FOUR YEAR UNDER GRADUATE PROGRAM
UNDER

JAMSHEDPUR WOMEN'S UNIVERSITY

ZOOLOGY HONOURS/RESEARCH

IMPLEMETED FROM 2022

COURSE STUCTURE FOR UNDERGRADUATE 'HONOURS' PROGRAMME

HIGHLIGHTS OF REGULATIONS OF FYUGP

PROGRAMME DURATION

- The Full-time, Regular UG programme for a regular student shall be for a period of four years with multiple entries and multiple exit options.

ELIGIBILITY

- The selection for admission will be primarily based on availability of seats in the Major subject and marks imposed by the institution. Merit point for selection will be based on marks obtained in Major subject at Class 12 (or equivalent level) or the aggregate marks of Class 12 (or equivalent level) if Marks of the Major subject is not available. Reservation norms of The Government of Jharkhand must be followed as and when amended in times.

ADMISSION PROCEDURE

- The reservation policy of the Government of Jharkhand shall apply in admission and the benefit of the same shall be given to the candidates belonging to the State of Jharkhand only. The candidates of other states in the reserved category shall be treated as General category candidates. Other relaxations or reservations shall be applicable as per the prevailing guidelines of the University for FYUGP.

ACADEMIC CALENDAR

- Each year the University shall draw out a calendar of academic and associated activities, which shall be strictly adhered to. The same is non-negotiable. Further, the Department will make all reasonable endeavors to deliver the programmes of study and other educational services as mentioned in its Information Brochure and website. However, circumstances may change prompting the Department to reserve the right to change the content and delivery of courses, discontinue or combine courses and introduce or withdraw areas of specialization.

PROGRAMME OVERVIEW/ SCHEME OF THE PROGRAMME

- Undergraduate degree programmes of either 3 or 4-year duration, with multiple entries and exit points and re-entry options within this period, with appropriate certifications such as:
    - a Certificate after completing 1 year (2 semesters) of study in the chosen fields of study,
    - a Diploma after 2 years (4 semesters) of study,
    - a Bachelor after a 3-year (6 semesters) programme of study,
    - a Bachelor (with Hons. / Research) after a 4-year (8 semesters) programme of study

VALIDITY OF REGISTRATION

- Validity of a registration for FYUGP will be for maximum for Seven years from the date of registration.

CALCULATION OF MARKS FOR THE PURPOSE OF RESULT

- Student's final marks and the result will be based on the marks obtained in Semester Internal Examination and End Semester Examination organized taken together.
- Passing in a subject will depend on the collective marks obtained in Semester internal and End Semester University Examination both. However, students must pass in Theory and Practical Examinations separately.

PROMOTION AND SPAN PERIOD

- The Requisite Marks obtained by a student in a particular subject will be the criteria for promotion to the next Semester.
- To get promotion from Semester-II to Semester-III a student will be required to pass in at least 75% of Courses in an academic year (a student has to pass in minimum 9 papers out of the total 12 papers. However, it will be necessary to procure pass marks in each of the paper before completion of the course.
- To get promotion from Semester-IV to Semester-V (taken together of Semester I, II, III & IV) a student has to pass in minimum 16 papers out of the total 22 papers.
- Eligibility to get entry in Semester VII is to secure a minimum of 7.5 CGPA up to semester VI along with other criteria imposed by the Institution.

PUBLICATION OF RESULT

- The result if the examination shall be notified by the Controller of Examinations of the University in different newspapers and also on University website.
- If a student is found indulged in any kind of malpractice during examination, the examination taken by the student will be cancelled. The candidate will be awarded zero marks in that paper. The candidate may re-appear in the subsequent semesters as per the available provisions.
- There shall be no Supplementary or Re-examination for any subject. Students who have failed in any subject in an even semester may appear in the subsequent even semester examination for clearing the backlog. Similarly, the students who have failed in any subject in an odd semester may appear in the subsequent odd semester examination for clearing the backlog.
- Regulation related with any concern not mentioned above shall be guided by the Regulations of the University for FYUGP.

COURSE STUCTURE FOR FYUGP 'HONOURS/ RESEARCH'

Table 1: Credit Framework for Four Year Undergraduate Programme (FYUGP) under State Universities of Jharkhand [Total Credits = 176]

- There will be four disciplinary areas: A-Natural Science, B-Humanities, C-Social Science, and D-Commerce; each having basket of courses. A student will have to select a 'Major' from any of the four disciplinary areas (out of A, B, C & D). The selection for admission will be primarily based on availability of seats in Major and marks imposed by the institution.
- A student has to select three subjects for 'Introductory Regular Courses' from a pool of subjects associated with the Major offered by the institution. One of the three subjects will continue as 'Minor' from semester IV onwards, based on the academic interest and performance of the student.

