	60	40
7a	ZH 113	**Biology of insecta**	**Program Core**	4	4	0	0	3	40	60
7b	ZH 163	**Biology of insecta Lab**	**Program Core**	1	0	0	2	3	60	40
8a	ZH 115	**Cell Biology**	**Program Core**	4	4	0	0	3	40	60
8b	ZH165	**Cell Biology Lab**	**Program Core**	1	0	0	2	3	60	40

L – Lecture
T – Tutorial
P – Practical

CIE – Continuous Internal Evaluation
ESE – End Semester Examination

Signature of Concerned Teacher **Signature of Convener-BOS**

Signature of Member Secretary

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Teaching and Examination Scheme
To commence from the Academic year: 2018-19
Department: School of Applied Sciences Program: B.Sc. Zoology Hons: Semester: II

S.No.	Course Code	Course Name	Type of Course Core/Elective	Credit	Contact Hrs/Wk.			Exam Hours	Weightage (in%)	
					L	T	P		CIE	ESE
1.	EM101	**Employability Skills**	**University Core**	1	0	0	2	3	60	40
2.	PC 102	**Proficiency in co-curricular activities**	**University Core**	2	0	0	0	0	100	00
3.	HUM 102	**Human Values & Ethics**	University Core	1	1	0	0	3	40	60
4.	EN 102	**English language II**	**University Core**	3	3	0	0	3	40	60
5.	FD104	**Foundation Course-II**	**University Core**	1	1	0	0	3	25	75
6.	ZH-112	**Diversity of Chordates**	**Program Core**	4	4	0	0	3	40	60
7.	ZH 162	**Diversity of Chordates Lab**	**Program Core**	1	0	0	2	3	60	40
8.	ZH-114	**Animal Physiology**	**Program Core**	4	4	0	0	3	40	60
9.	ZH164	**Animal Physiology Lab**	**Program Core**	1	0	0	2	3	60	40
10.	ZH116	**Parasitology**	**Program Core**	4	4	0	0	3	40	60
11.	ZH166	**Parasitology Lab**	**Program Core**	1	0	0	2	3	60	40

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Teaching and Examination Scheme
To commence from the Academic year: 2018-19

Department: School of Applied Sciences **Program: B.Sc. Zoology Hons: Semester: III**

S. No.	Course code	Course Name	Type of Course Core/Elective	Credits	Contact Hrs/Wk			Exam Hrs.	Weightage (in%)	
					L	T/S	P		CE	ESE
1.	PCA	Proficiency in Co-curricular	**University Core**	2	0	0	0	0	100	0
2.	EM 203	Employability Skills	**University Core**	1	0	0	2	3	100	0
3.	ZY211	Fundamentals of Biochemistry	**Programme Core**	4	4	0	0	3	40	60
4.	ZH213	Comparative Anatomy of Vertebrates	**Programme Core**	4	4	0	0	3	40	60
5.	ZH215	Physiology: Life Sustaining Systems	**Programme Core**	4	4	0	0	3	40	60
6.	ZH217	Molecular Biology	**Programme Core**	4	4	0	0	3	40	60
7.	ZH261	Fundamentals of biochemistry Lab	**Programme Core**	2	0	0	3	3	60	40
8.	ZH263	Comparative Anatomy of Vertebrates Lab	**Programme Core**	2	0	0	3	3	60	40
9.	ZH265	Molecular Biology Lab	**Programme Core**	2	0	0	3	3	60	40
10	ZY 113	Zoology-I Introduction to biology	**Programme Core**	4	4	0	0	3	40	60

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Teaching and Examination Scheme
To commence from the Academic year: 2018-19

Department: School of Applied Sciences **Program: B.Sc. Zoology Hons: Semester: IV**

S. No.	Course code	Course Name	Type of Course Core/Elective	Credits	Contact Hrs/Wk.			Exam Hrs.	Weightage (in%)	
					L	T/S	P		CE	ESE
1.	PC 202	Proficiency in Co-curricular	**University Core**	2	0	0	0	0	100	0
2.	EM 202	Employability Skills	**University Core**	1	0	0	2	3	60	40
4.	ZH212	Principles of Genetics	**Programme Core**	4	4	0	0	3	40	60
5.	ZH214	Developmental Biology	**Programme Core**	4	4	0	0	3	40	60
6.	ZH216	Evolutionary Biology	**Programme Core**	4	4	0	0	3	40	60
7.	ZH218	Endocrinology	**Programme Core**	4	4	0	0	3	40	60
8.	ZH262	Principles of Genetics Lab	**Programme Core**	2	0	0	3	3	60	40
9.	ZH264	Endocrinology Lab	**Programme Core**	2	0	0	3	3	60	40
10.	ZH266	Developmental Biology Lab	**Programme Core**	2	0	0	3	3	60	40

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Teaching and Examination Scheme
To commence from the Academic year: 2018-19
Department: School of Applied Sciences Program: B.Sc. Zoology Hons: Semester: V

S. No.	Course code	Course Name	Type of Course Core/Elective	Credits	Contact Hrs/Wk.			Exam Hrs.	Weightage (in%)	
					L	T/S	P		CIE	ESE
1.	PC	Proficiency in Co-curricular	**University Core**	2	0	0	0	0	100	0
2.	EM 301	Employability Skills – IV	**University Core**	1	0	0	2	3	60	40
3.	ZH311	Animal Behaviour	**Programme Core**	4	4	0	0	3	40	60
4.	ZH313	Functional Anatomy and Economic Importance of Non-Chordates	**Programme Core**	4	4	0	0	3	40	60
5.	ZH315	Immunology	**Programme Core**	4	4	0	0	3	40	60
6.	ZH317	Elective-1	**Programme Core**	4	4	0	0	3	40	60
7.	ZH361	Animal Behaviour Lab	**Programme Core**	2	0	0	3	3	60	40
8.	ZH363	Immunology Lab	**Programme Core**	2	0	0	3	3	60	40
9.	ZH365	Microbiology Lab	**Programme Core**	2	0	0	3	3	60	40

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Elective

1. **Microbiology**
2. **Fish and Fisheries**
3. **Exploring the Brain: Structure and Function**
4. **Food, Nutrition and Health**

Teaching and Examination Scheme

To commence from the Academic year: 2018-19

Department: School of Applied Sciences Program: B.Sc. Zoology Hons: Semester: VI

S. No.	Course code	Course Name	Type of Course Core/Elective	Credits	Contact Hrs/Wk.			Exam Hrs.	Weightage (in%)	
					L	T/S	P		CE	ESE
1.	ZY312	Environmental and Public Health	**Programme Core**	4	4	0	0	3	40	60
2.	ZY314	Biotechniques	**Programme Core**	4	4	0	0	3	40	60
3.	ZY316	Fundamentals of Biotechnology	**Programme Core**	4	4	0	0	3	40	60
4.	ZY318	Elective- II	**Programme Core**	4	4	0	0	3	40	60
5.	ZY362	Environmental Biology Lab	**Programme Core**	2	0	0	3	3	60	40
6.	ZY364	Biotechniques Lab	**Programme Core**	2	0	0	3	3	60	40
7.	ZY366	Fundamentals of Biotechnology Lab	**Programme C ore**	2	0	0	3	3	60	40