Table 1: Credit Framework for Four Year Undergraduate Programme (FYUGP) under State Universities of Jharkhand [Total Credits = 176]

	Common Courses (29)									Introductory Courses (15)				Minor** (32)		Research Courses (18)				Total Credit
Semester	Language and Communication Skills (Modern Indian Language including TRL) (6)	Language and Communication Skills (English) (6)	Environmental Studies (3)	Understanding India (2)	Health & Wellness, Yoga Education, Sports & Fitness (2)	Digital Education (3)	Mathematical & Computational Thinking and Analysis (2)	Value-Based Course/ Global Citizenship Education (2)	Community Engagement/ NCC/ NSS/ (3)	Introductory Courses [Natural Sc./ Humanities/ Social Sc./Commerce] (9)	Introductory Course [Vocational Studies] (6)	Internship/ Project (4)	Major* (54) + Adv. Major (24)	Natural Sc./ Humanities/ Social Sc./ Commerce (18)	Vocational Studies (14)	Research Methodology Courses (6)	Research Proposal, Review of literature (4)	Research Internship/ Field Work (4)	Preparation of the Research Project Report (4)	176
1	2	3	4	5	6	7	8			9	10	11	14	15	16	17	18	19	20	21
I	6			2	2					3	3		6							22
II		6					2	2		3	3		6							22
Exit Point: Undergraduate Certificate																				
III			3			3			3	3		4	6							22
IV													6+6	6	4					22
Exit Point: Undergraduate Diploma																				
V													6+6	6	4					22
VI													6+6	6	4					22
Exit Point: Bachelor's Degree																				
VII													6+6 (Adv. Topics)			6	4			22
VIII													6+6 (Adv. Topics)		2			4	4	22
Exit Point: Bachelor's Degree with Hons. /Research																				

*There will be four disciplinary areas: A-Natural Science, B-Humanities, C-Social Science, and D-Commerce; each having basket of courses. A student will have to select a 'Major' from any of the four disciplinary areas (out of A, B, C & D). The selection for admission will be primarily based on availability of seats in Major and marks imposed by the institution.

**A student has to select three subjects for 'Introductory Regular Courses' from a pool of subjects associated with the Major offered by the institution. One of the three subjects will continue as 'Minor' from semester IV onwards, based on the academic interest and performance of the student.

Jharkhand, NEP, FYUGP 2022 onwards

Table 2: Course structure for Undergraduate Certificate Programme *[May Exit after Sem.-II]*

Semester	Common Courses			Introductory Courses		Major	Total Credits
Sem.-I	LCS (MIL/TRL)	Understanding India	Health & Wellness, Yoga Education, Sports & Fitness	IRC-1	IVS-1A	MJ-1	
	(6 Credits)	(2 Credits)	(2 Credits)	(3 Credits)	(3 Credits)	(6 Credits)	(22)
Sem.-II	LCS (English)	Global Citizenship Education	Mathematical & Computational Thinking	IRC-2	IVS-1B	MJ-2	
	(6 Credits)	(2 Credits)	(2 Credits)	(3 Credits)	(3 Credits)	(6 Credits)	(22)

Total = 44 Credits

(LCS: Language and Communication Skills; MIL: Modern Indian Languages; TRL: Tribal Regional Languages; IRC: Introductory Regular Courses; IVS: Introductory Vocational Studies, MJ: Major)

Table 3: Course structure for Undergraduate Diploma Programme *[May Exit after Sem.-IV]*

Semester	Common Courses			Introductory Courses	Major	Minor	Internship/ Project	Vocational	Total Credits
Sem.-III	Environmental Studies	Community Engagement/ NCC/ NSS	Digital Education	IRC-3	MJ-3		Internship/ Project		
	(3 Credits)	(3 Credits)	(3 Credits)	(3 Credits)	(6 Credits)		(4 Credits)		(22)
Sem.-IV					MJ-4, MJ-5 (6+6=12 Credits)	MN-1 (6 Credits)		VS-1 (4 Credits)	(22)

Total = 88 Credits

(MN: Minor; VS: Vocational Studies)

Table 4: Course structure for Bachelor's Degree Programme *[May Exit after Sem.-VI]*

Semester	Major Courses	Minor Courses	Vocational	Total Credits
Sem.-V	MJ-6, MJ-7 (6+6 = 12 Credits)	MN-2 (6 Credits)	VS-2 (4 Credits)	(22)
Sem.-VI	MJ-8, MJ-9 (6+6= 12 Credits)	MN-3 (6 Credits)	VS-3 (4 Credits)	(22)