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Elective

1. **Applied Zoology**
2. **Agrochemicals and Pest Management**
3. **Basics of Neuroscience**
4. **Computational Biology**

ZH111	SYSTEMATICS AND ANIMAL DIVERSITY C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding regarding invertebrate, To gain knowledge about diversity and morphology of Protista, To have understanding about Platyhelminthes
Salient features	The student will be able to conceptualize about identification and classification of echinoderms, Able to understand general characteristics and evolutionary significance of Mollusca.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous.
Unit-I	**Protista, Parazoa and Metazoa, Porifera 7hr**
General characteristics and Classification up to classes Study of Euglena, Amoeba and Paramecium Life cycle and pathogenicity of Plasmodium vivax and Entamoeba histolytica Locomotion and Reproduction in Protista Evolution of symmetry and segmentation of Metazoa, General characteristics and Classification up to classes Canal system in sponges	
Unit- II	**Cnidaria Ctenophora, and Platyhelminthes 7hr**
General characteristics and Classification up to classes Metagenesis in Obelia Polymorphism in Cnidaria Corals and coral reefs, General characteristics and Evolutionary significance, General characteristics and Classification up to classes Life cycle and pathogenicity of Fasciola hepatica and Taenia solium, General characteristics and Classification up to classes Life cycle, and pathogenicity of Ascaris lumbricoides and Wuchereria bancrofti Parasitic adaptations in helminthes	
Unit-III	**Annelida and Arthropoda 7hr**
Evolution of coelom and metamerism, General characteristics and Classification up to classes Excretion in Annelida, General characteristics and Classification up to classes Vision and Respiration in Arthropoda Metamorphosis in Insects Social life in bees and termites	
Unit-IV	**Mollusca 7hr**
General characteristics and Evolutionary significance, General characteristics and Classification up to classes Respiration in Mollusca Torsion and detorsion in Gastropoda Pearl formation in bivalves Evolutionary significance of trochophore larva	
Unit-V	**Echinodermata 8hr**
General characteristics and Classification up to classes Water-vascular system in Asteroidea Larval forms in Echinodermata Affinities with Chordates	
Reference books	Barnes, R.D. (1982). Invertebrate Zoology, V Edition. Holt Saunders International Edition. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson Boradale, L.A. and Potts, E.A. (1961). Invertebrates: A Manual for the use of Students. Asia Publishing Home
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZH113	BIOLOGY OF INSECTA C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding general features of insects distribution and success of Insects, To have understanding about general morphology of insects.
Salient features	The student will be able to conceptualize about identification and physiology of insects, Able to analyze economic importance of social organization and social behavior of insects.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Introduction 7hr**
General Features of Insects Distribution and Success of Insects on the Earth, Basis of insect classification; Classification of insects up to orders	
Unit- II	**General Morphology of Insects 7hr**
External Features; Head – Eyes, Types of antennae, Mouth parts w.r.t. feeding habits Thorax: Wings and wing articulation, Types of Legs adapted to diverse habitat Abdominal appendages and genitalia	
Unit-III	**Physiology of Insects 7hr**
Structure and physiology of Insect body systems - Integumentary, digestive, excretory, circulatory, respiratory, endocrine, reproductive, and nervous system Sensory receptors Growth and metamorphosis	
Unit-IV	**Insect Society 7hr**
Group of social insects and their social life Social organization and social behaviour (w.r.t. any one example)	
Unit-V	**Insect Plant Interaction 8hr**
Theory of co-evolution, role of allelochemicals in host plant mediation Host-plant selection by phytophagous insects, Insects as plant pests, Insects as mechanical and Biological vectors, Brief discussion on houseflies and mosquitoes as important insect vectors	
Reference books	A general text book of entomology, Imms , A. D., Chapman & Hall, UK The Insects: Structure and function, Chapman, R. F., Cambridge University Press, UK Principles of Insect Morphology, Snodgrass, R. E., Cornell Univ. Press, USA Introduction to the study of insects, Borror, D. J., Triplehorn, C. A., and Johnson, N. F., M Saunders College Publication, USA The Insect Societies, Wilson, E. O., Harward Univ. Press, UK Host Selection by Phytophagous insects, Bernays, E. A., and Chapman, R. F., Chapman and Hall, New York, USA Physiological system in Insects, Klowden, M. J., Academic Press, USA The Insects, An outline of Entomology, Gullan, P. J. , and Cranston, P. S., Wiley Blackwell, UK
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZH115	CELL BIOLOGY	C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**	
Learning objective	The learning objectives of course are: To create an understanding regarding plasma membrane, To gain knowledge about endomembrane system. To have understanding about structure and function of cell organelles.	
Salient features	The student will be able to conceptualize about roll of cytoskeleton, Able to understand cell cycle and its regulation.	
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous	
Unit-I	**Plasma Membrane**	**7hr**
Prokaryotic and Eukaryotic cells, Virus, Viroids, Mycoplasma, Prions, Various models of plasma membrane structure Transport across membranes: Active and Passive transport, Facilitated transport Cell junctions: Tight junctions, Desmosomes, Gap junctions		
Unit- II	**Endomembrane System**	**7hr**
Structure and Functions: Endoplasmic Reticulum, Golgi Apparatus, Lysosomes		
Unit-III	**Mitochondria and Peroxisomes**	**7hr**
Mitochondria: Structure, Semi-autonomous nature, Endosymbiotic hypothesis Mitochondrial Respiratory Chain, Chemi-osmotic hypothesis Peroxisomes		
Unit-IV	**Cytoskeleton**	**7hr**
Structure and Functions: Microtubules, Microfilaments and Intermediate filaments, GPCR and Role of second messenger (cAMP)		
Unit-V	**Nucleus**	**8hr**
Structure of Nucleus: Nuclear envelope, Nuclear pore complex, Nucleolus Chromatin: Euchromatin and Hetrochromatin and packaging (nucleosome), Mitosis, Meiosis, Cell cycle and its regulation		
Reference books	Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition. John Wiley and Sons. Inc. De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia. Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. V Edition. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of theCell. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco. Bruce Albert, Bray Dennis, Levis Julian, Raff Martin, Roberts Keith and Watson James (2008). Molecular Biology of the Cell, V Edition, Garland publishing Inc., New York and London.	
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT	
Recommended By BOS on:		
Approved by academic council on:		