Total = 132 Credits

Table 5: Course structure for Bachelor's Degree with Hons./Research Programme

SEMESTER WISE COURSES OF STUDY FOR FOUR YEAR UNDERGRADUATE PROGRAMME			
Semester	Common, Introductory, Major, Minor, Vocational & Internship Courses		Credits
	Code	Paper	
I	CC-1	Language and Communication Skills (Modern Indian language including TRL)	6
	CC-2	Understanding India	2
	CC-3	Health & Wellness, Yoga Education, Sports & Fitness	2
	IRC-1	Introductory Regular Course-1	3
	IVS-1A	Introductory Vocational Studies-1	3
	MJ-1	Major paper 1 (Disciplinary/Interdisciplinary Major)	6
II	CC-4	Language and Communication Skills (English)	6
	CC-5	Mathematical & Computation Thinking Analysis	2
	CC-6	Global Citizenship Education & Education for Sustainable Development	2
	IRC-2	Introductory Regular Course-2	3
	IVS-2B	Introductory Vocational Studies-2	3
	MJ-2	Major paper 2 (Disciplinary/Interdisciplinary Major)	6
III	CC-7	Environmental Studies	3
	CC-8	Digital Education (Elementary Computer Applications)	3
	CC-9	Community Engagement & Service (NSS/ NCC/ Adult Education)	3
	IRC-3	Introductory Regular Course-3	3
	IAP	Internship/Apprenticeship/ Project	4
	MJ-3	Major paper 3 (Disciplinary/Interdisciplinary Major)	6
IV	MJ-4	Major paper 4 (Disciplinary/Interdisciplinary Major)	6
	MJ-5	Major paper 5 (Disciplinary/Interdisciplinary Major)	6
	MN-1	Minor Paper 1 (Disciplinary/Interdisciplinary Minor)	6
	VS-1	Vocational Studies-1 (Minor)	4
V	MJ-6	Major paper 6 (Disciplinary/Interdisciplinary Major)	6
	MJ-7	Major paper 7 (Disciplinary/Interdisciplinary Major)	6
	MN-2	Minor Paper 2 (Disciplinary/Interdisciplinary Minor)	6
	VS-2	Vocational Studies 2 (Minor)	4
VI	MJ-8	Major paper 8 (Disciplinary/Interdisciplinary Major)	6
	MJ-9	Major paper 9 (Disciplinary/Interdisciplinary Major)	6
	MN-3	Minor Paper 3 (Disciplinary/Interdisciplinary Minor)	6
	VS-3	Vocational Studies 3 (Minor)	4

VII	AMJ-1	Advance Major paper 1 (Disciplinary/Interdisciplinary Major)	6
	AMJ-2	Advance Major paper 2 (Disciplinary/Interdisciplinary Major)	6
	RC-1	Research Methodology	6
	RC-2	Research Proposal	4
VIII	AMJ-3	Advance Major paper 3 (Disciplinary/Interdisciplinary Major)	6
	AMJ-4	Advance Major paper 4 (Disciplinary/Interdisciplinary Major)	6
	RC-3	Research Internship/Field Work	4
	RC-4	Research Report	4
	VSR	Vocational Studies (Associated with Research)	2
		Total Credit	176

Abbreviations:

CC Common Courses
IRC Introductory Regular Courses
IVS Introductory Vocational Studies
IAP Internship/Apprenticeship/ Project
VS Vocational Studies
MJ Major Disciplinary/Interdisciplinary Courses
MN Minor Disciplinary/Interdisciplinary Courses
AMJ Advance Major Disciplinary/Interdisciplinary Courses
RC Research Courses
VSR Vocational Studies associated with Research

Outcome of Zoology

Zoology is one of the most popular branch of science that involves the study of animals and their biological processes. Zoology courses are offered at the graduate and post graduate levels. Candidates in this discipline are basically taught animals anatomy, physiology, biochemistry, genetics ,evolution ,ecology ,animal behaviour and conservation.

Career options after pursuing a B.SC, M.SC and Ph.D in zoology are varied. Candidates find opportunities in government department ,environmental agencies ,universities , colleges ,biotechnological pharmaceuticals ,environmental field , wildlife management ,fisheries and aqua culture , forensics , forest laboratories , medical laboratories , veterinaries etc.

The courses also trains students in the field of applied zoology like sericulture, apiculture, pisiculture etc. students understand about the various concepts of genetics and its importance in human health.

JAMSHEDPUR WOMEN'S UNIVERSITY

DEPARTMENT OF ZOOLOGY

4 YEAR UNDERGRADUATE DEGREE COURSE (ACCORDING TO NATIONAL EDUCATION POLICY)

IRC	INTRODUCTORY REGULATORY COURSE
MJ1	NON CHORDATAS FROM PROTOZOA TO PSEUDOCOELOMATES
MJ2	PRINCIPLE OF ECOLOGY
MJ3	NON-CHORDATA 2(COELOMATES) AND CELL BIOLOGY
MJ4	DIVERSITY OF CHORDATES
MJ5	ANIMAL PHYSIOLOGY CONTROLLING AND COORDINATORY SYSTEMS
MJ6	FUNDAMENTALS OF BIOCHEMISTRY AND BIOCHEMISTRY OF METABOLISM
MJ7	ANIMAL PHYSIOLOGY AND BIOCHEMISTRY OF METABOLIC PROCESSES
MJ8	MOLECULAR BIOLOGY AND GENETICS
MJ9	COMPARATIVE ANATOMY OF VERTEBRATE

Advanced Major 1	FISHES AND FISHERIES
Advanced Major 2	IMMUNOLOGY
Advanced Major 3	PARASITOLOGY
Advanced Major 4	WILDLIFE MANAGEMENT
Minor 1	NON CHORDATES AND ECOLOGY
Minor 2	NON CHORDATES AND CELL BIOLOGY
Minor 3	EMBRYOLOGY, PHYSIOLOGY, ENDOCRYNOLOGY AND EVOLUTION

B.Sc. Zoology

SEMESTER - 1

Zoology Common Introductory Paper

National Education Policy

Full marks 100 **Credits 3**

Unit – 1	ECOSYSTEM, POND ECOSYSTEM, NATALITY, MORTALITY, FOOD CHAIN
Unit – 2	COMMON BACTERIAL AND VIRAL DISEASES, SYMPTOMS AND PREVENTION
Unit – 3	HORMONES DISORDER,DIABETES, GOITRE, MYXOEDEMA, DWARFISM
Unit – 4	COMPONENTS OF BLOOD AND THEIR FUNCTIONS, ABO BLOODGROUPS, DIFFERENT TYPES OF WBC
Unit – 5	FOOD ADDITIVES AND THEIRTYPES, RADIOACTIVE SUBSTRANCE, PESTICIDES,
Unit – 6 IRC	GREEN HOUSE GASES AND GLOBAL WARMING, ACID RAIN, OZONE LAYERS DISTRUTION EFFECT ON CLIMATE CHANGE PUBLIC HEALTH

B. Sc. ZOOLOGY SEMESTER-1
CODE – MJ1

NON-CHORDATES 1: PROTOZOA TO PSEUDOCOELOMATES

THEORY **(CREDITS 4)**

Unit 1: PROTOZOA, Parazoa and Metazoa — 19 Lectures

General characteristics and Classification up to order
Study of *Paramecium*
Life cycle and pathogenicity of *Plasmodium vivax*
Locomotion, Nutrition and Reproduction in PROTOZOA

Unit 2: Porifera — 7 Lectures

General characteristics and Classification up to order
Canal system and spicules in sponges

Unit 3 : Cnidaria — 12 Lectures

General characteristics and Classification up to order
Metagenesis in Obelia
Polymorphism in siphonophora
Corals and coral reefs

Unit 4 : Ctenophora — 4 Lectures

General characteristics and Evolutionary significance

Unit 5 : Platy Helminthes — 10 Lectures

General characteristics and Classification up to classes
Life cycle and pathogenicity of *Fasciola hepatica*

Unit 6 : Nemat helminthes — 8 Lectures

General characteristics and Classification up to order Life cycle and pathogenicity of Ascaris lumbricoides
Parasitic adaptations in helminthes

NON-CHORDATES 1: PROTOZOA TO PSEUDOCOELOMATES (PRACTICALS)

PRACTICALS **(Credits 2)**

Time :- 03 Hours

Museum Specimens

- Study of *Obelia, Physalia, Millepora, Aurelia, Tubipora, Corallium, Alcyonium, Gorgonia, Meridium, Pennatula, Fungia, Meandrina, Madrepora.*
- Study of whole mount of *Euglena, Amoeba and Paramecium*, Binary fission andConjugation in *Paramecium.*
- Examination of pond water collected from different places for diversity in PROTOZOA .

Permanent Slides

- Slide of Study of *Sycon*(T.S. and L.S), *Hyalonema, Euplectella, Spongilla.*
- One specimen/slide of any Ctenophore.
- Life Cycle of *Fasciola hepatica, Taenia solium*and their life cycles (Slides/micro-photographs).
- Study of adult *Ascari slumbricoides*and its life stages (Slides/micro-photographs).

Marks Distribution :-

Spots	**2 X 5 = 10**
Life Cycle	**= 5**
Records + Viva	**= 5**
Total	**= 20**

B. Sc. ZOOLOGY SEMESTER-2
CODE – MJ2

PRINCIPLES OF ECOLOGY

THEORY **(CREDITS 4)**

Unit 1 : Introduction to Ecology 6 Lectures

History of ecology, Autoecology and synecology,
Levels of organization, Laws oflimiting factors, Study of physical factors

Unit 2: Population 24 Lecture

Population : Density, natality,
mortality, life tables, fecundity tables, survivourship curves, age ratio,
sex ratio, dispersal and dispersionExponential and logistic growth,
equation and patterns, r and K
Population interactions, Gause's Principle with laboratory and field examples,
Lotka-Volterra equation for competition and Pradation, functional and numerical responses

Unit3:Community 12 Lecture

Community and its characteristics : species richness, dominance, diversity,
abundance, vertical stratification, Ecotone and edge effect ;
Ecologicalsuccession Theories pertaining to climax community