ZH112	DIVERSITY OF CHORDATES	C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**	
Learning objective	The learning objectives of course are: To create an understanding regarding characteristics and outline classification of chordates, To gain knowledge about general characteristics and classification of cyclostomes up to class.	
Salient features	The student will be able to conceptualize about identification and classification of Amphibia, Able to analyze Zoogeographical realms.	
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous	
Unit-I	**Protochordata**	**7hr**
General characteristics and outline classification of chordates, General characteristics of Hemichordata, Urochordata and Cephalochordata; Study of larval forms in protochordates; Retrogressive metamorphosis in Urochordata, Dipleurula concept and the Echinoderm theory of origin of chordates Advanced features of vertebrates over Protochordata		
Unit- II	**Agnatha and Pisces**	**7hr**
General characteristics and classification of cyclostomes up to class, General characteristics of Chondrichthyes and Osteichthyes, Classification up to order Migration, Osmoregulation and Parental care in fishes		
Unit-III	**Amphibia and Reptilia**	**7hr**
Origin of Tetrapoda (Evolution of terrestrial ectotherms); General characteristics and classification up to order; Parental care in Amphibians, General characteristics and classification up to order; Affinities of Sphenodon; Poison apparatus and Biting mechanism in snakes		
Unit-IV	**Aves and Mammals**	**7hr**
General characteristics and classification up to order Archaeopteryx-- a connecting link; Principles and aerodynamics of flight, Flight adaptations and Migration in birds, General characters and classification up to order; Affinities of Prototheria; Adaptive radiation with reference to locomotory appendages		
Unit-V	**Zoogeography**	**8hr**
Zoogeographical realms, Theories pertaining to distribution of animals, Plate tectonic and Continental drift theory, distribution of vertebrates in different realms		
Reference books	Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press. Pough H. Vertebrate life, VIII Edition, Pearson International. Darlington P.J. The Geographical Distribution of Animals, R.E. Krieger Pub. Co. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.	
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT	
Recommended By BOS on:		
Approved by academic council on:		