Unit4:Ecosystem 14 Lecture

Types of ecosystem with one example in detail (Pond Ecosystem),
Food chain: Detritus and grazing foodchains, Linear and Y-shaped food chains,
Food web, Energy flow through the ecosystem,
Ecological pyramids
Nutrient and biogeochemical cycle : Nitrogen and carbon cycle

Unit5:Applied Ecology 4 Lecture

Ecology in Wildlife Conservation and its Management

PRINCIPLES OF ECOLOGY (PRACTICALS)

PRACTICALS **(Credits 2)**

Time :- 03 Hours

- Determination of population density in a natural/hypothetical community by quadrate method and calculation of Shannon-Weiner diversity index for the same community.
- Study of an aquatic ecosystem : Phytoplankton and zooplankton, Measurement of area, temperature, turbidity/penetration of light, determination of pH, and Dissolved oxygen content(Winkler's method).
- Report on a visit to NationalPark/Biodiversity Park/Wild life sanctuary.

Marks Distribution :-

Population Studies	**= 6**
Plankton Studies	**= 6**
Project	**= 4**
Records + Viva	**= 5**
Total	**= 20**

B. Sc. ZOOLOGY SEMESTER-3
CODE – MJ3
NON-CHORDATES II : COELOMATES AND CELL BIOLOGY

THEORY **(CREDITS 4)**

Unit 1 : Annelida — 8 Lecture
General characteristics and Classification up to order
Excretion in Annelida

Unit 2 : Arthropoda — 8 Lecture
General characteristics and Classification up to order
Rrespiration in Arthropoda
Larval forms in Crustacea

Unit 3 : Onychophora — 4 Lecture
General characteristics and Evolutionary significances of Peripatus.

Unit 4 : Mollusca — 7 Lecture
General characteristics and Classification up to order
Respiration in Mollusca
Torsion and detorsion in Gastropoda

Unit 5 : Echinodermata — 7 Lecture
General characteristics and Classification up to order
Water-vascular system in Asteroidea

CELL BIOLOGY

Unit 6 : Plasma Membrane — 8 Lecture
Various models of plasma membrane structure
Transport across membrane : Active and Passive transport, Facilitated diffusion

Unit 7 : Endomembrane System — 12 Lecture
Structure and Function : Endoplasmic Reticulum, Golgi Apparatus, Lysosomes
Mitochondria

Unit 9: Nucleus — 6 Lecture
Structure of Nucleus : Nuclear envelope, Nucleolus Chromatin

NON-CHORDATES II : COELOMATES & CELL BIOLOGY (PRACTICALS)

PRACTICAL **(Credits 2)**

Time :- 03 Hours

Non-Chordates

- Study of following specimen :
  Annelids – *Aphrodites, Nereis, Heteronereis, Sabella, Serpula, Chaetopterus, Pheritima, Hirudinaria*
  Arthropods – *Limulus, Palamnaues, Palaemon, Daphnia, Balanus,Sacculina, Cancer, Eupagurus,*
  Scolopendra, Julus, Bombyx, Periplaneta, termites andhoney bees Onychophora – *Peripatus*
  Molluscs – *Chiton, Dentalium, Pila, Doris, Helix, Unio, Ostrea, Pinctada, Sepia, Octopus,Nautilus*
  Echinodermates – Pantaceros/Asterias, Ophiura, Clypeaster, Echinus,Cucummaria and Antedon
- Study of digestive system, septal nephridia and pharyngeal nephridia of earthworm
- T.S through pharynx, gizzard and typhlosolar intestine of earthworm
- To submit a Project Report on any related topic to larval forms (crustacean, mollusc and echinoderm)

Cell Biology

- Preparation of temporary stained squash of onion root tip to study variousstages of mitosis.
- Study of permanent slides of meiosis/mitosis.

Marks Distribution :-

Spots	**2 X 5 = 10**
Onion root tip	**= 3**
Project	**= 3**
Records + Viva	**= 4**
Total	**= 20**

B. Sc. ZOOLOGY SEMESTER-4
CODE – MJ4
DIVERSITY OF CHORDATA

THEORY **(CREDITS 4)**

Unit 1 : Introduction to chordates **2 Lecture**

General characteristics and outline classification

Unit 2: Protochordata **10 Lecture**

General characteristics of Hemichordata, Urochordata and Cephalochordata ,Retrogressive metamorphosis in herdmania.

Unit 3 : Origin & General characteristics of Chordata

Unit 4 : Agnatha **2 Lecture**

General characteristics and classification of cyclostomes

Unit 5 : Pisces **8 Lecture**

General characteristics of Chondrichthyes and Osteichthyes,
classification up to order, parental care in fishes

Unit 6 : Amphibia **6 Lecture**

General characteristics and classification up to order; Parental care in Amphibians

Unit 7: Reptilia **7 Lecture**

General characteristics and classification up toorder; Affinities of Sphenodon;
Poison apparatus and Bitting mechanism in snakes

Unit 8: Aves **10 Lecture**

General characteristics and classification up to
order, Origin of bird, Flight adaptations and
Migration in birds

Unit 9: Mammals **15 Lecture**

General characters and classification up to order ,
Affinities of Prototheria, Metatheria

DIVERSITY OF CHORDATA (PRACTICAL)

PRACTICAL **(Credits 2)**

Time :- 03 Hours

- Protochordata : *Balanoglossus, Herdmania, Branchiostomata,* Colonial Urochordata sections of*Balanoglossus* through proboscis and branchio genital regions, Sections of Amphioxus through pharyngeal regions, Sections of *Amphioxus* through pharyngeal, intestinal and caudal regions, Permanent slide of *Herdmania*.

- Museum Specimen : Petromyzon, Myxine, *Scoliodon, Sphyrna, Pristis, Torpedo, Chimaera, Mystus, Heteropneustes, Labeo, Exocoetus, Echeneis, Anguilla, Hippocampus, Tetrodon/Diodon, Anabas*, Flat fish, *Ichthyophis/Ureotyphlus, Necturus, Bufo, Hyla, Alytes, Salamandra, Chelone, Trionyx, Hemidactylus, Varanus, Uromastrix, Chamaelon, Ophiosaurus, Draco, Bungarus, Vipera, Naja, Hydrophis, Zamenis, Crocodylus*, Key for identification of poisonous and non- poisonous snakes.

- Study of six common birds from different orders. Types of beaks and claws

- Sorex, Bat (Insectivorous and Frugivorous), *Funambulus, Loris, Herpestes, Erinaceous* Mount of weberianossicles of *Mystus*, pectin from Fowl head

- Preparation of temporary slides of scales of fishes
- Project on any two animals from two different classes.

Marks Distribution :-

Spots	**2 X 5 = 10**
Temporary Mounting	**= 3**
Project	**= 3**
Records + Viva	**= 4**
Total	**= 20**

B. Sc. ZOOLOGY SEMESTER-4
CODE – MJ5
ANIMAL PHYSIOLOGY: CONTROLLING AND COORDINATING SYSTEMS

THEORY **(Credits 4)**

Unit 1 : Tissues — 6 Lecture

Structure, location, classification and functions of epithelial tissue, connective tissue, muscular tissue and nervous tissue

Unit 2 : Bone and Cartilage — 4 Lecture

Structure and types of bones and cartilages, Ossification, bone growth and resorption

Unit 3 : Nervous system — 10 Lecture

Structure of neuron, resting membrane potential,
Origin of action potential and its propagation across the
myelinated and unmyelinated nerve fibres;
Types of synapse,Synaptic transmission and Neuromuscular junction;
Reflex action and its types – reflex arc

Unit 4 : Muscle — 12 Lecture

Histology of different types of muscle;
Ultra structure of skeletal muscle;
Molecular andchemical basis of muscle contraction.

Unit 5 : Reproductive System — 10 Lecture

Anatomy of male and female reproductive organs and Puberty,Methodology of contraception in male and female

Unit 6 : Endocrine system — 18 Lecture

Histology of endocrine glands – pineal, pituitary, thyroid, parathyroid, pancreas, adrenal; testis and ovary
Hormones secreted by them and their functions,
Hypothalamus(neuroendocrine gland), Placental hormones

ANIMAL PHYSIOLOGY : CONTROLLING AND COORDINATING SYSTEMS (PRACTICAL)

PRACTICALS ***(Credits 2)***

Time :- 03 Hours

- Demonstration of the unconditioned reflex action (Deep tendon reflex such as knee jerk reflex).
- Study of permanent slides of Mammalian skin, Cartilage, Bone, Spinal cord, Nerve cell, Pituitary, Pancreas, Testis, Ovary, Adrenal, Thyroid and Parathyroid .

Marks Distribution :-

Spots	**2 X 5 = 10**
Reflex Action	**= 5**
Records + Viva	**= 5**
Total	**= 20**

B. Sc. ZOOLOGY SEMESTER-5
CODE – MJ6
FUNDAMENTALS OF BIOCHEMISTRY AND DEVELOPMENTAL BIOLOGY

THEORY **(Credits 4)**

Unit 1: Carbohydrates — 12 Lecture

Structure and Biological importance : Monosaccharides, Disaccharides,Polysaccharides

Unit 2: Lipids — 12 Lecture

Structure and significance : Physiologically important saturated and unsaturatedfatty acids

Unit 3 : Proteins — 12 Lecture

Amino Acids : Structure, Classification and General properties.
Proteins : Structure, Classification and types

DEVELOPMENTAL BIOLOGY

Unit4: Early Embryonic Development — 12 Lecture

Gametogenesis, Spermatogenesis, Oogenesis; Types of eggs
Fertilization (External and Internal)

Unit5:Late Embryonic Development — 12 Lecture

Placenta(Structure, types and functions of placenta).