ZH114	ANIMAL PHYSIOLOGY C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding regarding physiology of digestion, To gain knowledge about physiology of respiration, To have understanding about renal physiology.
Salient features	The student will be able to conceptualize about structure and function of blood components, Able to understand physiology of heart.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Physiology of Digestion 7hr**
Structural organization and functions of gastrointestinal tract and associated glands; Mechanical and chemical digestion of food; Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins; Hormonal control of secretion of enzymes in Gastrointestinal tract.	
Unit- II	**Physiology of Respiration 7hr**
Histology of trachea and lung; Mechanism of respiration, Pulmonary ventilation; Respiratory volumes and capacities; Transport of oxygen and carbon dioxide in blood; Respiratory pigments, Dissociation curves and the factors influencing it; Carbon monoxide poisoning; Control of respiration	
Unit-III	**Renal Physiology 7hr**
Structure of kidney and its functional unit; Mechanism of urine formation; Regulation of water balance; Regulation of acid-base balance	
Unit-IV	**Blood 7hr**
Components of blood and their functions; Structure and functions of haemoglobin Haemostasis: Blood clotting system, Kallikrein-Kinninogen system, Complement system& Fibrinolytic system, Haemopoiesis Blood groups: Rh factor, ABO and MN	
Unit-V	**Physiology of Heart 8hr**
Structure of mammalian heart; Coronary circulation; Structure and working of conducting myocardial fibers. Origin and conduction of cardiac impulses Cardiac cycle; Cardiac output and its regulation, Frank-Starling Law of the heart, nervous and chemical regulation of heart rate. Electrocardiogram, Blood pressure and its regulation	
Reference books	Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. /W.B. Saunders Company. Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII Edition.Lippincott W. & Wilkins. Arey, L.B. (1974). Human Histology. IV Edition. W.B. Saunders.
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZH116	PARASITOLOGY C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding regarding parasitology, To gain knowledge about parasitic Protists, To have understanding about parasitic Platyhelminthes.
Salient features	The student will be able to conceptualize about Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, and Diagnosis of Parasitic Nematodes. Able to understand of Biology, importance and control of parasitic Arthropoda.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Introduction to Parasitology** **7hr**
Brief introduction of Parasitism, Parasite, Parasitoid and Vectors (mechanical and biological vector) Host parasite relationship	
Unit- II	**Parasitic Protists** **7hr**
Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of Entamoeba histolytica, Giardia intestinalis, Trypanosoma gambiense, Leishmania donovani, Plasmodium vivax	
Unit-III	**Parasitic Platyhelminthes** **7hr**
Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of Fasciolopsis buski, Schistosoma haematobium, Taenia solium and Hymenolepis nana	
Unit-IV	**Parasitic Nematodes** **7hr**
Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of Ascaris lumbricoides, Ancylostoma duodenale, Wuchereria bancrofti and Trichinella spiralis. Study of structure, life cycle and importance of Meloidogyne (root knot nematode), Pratylencus (lesion nematode)	
Unit-V	**Parasitic Arthropoda** **8hr**
Biology, importance and control of ticks, mites, Pediculus humanus (head and body louse), Xenopsylla cheopis and Cimex lectularius, A brief account of parasitic vertebrates; Cookicutter Shark, Candiru, Hood Mockingbird and Vampire bat	
Reference books	Arora, D. R and Arora, B. (2001) Medical Parasitology. II Edition. CBS Publications and Distributors E.R. Noble and G.A. Noble (1982) Parasitology: The biology of animal parasites. V Edition, Lea & Febiger Ahmed, N., Dawson, M., Smith, C. and Wood, Ed. (2007) Biology of Disease. Taylor and Francis Group Parija, S. C. Textbook of medical parasitology, protozoology & helminthology (Text and colour Atlas), II Edition, All India Publishers & Distributers, Medical Books Publishers, Chennai, Delhi Rattan Lal Ichhpujani and Rajesh Bhatia. Medical Parasitology, III Edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi Meyer, Olsen & Schmidt's Essentials of Parasitology, Murray, D. Dailey, W.C. Brown Publishers
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZY211	FUNDAMENTALS OF BIOCHEMISTRY C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding regarding biomolecules, To gain knowledge about carbohydrate metabolism, To have understanding about protein metabolism.
Salient features	The student will be able to conceptualize about identification reaction of biomolecules, Able to understand enzymes and their industrial applications.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Carbohydrates 7hr**
Structure and Biological importance: Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates, Catabolism vs Anabolism, Stages of catabolism, Compartmentalization of metabolic pathways, Shuttle systems and membrane transporters; ATP as "Energy Currency of cell"; coupled reactions; Use of reducing equivalents and cofactors; Intermediary metabolism and regulatory mechanisms, Sequence of reactions and regulation of glycolysis, Citric acid cycle, Phosphate pentose pathway, Gluconeogenesis, Glycogenolysis and Glycogenesis	
Unit- II	**Lipids 7hr**
Structure and Significance: Physiologically important saturated and unsaturated fatty acids, Tri-acylglycerols, Phospholipids, Glycolipids, Steroids, β-oxidation and omega -oxidation of saturated fatty acids with even and odd number of carbon atoms; Biosynthesis of palmitic acid; Ketogenesis	
Unit-III	**Proteins 7hr**
Amino acids: Structure, Classification and General properties of α-amino acids; Physiological importance of essential and non-essential α-amino acids Proteins: Bonds stabilizing protein structure; Levels of organization in proteins; Denaturation; Introduction to simple and conjugate proteins Immunoglobulins: Basic Structure, Classes and Function, Antigenic Determinants, Catabolism of amino acids: Transamination, Deamination, Urea cycle; Fate of C-skeleton of Glucogenic and Ketogenic amino acids	
Unit-IV	**Nucleic Acids 7hr**
Structure: Purines and pyrimidines, Nucleosides, Nucleotides, Nucleic acids Cot Curves: Base pairing, Denaturation and Renaturation of DNA Types of DNA and RNA, Complementarity of DNA, Hpyo-Hyperchromaticity of DNA	
Unit-V	**Enzymes 8hr**
Nomenclature and classification; Cofactors; Specificity of enzyme action; Isozymes; Mechanism of enzyme action; Enzyme kinetics; Factors affecting rate of enzyme-catalyzed reactions; Derivation of Michaelis-Menten equation, Concept of Km and Vmax, Lineweaver-Burk plot; Multi-substrate reactions; Enzyme inhibition; Allosteric enzymes and their kinetics; Regulation of enzyme action, Redox systems; Review of mitochondrial respiratory chain, Inhibitors and un-couplers of Electron Transport System	
Reference books	Cox, M.M and Nelson, D.L. (2008). Lehninger's Principles of Biochemistry, V Edition, W.H. Freeman and Co., New York. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). Biochemistry, VI Edition, W.H. Freeman and Co., New York. Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Well, P.A. (2009). Harper's Illustrated Biochemistry, XXVIII Edition, International Edition, The McGraw- Hill Companies Inc. Hames, B.D. and Hooper, N.M. (2000). Instant Notes in Biochemistry, II Edition, BIOS Scientific Publishers Ltd., U.K. Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. and Losick, R. (2008). Molecular Biology of the Gene, VI Edition, Cold Spring Harbor Lab. Press, Pearson Pub.
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZH213	COMPARATIVE ANATOMY OF VERTEBRATES C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding regarding skeletal system, To gain knowledge about digestive system and respiratory system, To have understanding about comparative account of brain autonomic nervous system.
Salient features	The student will be able to conceptualize about sense organs, Able to understand about receptors like visual and auditory receptors.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Skeletal System** **7hr**
Structure, functions and derivatives of integument, Overview of axial and appendicular skeleton, Jaw suspensorium, Visceral arches	
Unit- II	**Digestive System and Respiratory System** **7hr**
Alimentary canal and associated glands, dentition, Skin, gills, lungs and air sacs; Accessory respiratory organs	
Unit-III	**Circulatory System and Urinogenital System** **7hr**
General plan of circulation, evolution of heart and aortic arches, Succession of kidney, Evolution of urinogenital ducts, Types of mammalian uteri	
Unit-IV	**Nervous System** **7hr**
Comparative account of brain Autonomic nervous system, Spinal cord, Cranial nerves in mammals	
Unit-V	**Sense Organs** **8hr**
Classification of receptors Brief account of visual and auditory receptors in man.	
Reference books	Kardong, K.V. (2005) Vertebrates' Comparative Anatomy, Function and Evolution. IV Edition. McGraw-Hill Higher Education Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition. The McGraw-Hill Companies Weichert C.K and William Presch (1970). Elements of Chordate Anatomy, Tata McGraw Hills Hilderbrand, M and Gaslow G.E. Analysis of Vertebrate Structure, John Wiley and Sons Walter, H.E. and Sayles, L.P; Biology of Vertebrates, Khosla Publishing House
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZH215	PHYSIOLOGY: LIFE SUSTAINING SYSTEMS C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding physiology of digestion, To gain knowledge about physiology of respiration.
Salient features	The student will be able to conceptualize about blood components, Able to understand physiology of heart.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Physiology of Digestion 7hr**
Structural organization and functions of gastrointestinal tract and associated glands; Mechanical and chemical digestion of food; Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins; Hormonal control of secretion of enzymes in Gastrointestinal tract.	
Unit- II	**Physiology of Respiration 7hr**
Histology of trachea and lung; Mechanism of respiration, Pulmonary ventilation; Respiratory volumes and capacities; Transport of oxygen and carbon dioxide in blood; Respiratory pigments, Dissociation curves and the factors influencing it; Carbon monoxide poisoning; Control of respiration	
Unit-III	**Renal Physiology 7hr**
Structure of kidney and its functional unit; Mechanism of urine formation; Regulation of water balance; Regulation of acid-base balance	
Unit-IV	**Blood 7hr**
Components of blood and their functions; Structure and functions of haemoglobin Haemostasis: Blood clotting system, Kallikrein-Kinninogen system, Complement system& Fibrinolytic system, Haemopoiesis Blood groups: Rh factor, ABO and MN	
Unit-V	**Physiology of Heart 8hr**
Structure of mammalian heart; Coronary circulation; Structure and working of conducting myocardial fibers. Origin and conduction of cardiac impulses Cardiac cycle; Cardiac output and its regulation, Frank-Starling Law of the heart, nervous and chemical regulation of heart rate. Electrocardiogram, Blood pressure and its regulation	
Reference books	Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. W.B. Saunders Company. Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons, Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII Edition. Lippincott W. & Wilkins. Arey, L.B. (1974). Human Histology. IV Edition. W.B. Saunders. Vander A, Sherman J. and Luciano D. (2014). Vander's Human Physiology: The Mechanism of Body Function. XIII Edition, Mcgraw Hills
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZH217	MOLECULAR BIOLOGY C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding regarding nucleic acid, To gain knowledge about transcription and translation, To have understanding about post transcriptional modification.
Salient features	The student will be able to conceptualize about regulation of gene, Able to DNA repair mechanisms.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Nucleic Acids 7hr**
Salient features of DNA and RNA Watson and Crick model of DNA, DNA Replication in prokaryotes and eukaryotes, mechanism of DNA replication,Semi-conservative, bidirectional and semi-discontinuous replication, RNA priming, Replication of circular and linear ds-DNA, replication of telomeres	
Unit- II	**Transcription and Translation 7hr**
RNA polymerase and transcription Unit, mechanism of transcription in prokaryotes and eukaryotes, synthesis of rRNA and mRNA, transcription factors, Genetic code, Degeneracy of the genetic code and Wobble Hypothesis; Process of protein synthesis in prokaryotes: Ribosome structure and assembly in prokaryotes, fidelity of protein synthesis, aminoacyl tRNA synthetases and charging of tRNA; Proteins involved in initiation, elongation and termination of polypeptide chain; Inhibitors of protein synthesis; Difference between prokaryotic and eukaryotic translation	
Unit-III	**Post Transcriptional Modifications and Processing of Eukaryotic RNA 7hr**
Structure of globin mRNA; Split genes: concept of introns and exons, splicing mechanism, alternative splicing, exon shuffling, and RNA editing, Processing of tRNA,	
Unit-IV	**Gene Regulation 7hr**
Transcription regulation in prokaryotes: Principles of transcriptional regulation with examples from lac operon and trp operon; Transcription regulation in eukaryotes: Activators, repressors, enhancers, silencer elements; Gene silencing, Genetic imprinting	
Unit-V	**DNA Repair Mechanisms 8hr**
Pyrimidine dimerization and mismatch repair, Ribo-switches, RNA interference, miRNA, siRNA	
Reference books	Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of the Cell. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter: Molecular Biology of the Cell, IV Edition. Cooper G. M. and Robert E. Hausman R. E. The Cell: A Molecular Approach, V Edition, ASM Press and Sinauer Associates. De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia. Karp, G. (2010) Cell and Molecular Biology: Concepts and Experiments. VI Edition. John Wiley and Sons. Inc.
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZH212	PRINCIPLES OF GENETICS C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding regarding mendelian genetics, To gain knowledge about mechanisms of sex determination, To have understanding about polygenic inheritance.
Salient features	The student will be able to conceptualize about transposons in bacteria, Able to understand about transposons in human.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Mendelian Genetics and its Extension 7hr**
Principles of inheritance, Incomplete dominance and co-dominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Sex-linked, sex-influenced and sex-limited characters inheritance. Linkage and crossing over, Cytological basis of crossing over, Molecular mechanisms of crossing over including models of recombination, Recombination frequency as a measure of linkage intensity, Two factor and three factor crosses, Interference and coincidence, Somatic cell hybridization.	
Unit- II	**Mutations 7hr**
Types of gene mutations (Classification), Types of chromosomal aberrations (Classification, figures and with one suitable example of each), Molecular basis of mutations in relation to UV light and chemical mutagens; Detection of mutations: CLB method, attached X method.	
Unit-III	**Sex Determination 7hr**
Chromosomal mechanisms of sex determination in Drosophila and Man, Criteria for extra-chromosomal inheritance, Antibiotic resistance in Chlamydomonas, Mitochondrial mutations in Saccharomyces, Infective heredity in Paramecium and Maternal effects	
Unit-IV	**Polygenic Inheritance 7hr**
Polygenic inheritance with suitable examples; simple numericals based on it. Conjugation, Transformation, Transduction, Complementation test in Bacteriophage	
Unit-V	**Transposable Genetic Elements 8hr**
Transposons in bacteria, Ac-Ds elements in maize and P elements in Drosophila, Transposons in humans	
Reference books	Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. VIII Edition. Wiley India Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons Inc Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. X Edition. Benjamin Cummings Russell, P. J. (2009). Genetics- A Molecular Approach.III Edition. Benjamin Cummings Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. Introduction to Genetic Analysis. IX Edition. W. H. Freeman and Co
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZH214	DEVELOPMENTAL BIOLOGY C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding basic concepts of development biology, To gain knowledge about gametogenesis, To have understanding about late embryonic development.
Salient features	The student will be able to conceptualize about post embryonic development, Able to understand teratogenesis.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Introduction** **7hr**
Historical perspective and basic concepts: Phases of development, Cell-Cell interaction, Pattern formation, Differentiation and growth, Differential gene expression, Cytoplasmic determinants and asymmetric cell division	
Unit- II	**Early Embryonic Development** **7hr**
Gametogenesis, Spermatogenesis, Oogenesis; Types of eggs, Egg membranes; Fertilization (External and Internal): Changes in gametes, Blocks to polyspermy; Planes and patterns of cleavage; Types of Blastula; Fate maps (including Techniques); Early development of frog and chick up to gastrulation; Embryonic induction and organizers	
Unit-III	**Late Embryonic Development** **7hr**
Fate of Germ Layers; Extra-embryonic membranes in birds; Implantation of embryo in humans, Placenta (Structure, types and functions of placenta)	
Unit-IV	**Post Embryonic Development** **7hr**
Metamorphosis: Changes, hormonal regulations in amphibians and insects; Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (with one example each); Ageing: Concepts and Theories	
Unit-V	**Implications of Developmental Biology** **8hr**
Teratogenesis: Teratogenic agents and their effects on embryonic development; In vitro fertilization, Stem cell (ESC), Amniocentesis	
Reference books	Gilbert, S. F. (2010). Developmental Biology, IX Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA Balinsky B. I. and Fabian B. C. (1981). An Introduction to Embryology, V Edition, International Thompson Computer Press Carlson, R. F. Patten's Foundations of Embryology Kalthoff (2008). Analysis of Biological Development, II Edition, McGraw-Hill Publishers Lewis Wolpert (2002). Principles of Development. II Edition, Oxford University Press
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZH216	EVOLUTIONARY BIOLOGY	C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**	
Learning objective	The learning objectives of course are: To create an understanding regarding evolutionary concepts, To gain knowledge about evidence of evolution, To have understanding population genetics.	
Salient features	The student will be able to conceptualize about micro evolutionary changes, Able to understand origin and evolution of man.	
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous	
Unit-I	**Introduction**	**7hr**
Life's Beginnings: Chemogeny, RNA world, Biogeny, Origin of photosynthesis, Evolution of eukaryotes, Historical review of evolutionary concept: Lamarckism, Darwinism, Neo-Darwinism		
Unit- II	**Evidences of Evolution**	**7hr**
Fossil record (types of fossils, transitional forms, geological time scale, evolution of horse, Molecular (universality of genetic code and protein synthesising machinery, three domains of life, neutral theory of molecular evolution, molecular clock ,example of globin gene family, rRNA/cyt c, Sources of variations: Heritable variations and their role in evolution		
Unit-III	**Population genetics**	**7hr**
Hardy-Weinberg Law (statement and derivation of equation, application of law to human Population);Evolutionary forces upsetting H-W equilibrium. Natural selection (concept of fitness, selection coefficient, derivation of one unit of selection for a dominant allele, genetic load, mechanism of working, types of selection, density-dependent selection, heterozygous superiority, kin selection, adaptive resemblances, sexual selection. Genetic Drift (mechanism, founder's effect, bottleneck phenomenon; Role of Migration and Mutation in changing allele frequencies		
Unit-IV	**Product of evolution**	**7hr**
Product of evolution: Micro evolutionary changes (inter-population variations, clines, races, Species concept, Isolating mechanisms, modes of speciation—allopatric, sympatric, Adaptive radiation / macroevolution (exemplified by Galapagos finches, Extinctions, Back ground and mass extinctions (causes and effects), detailed example of K-T extinction		
Unit-V	**Origin and evolution**	**8hr**
Origin and evolution of man, Unique hominin characteristics contrasted with primate characteristics, primate phylogeny from Dryopithecus leading to Homo sapiens, molecular analysis of human origin, Phylogenetic trees, Multiple sequence alignment, construction of phylogenetic trees, interpretation of trees		
Reference books	Ridley,M (2004) Evolution III Edition Blackwell publishing Hall, B.K. and Hallgrimson, B (2008). Evolution IV Edition. Jones and Barlett Publishers. Campbell, N.A. and Reece J.B (2011). Biology. IX Edition. Pearson, Benjamin, Cummings. Douglas, J. Futuyma (1997).Evolutionary Biology. Sinauer Associates. Snustad. S Principles of Genetics. Pevsner, J (2009). Bioinformatics and Functional Genomics. II Edition Wiley- Blackwell Minkoff, E. (1983). Evolutionary Biology. Addison-Wesley	
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT	
Recommended By BOS on:		
Approved by academic council on:		