FUNDAMENTALS OF BIOCHEMISTRY (PRACTICAL)

PRACTICAL **(Credits 2)**

Time :- 03 Hours

- Qualitative test of functional groups in carbohydrates, proteins and lipids.
- Paper chromatography of amino acids.
- Action of salivary amylase under optimum conditions.
- Effect of pH, temperature and inhibitors on the action of salivary amylase.

SUGGESTED READINGS

- 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.
- Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XIEdition. Hercourt Asia PTE Ltd./W.B. Saunders Company
- Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XIEdition John Wiley & sons
- Victor P.Eroschenko. (2008).diFiore's Atlas of Histology with Functionalcorrelations. XII Edition. Lippincott W. & Wilkins.

Marks Distribution :-

Bio-chemical Tests	**= 8**
Chromatography	**= 5**
Salivary amylase test	**= 2**
Records + Viva	**= 5**
Total	**= 20**

B. Sc. ZOOLOGY SEMESTER-5
CODE – MJ7
ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS

THEORY **(Credits 4)**

Unit 1: Physiology of Digestion 14 Lecture

Structural organization and functions of gastrointestinal tract and associated glands; Mechanical and chemical digestion of food; Absorption of carbohydrates, lipids, proteins, water, minerals and vitamins; Hormonal control of secretion of enzymes in Gastrointestinal tract.

Unit 2: Physiology of Respiration 16 Lecture

Mechanism of respiration, Pulmonary ventilation; Respiratory volumes and capacities; Transport of oxygen and carbon dioxide in tissue ; Respiratory pigments.

Unit 3: Renal Physiology 14 Lecture

Structure of kidney and its functional unit; Mechanism of urine formation; Regulation of water balance; acid-base balance

Unit 4: Blood 16 Lecture

Components of blood and their functions; Structure and functions ofhaemoglobin Blood clotting mechanism
Blood groups; Rh factor, ABO and MN

ANIMAL PHYSIOLOGY : LIFE SUSTAINING SYSTEMS

PRACTICAL **(Credits 2)**

Time :- 03 Hours

- Determinations of ABO Blood group.
- Enumeration of red blood cells and white blood cells usinghaemocytometer.
- Recording of blood pressure using a sphygmomanometer.
- Examination of sections of mammalian oesophagus, stomach, duodenum, ileum, rectum, liver, Trachea, lung, kidney

Marks Distribution :-

Blood Group tests		**= 5**
Blood Pressure recording		**= 5**
Spoting	**3 X 2**	**= 6**
Records + Viva		**= 4**
Total		**= 20**

B. Sc. ZOOLOGY SEMESTER-6
CODE – MJ8
MOLECULAR BIOLOGY AND PRINCIPALS OF GENETICS

THEORY **(Credits 4)**

Unit 1 : Nucleic acids 4 Lecture

Salient features of DNA and RNA
Watson and Crick model of DNA

Unit 2 : DNA Replication 10 Lecture

DNA Replication in prokaryotes and eukaryotes, mechanism of DNAreplication, Semi- conservative, bidirectional.

Unit 3 :Transcription 10 Lecture

RNA polymerase and transcription Unit, mechanism of transcription in prokaryotesand eukaryotes

Unit4: MendelianGenetics and itsExtension 10 Lecture

Principles of Inheritance, Incomplete dominance and co-dominance, Multiple alleles,Lethal alleles

Unit 5 : Linkage, Crossing Over and Chromosomal Mapping 12 Lecture

Linkage and crossing over, Cytological basis of crossing over & chromosomal mapping,

Unit6:Mutations 10 Lecture

Types of gene mutations (Classification), Types of chromosomal aberrations (Classification, figures and with one suitable example of each)

Unit 7 : Sex Determination 4 Lecture

Chromosomal mechanism of sex determination in Drosophila and man.

Gene balance Theory

MOLECULAR BIOLOGY

PRACTICALS **(Credits 2)**

Time :- 03 Hours

- Study of Polytene chromosome from Chironomous / Drosophila larvae.
- Preparation of liquid culture medium (LB) and raise culture of E.coli
- Preparation of solid culture medium (LB) and growth of E.coli by spreading and streaking.

Marks Distribution :-

Polytene chromosome	**= 7**
E.coli Culture	**= 7**
Records + Viva	**= 6**
Total	**= 20**

B. Sc. ZOOLOGY SEMESTER-6
CODE – MJ9
COMPARATIVE ANATOMY OF VERTEBRATES

THEORY **(Credits 4)**

Unit 1 : Digestive System — 14 Lecture

Alimentary canal and associated glands, dentition

Unit 2 : Respiratory system — 16 Lecture

Skin, gills, lungs and air sacs; Accessory respiratory organs

Unit 3 : Circulatory Systems — 14 Lecture

Evolution of heart and aortic arches in Vertebrates

Unit 4 : Urinogenital System — 16 Lecture

Succession of kidney, Evolution of urinogenital ducts, Types of mammalian uteri

COMPARATIVE ANATOMY OF VERTEBRATES

PRACTICALS **(Credits 2)**

Time :- 03 Hours

- Study of placoid, cycloid and ctenoid scales through permanent slides/photographs
- Disarticulated skeleton of Frog, *Varanus*, fowl, rabbit
- Carapace and plastron of turtle/tortoise
- Mammalian skulls : One herbivorous and carnivorous animal