ZH218	ENDOCRINOLOGY C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding regarding introduction of endocrinology, To gain knowledge about Epiphysis, Hypothalamo-hypophysial Axis, To have understanding about structure and function of peripheral endocrine glands.
Salient features	The student will be able to conceptualize about regulation of hormone action, Able to understand structure and function of pancreas and its hormones.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Introduction to Endocrinology 7hr**
History of endocrinology, Classification, Characteristic and Transport of Hormones, Neurosecretions and Neurohormones	
Unit- II	**Epiphysis, Hypothalamo-hypophysial Axis 7hr**
Structure of pineal gland, Secretions and their functions inbiological rhythms and reproduction. Structure of hypothalamus, Hypothalamic nuclei and their functions, Regulation of neuroendocrine glands, Feedback mechanisms Structure of pituitary gland, Hormones and their functions, Hypothalamo-hypophysial portal system, Disorders of pituitary gland.	
Unit-III	**Peripheral Endocrine Glands 7hr**
Structure, Hormones, Functions and Regulation of Thyroid gland, Parathyroid, Adrenal, Pancreas, Ovary and Testis Hormones in homeostasis, Disorders of endocrine glands	
Unit-IV	**Regulation of Hormone Action 7hr**
Hormone action at Cellular level: Hormone receptors, transduction and regulation Hormone action at Molecular level: Molecular mediators, Genetic control of hormone action	
Unit-V	**Pancreas and its hormones 8hr**
Structure of Pancreatic Islets of Langerhans and hormones secreted by it; insulin secretion (proinsulin) its activation, Glucagon secretion, mechanism of action of both hormones in controlling the blood glucose level. Diabetes mellitus.	
Reference books	General Endocrinology C. Donnell Turner Pub- SaundersToppan Endocrinology: An Integrated Approach; Stephen Nussey and Saffron Whitehead. Oxford: BIOS Scientific Publishers; 2001. Hadley, M.E. and Levine J.E. 2007. Endocrinology, 6th Edition. Pearson Prentice-Hall, Pearson Education Inc., New Jersey. A textbook of comparative endocrinology, Aubrey Gorbman, Howard Alan Bern, 1962, Medical. Vertebrate Endocrinology by David O. Norris,
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZH311	ANIMAL BEHAVIOUR C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding regarding animal behaviour, To gain knowledge about pattern of behaviour, To have understanding about social and sexual behavior of animal.
Salient features	The student will be able to conceptualize about chronobiology, Able to analyze biological rhythms.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Introduction to Animal Behaviour 7hr**
Origin and history of Ethology; Brief profiles of Karl Von Frish, Ivan Pavlov, Konrad Lorenz, Niko Tinbergen, Proximate and ultimate causes of behaviour, Methods and recording of a behavior	
Unit- II	**Patterns of Behaviour 7hr**
Stereotyped Behaviours (Orientation, Reflexes); Individual Behavioural patterns; Instinct vs. Learnt Behaviour; Associative learning, classical and operant conditioning, Habituation, Imprinting.	
Unit-III	**Social and Sexual Behaviour 7hr**
Social Behaviour: Concept of Society; Communication and the senses; Altruism; Insects' society with Honey bee as example; Foraging in honey bee and advantages of the waggle dance. Sexual Behaviour: Asymmetry of sex, Sexual dimorphism, Mate choice, Intra-sexual selection (male rivalry), Inter-sexual selection (female choice), Sexual conflict in parental care.	
Unit-IV	**Introduction to Chronobiology 7hr**
Historical developments in chronobiology; Biological oscillation: the concept of Average, amplitude, phase and period. Adaptive significance of biological clocks	
Unit-V	**Biological Rhythm 8hr**
Types and characteristics of biological rhythms: Short- and Long- term rhythms; Circadian rhythms; Tidal rhythms and Lunar rhythms; Concept of synchronization and masking; Photic and non-photic zeitgebers; Circannual rhythms; Photoperiod and regulation seasonal reproduction of vertebrates; Role of melatonin. Relevance of biological clocks; Chronopharmacology, Chronomedicine, Chronotherapy.	
Reference books	David McFarland, Animal Behaviour, Pitman Publishing Limited, London, UK. Manning, A. and Dawkins, M. S, An Introduction to Animal Behaviour, Cambridge,University Press, UK. John Alcock, Animal Behaviour, Sinauer Associate Inc., USA. Paul W. Sherman and John Alcock, Exploring Animal Behaviour, Sinauer Associate Inc., Massachusetts, USA. Chronobiology Biological Timekeeping: Jay. C. Dunlap, Jennifer. J. Loros, Patricia J. DeCoursey (ed). 2004, Sinauer Associates, Inc. Publishers, Sunderland, MA, USA
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZH313	FUNCTIONAL ANATOMY AND ECONOMIC IMPORTANCE OF NON-CHORDATES C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding regarding protozoans, To gain knowledge about classification and general characteristics of Porifera, Cnidaria and Ctenophora, To have understanding about Platyhelminthes and Nemathelminthes.
Salient features	The student will be able to conceptualize about study of Annelids and Arthropods, Able to understand economic importance of Mollusca and Echinodermata organisms.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Protozoa 7hr**
Study of Euglena and Monocystis (locomotion, nutrition and reproduction), Parasitic protozoans of man: Entamoeba, Giardia, Trypanosoma, Leishmania (diagnostic characters, mode of infection and diseases caused), Soil protozoa and their role in agriculture**.** Germ layers, diplolblatic and triploblastic organization, Theories on the origin of Metazoans	
Unit- II	**Porifera, Cnidaria and Ctenophora 7hr**
Study of Leucosolenia and Sycon (structure, skeleton and canal system), Sponge culture and its importance in industry and commerce, Study of Obelia and Aurelia (structure and reproduction), Salient features of ctenophores and comparisons with cnidarians, Coral reefs and coral in commerce and industry	
Unit-III	**Platyhelminthes and Nemathelminthes 7hr**
Fasciola and Taenia: structure, reproduction, life-cycle and parasitic adaptations, Ascaris: structure, reproduction and life-cycle, Nematode parasites of man: Ascaris, Ancylostoma, Enterobius and Wuchereria: diagnostic characters, mode of infection and diseases caused	
Unit-IV	**Annelida and Arthropoda 7hr**
Nereis: structure with special reference to reproduction, Trochophore larva and its significance, Earthworms and soil improvement, Palaemon: structure with special reference to reproduction, Zoological importance of Limulus, Prawn culture and its economic importance	
Unit-V	**Mollusca and Echinodermata 8hr**
Unio: structure with special reference to reproduction, Torsion and detorsion in gastropods, Modification of foot in molluscs, Utility of molluscs in food and ornaments, Pearl culture, Asterias: structure with special reference to water vascular system. Larval forms of Echinoderms and their significance, Origin and Evolution of Echinoderm Larvae	
Reference books	1. Barnes: Invertebrate Zoology (4th ed. 1980, Holt-Saunders) 2. Barnes: The invertebrate (3rd ed. 2001Blackwell) 3. Barrington: Invertebrate Structure and Function (1967Nelson) 4. Moore: An introduction to the invertebrartes (2001Cambridge) 5. Ekambaranath Ayar: A manual of Zoology, Part I – Invertebrata, (1973, S. Vishwanathan) 6. Kotpal, Agarwal and Khetrapal: Modern Textbook of Zoology: Invertebrate, (1976, Rastogi) 7. Marshall: Parker and Haswell Textbook of Zoology, Vol. I (7th ed. 1972, Macmillan)
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZH315	IMMUNOLOGY C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding regarding basic concept of immune system, To gain knowledge about antigenicity and immunogenicity, To have understanding about structure and functions of immunoglobulins.
Salient features	The student will be able to conceptualize about MHC complex and their importance, Able to understand various types of hypersensitivity reactions.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Overview of Immune System 7hr**
Historical perspective of Immunology, Early theories of Immunology, Cells and organs of the Immune system, Anatomical barriers, Inflammation, Cell and molecules involved in innate immunity, Adaptive immunity (Cell mediated and humoral), Passive: Artificial and natural Immunity, Active: Artificial and natural Immunity, Immune dysfunctions (brief account of autoimmunity with reference to Rheumatoid Arthritis and tolerance, AIDS).	
Unit- II	**Antigens 7hr**
Antigenicity and immunogenicity, Immunogens, Adjuvants and haptens, Factors influencing immunogenicity, B and T-Cell epitopes	
Unit-III	**Immunoglobulins 7hr**
Structure and functions of different classes of immunoglobulins, Antigen-antibody interactions, Immunoassays (ELISA and RIA), Polyclonal sera, Hybridoma technology: Monoclonal antibodies in therapeutics and diagnosis	
Unit-IV	**Major Histocompatibility Complex 7hr**
Structure and functions of MHC molecules. Endogenous and exogenous pathways of antigen processing and presentation, Properties and functions of cytokines, Therapeutics Cytokines, Components and pathways of complement activation.	
Unit-V	**Hypersensitivity 8hr**
Gell and Coombs' classification and brief description of various types of hypersensitivities, Various types of vaccines.	
Reference books	Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006). Immunology, VI Edition. W.H. Freeman and Company. David, M., Jonathan, B., David, R. B. and Ivan R. (2006). Immunology, VII Edition, Mosby, Elsevier Publication. Abbas, K. Abul and Lechtman H. Andrew (2003.) Cellular and Molecular Immunology. V Edition. Saunders Publication.
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZH317	MICROBIOLOGY	C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**	
Learning objective	The learning objectives of course are: To create an understanding regarding various microbiological techniques, To gain knowledge about microbial nutrition and growth, To have understanding about microbial cell organization.	
Salient features	The student will be able to conceptualize about role of microbiological technique in food, Able to analyze understand industrial applications of microbiology.	
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous	
Unit-I	**History of Microbiology and classification**	**7hr**
History of development of microbiology as a discipline, Spontaneous generation versus biogenesis, development of various microbiological techniques, concept of fermentation, establishment of fields of medical microbiology, immunology and environmental microbiology Molecular methods of assessing microbial phylogeny- molecular chronometer, phylogenetic trees, rRNA, DNA and proteins as indicator of phylogeny. Major Divisions of life-Domains, Kingdoms.		
Unit- II	**Microbial Nutrition and Growth**	**7hr**
Nutritional types of microorganisms, growth factors, culture media- synthetic and complex, types of media; isolation of pure cultures, growth curves, mean growth rate constant, generation time; general concept of effect of environmental factors on growth of microbes; sterilization and disinfection; activity, use of physical methods (heat, low temperature, filtration, radiation)and chemical agents (phenolics, halogens, heavy water, sterilization gases).		
Unit-III	**Microbial Cell organization**	**7hr**
Cell size, shape and arrangement, glycocalyx, capsule, flagella, fimbriae and pili; Cell-wall: Composition and detailed structure of Gram positive and Gramnegative cell walls, Archaebacterial cell wall, Gram and acid fast staining mechanisms, lipopolysaccharide (LPS) and protoplasts. Effect ofantibiotics and enzymes on the cell wall; Cell Membrane: Structure, function and chemical composition of bacterial and archaeal cell membranes; Cytoplasm: Ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids; Endospore: Structure, formation, stages of sporulation.		
Unit-IV	**Food and Microbiology**	**7hr**
Overview of importance of microbiology in food and industrial microbiology; Microorganism growth in food; extrinsic and intrinsic factors for food spoilage; microorganisms causing food spoilage in fresh food, milk, and canned food; Preservation of foods by aseptic handling, high temperature, low temperature, dehydration, osmotic pressure, chemicals and radiations; preparation of fermented food products, fermented milk such as yoghurt, curd and cheese.		
Unit-V	**Industrial Microbiology**	**8hr**
Microbiological processes in industry; Basic design of fermenter – continuous and discontinuous; treatment of waste water (Municipal treatment plant) and sewage; Preparation of wine, beer, cheese; Single cell proteins.		
Reference books	1. Microbiology, Prescott, Harley and Kleins, McGraw Hill International. 2. Microbiology, Pelczar, Chan and Krieg.McGraw Hill International . 3. Biology of Microorganisms, T. D. Brock and M.T. Madigan, Pearsons, Benjamin Cumming.	
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT	
Recommended By BOS on:		
Approved by academic council on:		

ZY312	ENVIRONMENTAL AND PUBLIC HEALTH C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding regarding interrelationship between environment and public health, To gain knowledge about impact of climate change on environment, To have understanding about technology used for waste management.
Salient features	The student will be able to conceptualize about disease and their control, Able to water born and air born disease.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Introduction** **7hr**
Sources of Environmental hazards, hazard identification and accounting, fate of toxic and persistent substances in the environment, dose Response Evaluation, exposure Assessment.	
Unit- II	**Climate Change** **7hr**
Greenhouse gases and global warming, Acid rain, Ozone layer destruction, Effect of climate change on public health	
Unit-III	**Pollution** **7hr**
Air, water, noise pollution sources and effects, Pollution control.	
Unit-IV	**Waste Management Technologies** **7hr**
Sources of waste, types and characteristics, Sewage disposal and its management, Solid waste disposal, Biomedical waste handling and disposal, Nuclear waste handling and disposal, Waste from thermal power plants, Case histories on Bhopal gas tragedy, Chernobyl disaster, Seveso disaster and Three Mile Island accident and their aftermath.	
Unit-V	**Diseases** **8hr**
Causes, symptoms and control of tuberculosis, Asthma, Cholera, Minamata disease, typhoid	
Reference books	Cutter, S.L., Environmental Risk and Hazards, Prentice-Hall of India Pvt. Ltd., New Delhi, 1999. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff ―Risk Assessment and Management Handbook‖, McGraw Hill Inc., New York,1996. Kofi Asante Duah ―Risk Assessment in Environmental management‖, John Wiley and sons, Singapore, 1998. Kasperson, J.X. and Kasperson, R.E. and Kasperson,R.E., Global Environmental Risks, V.N.University Press, New York, 2003. Joseph F Louvar and B Diane Louver Health and Environmental Risk Analysis fundamentals with applications, Prentice Hall, New Jersey 1997.
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZY314	BIOTECHNIQUES C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding regarding principles and uses of analytical instrument, To gain knowledge about microscopy, To have understanding about cell and tissue culture technology.
Salient features	The student will be able to conceptualize about chromatography. Able to understand principle and application of electrophoresis.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Principles and uses of analytical instruments 7hr**
pH meter, Principle of UV-Visible absorption spectrophotometry, instrumentation and applications, Flourimetry: Phenomena of fluorescence, intrinsic and extrinsic fluorescence, instrumentation and applications, Principle of centrifugation, basic rules of sedimentation, sedimentation coefficient, various types of centrifuges, different types of rotors, differential centrifugation, density gradient centrifugation (Rate zonal and Isopycnic), Geiger Muller and scintillation counters	
Unit- II	**Microtomy and Microscopy 7hr**
Tissue preparation, Fixation, Block preparation, Microtomy (paraffin and frozen tissue sectioning), Types of Microscopes, Bright field, Dark-field, Phase contrast, Fluorescence, Confocal, Scanning and transmission electron microscopes	
Unit-III	**Cell and tissue culture techniques 7hr**
Culture media, Sterilization : room, media and glasswares, Types of animal cell culture, Cell viability testing, Cryopreservation	
Unit-IV	**Chromatography 7hr**
Partition coefficient, concept of theoretical plates, various modes of chromatography (paper, thin layer, column), preparative and analytical applications, LPLC and HPLC. Principle and applications of: Paper Chromatography, Thin Layer Chromatography. Molecular Sieve Chromatography, Ion Exchange Chromatography, Affinity Chromatography	
Unit-V	**Electrophoresis 8hr**
Basic Principle of electrophoresis, Paper electrophoresis, Gel electrophoresis, discontinuous gel electrophoresis, PAGE, SDS-PAGE, Native and denaturing gels. Agarose gel electrophoresis, buffer systems in electrophoresis. Electrophoresis of proteins and nucleic acids, protein and nucleic acid blotting, detection and identification. Molecular weight determination, Isoelectric Focusing of proteins	
Reference books	1. Physical Biochemistry: Applications to Biochemistry and Molecular Biology (1982) 2nd ed., Freifelder, D., W.H. Freeman and Company (New York). 2. An Introduction to Practical Biochemistry (1998) 3rd ed., Plummer D. T., Tata McGraw Hill Education Pvt. Ltd. (New Delhi)
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZY316	FUNDAMENTALS OF BIOTECHNOLOGY C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding regarding basic principal of biotechnology, To gain knowledge about molecular techniques in gene manipulation, To have understanding about genetically modified organisms. .
Salient features	The student will be able to conceptualize about cloning, Able to understand animal cell culture technology.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Introduction 7hr**
Concept and scope of biotechnology, Cloning vectors: Plasmids, Cosmids, Phagemids, Lambda Bacteriophage, M13, BAC, YAC, MAC and Expression vectors (characteristics). Restriction enzymes: Nomenclature, detailed study of Type II.	
Unit- II	**Molecular Techniques in Gene manipulation 7hr**
Transformation techniques: Calcium chloride method and electroporation. Construction of genomic and cDNA libraries and screening by colony and plaque hybridization Southern, Northern and Western blotting DNA sequencing: Sanger method Polymerase Chain Reaction, DNA Finger Printing and DNA micro array	
Unit-III	**Genetically Modified Organisms 7hr**
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. Production of transgenic plants: Agrobacterium mediated transformation. Applications of transgenic plants: insect and herbicide resistant plants.	
Unit-IV	**Culture Techniques and Applications 7hr**
Expressing cloned genes in mammalian cells, Molecular diagnosis of genetic diseases (Cystic fibrosis, Sickle cell anemia) Recombinant DNA in medicines: Recombinant insulin and human growth hormone, Gene therapy	
Unit-V	**Animal cell Culture 8hr**
Basic techniques in animal cell culture and organ culture, Primary Culture and Cell lines, Culture media- Natural and Synthetic, Stem cells, Cryopreservation of cultures. Agarose and Polyacrylamide Gel Electrophoresis, Southern, Northern and Western blotting, DNA sequencing: Sanger method, Polymerase chain reaction, DNA Fingerprinting and DNA microarrays. Production of transgenic animals: nuclear transplantation, Retroviral method, DNA microinjection method, Dolly and Polly.	
Reference books	Animal Cells Culture and Media, D.C. Darling and S.J. Morgan, 1994. BIOS Scientific Publishers Limited. Methods in Cell Biology, Volume 57, Jennie P. Mathur and David Barnes, 1998. Animal Cell Culture Methods Academic Press. P.K. Gupta: Biotechnology and Genomics, Rastogi publishers (2003). B.D. Singh: Biotechnology, Kalyani publishers, 1998 (Reprint 2001). T.A. Brown: Gene cloning and DNA analysis: An Introduction, Blackwell Science (2001). Bernard R. Click & Jack J. Pasternak: Molecular Biotechnology, ASM Press, Washington (1998). Methods in Gene Biotechnology, W. Wu, M.J. Welsh, P.B. Kaufman & H.H. Zhang, 1997, CRC Press, New York
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	

ZY318	APPLIED ZOOLOGY C (L, T, P) = 4 (4, 0, 0)
Version	**Ist**
Learning objective	The learning objectives of course are: To create an understanding regarding Introduction to host-parasite relationship, To gain knowledge about diversity of Rickettsiae and Spirochaetes, To have understanding about life history of Parasitic Helminthes.
Salient features	The student will be able to conceptualize about medical importance of insects, Able to understand poultry farming and fish technology.
Utility	A degree in Zoology Hons allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what's beneficial and what is imbalanced and dangerous
Unit-I	**Introduction to Host-parasite Relationship 7hr**
Host, Definitive host, Intermediate host, Parasitism, Symbiosis, Commensalism, Reservoir, Zoonosis, Transmission, Prevention and control of diseases: Tuberculosis, typhoid	
Unit- II	**Rickettsiae and Spirochaetes 7hr**
Brief account of Rickettsia prowazekii, Borrelia recurrentis and Treponema pallidum, Life history and pathogenicity of Entamoeba histolytica, Plasmodium vivax and Trypanosoma gambiense	
Unit-III	**Parasitic Helminthes 7hr**
Life history and pathogenicity of Ancylostoma duodenale and Wuchereria bancrofti, Biology, Control and damage caused by Helicoverpa armigera, Pyrilla perpusilla and Papilio demoleus, Callosobruchus chinensis, Sitophilus oryzae and Tribolium castaneum	
Unit-IV	**Insects Medical Importance 7hr**
Medical importance and control of Pediculus humanus corporis, Anopheles, Culex, Aedes, Xenopsylla cheopis, Preservation and artificial insemination in cattle; Induction of early puberty and synchronization of estrus in cattle	
Unit-V	**Poultry Farming and Fish Technology 8hr**
Principles of poultry breeding, Management of breeding stock and broilers, Processing and preservation of eggs, Genetic improvements in aquaculture industry; Induced breeding and transportation of fish seed	
Reference books	Dunham R.A. (2004). Aquaculture and Fisheries Biotechnology Genetic Approaches. CABI publications, U.K. Prost, P. J. (1962). Apiculture. Oxford and IBH, New Delhi. Bisht D.S., Apiculture, ICAR Publication. Singh S., Beekeeping in India, Indian council of Agricultural Research, New Delhi.
Mode of Examination	Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT
Recommended By BOS on:	
Approved by academic council on:	