Marks Distribution :-

Mounting	**= 5**
Spoting	**= 10**
Records + Viva	**= 5**
Total	**= 20**

SUGGESTED READING

- 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. andWell, P.A. (2009).
- Harper's Illustrated Biochemistry, XXVIII Edition, International Edition, The McGraw-Hill
- Hames, B.D. and Hooper, N.M. (2000). Instant Notes in Biochemistry, II Edition,BIOS Scientific Publishers Ltd., U.K.
- Watson, J.D., Barker, 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.
- Kardong, K.V. (2005) Vertebrate's Comparative Anatomy . Function andEvolution. IV Edition. McGraw-Hill Higher Education
- Kent,G.C. and Carr R.K (2000). Comparative Anatomy of the Vertebrates. IXEdition. The McGraw-Hill Companies
- 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
- 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.XIEditionJohn Wiley & sons.
- Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XIIEdition. Lippincott W. & Wilkins.
- Vander A, Sherma J. And Luciano D. (2014). Vander's Human Physiology : The Mechanism of
- Body Function. XIII Edition, McGraw Hills

B. Sc. ZOOLOGY SEMESTER-7
ADVANCED MAJOR 1
FISH AND FISHERIES

THEORY **(CREDITS 4)**

Unit 1 :Introduction and Classification 10 Lecture

General description of fish; Account of systematic classification of fishes (upto classes)

Unit 2 : Morphology and Physiology 10 Lecture

Types of fins and their modifications; Locomotion in fishes, Types of Scales, Gills andgas exchange; Swim bladder: Types and role in respiration, Electric organs, Parentalcare.

Unit 3 : Fisheries 10 Lecture

Inland Fisheries; Marine Fisheries; Fishing crafts and Gears; Depletion of fisheries resources; Fisheries law and regulations.

Unit 4 : Aquaculture 27 Lecture

Sustainable Aquaculture; Extensive, semi-intensive and intensive culture of fish; Pen and cage culture; Polyculture; Composite fish culture; Brood stock management; Induced breeding of fish; Management of finfish hatcheries; Preparation and maintenance of fish aquarium; Preparation of compound diets forfish; Role of water quality in aquaculture; Fish diseases : Bacterial, viral and parasitic; Preservation and processing of harvested fish, Fishery by-products.

Unit 5 : Fish in research 3 Lecture

Zebrafish as a model organism in research.

FISH AND FISHERIES

PRACTICAL **(Credits 2)**

Time :- 03 Hours

- Study of Petromyzon, Myxine, Pristis, Chimaera, Exocoetus, Hippocampus,Gambusia, Labeo, Heteropneustus, Anabas.
- Study of different types of scales (through permanent slides/photographs).
- Study of crafts and gears used in Fisheries.
- Demonstration of induced breeding in Fishes(video).
- Demonstration of parental care in fishes (video). 6.Project Report on a visit to any fish farm/ pisciculture unit/ Zebrafish rearing lab.

Marks Distribution :-

Mounting		**= 3**
Spoting	**4 X 2**	**= 8**
Project		**= 4**
Records + Viva		**= 5**
Total		**= 20**

SUGGESTED READINGS

- Q Bone andR Moore, Biology of Fishes, Taylor and Francis Group, CRC Press, U.K.
- D.H. Evansand J.D. Claiborne, The Physiology of Fishes, Taylor and FrancisGroup, CRC press,
- **UK von der Emde, R.J.Mogdans and B.G. Kapoor. The Senses of Fish :Adaptions for the Reception of Natural Stimuli, Springer, Netherlands**
- C.B.L. Srivastava, Fish Biology, Narendra Publishing House
- J.R. Norman, A history of Fishes,Hill and Wang Publishers
- S.S. Khanna and H.R. Singh, A text book of Fish biology and Fisheries,Narendra Publishing House.
- Jhingeran-Fish and Fisheries,Latest Edition
- Fish of UP and Bihar – Gopalji Srivastava
- Fish and Fisheries – Pandey and Shukla
- Fish Physiology - hoar

B. Sc. ZOOLOGY SEMESTER-7
ADVANCED MAJOR 2
IMMUNOLOGY

THEORY **CREDITS 4**

Unit 1 : Overview of Immune System 10 Lecture

Historical perspective of Immunology, early theories of Immunology, Cells and organsof the Immune system.

Unit 2 : Innate and adaptive Immunity—Basics 20 Lecture

Anatomical barriers, Inflammation, Cell and molecules involved in innate immunity, Adaptive immunity (Cell mediated and humoral), Passive : Artificialand natural immunity, Active : Artificial and natural immunity, Immune dysfunctions (brief account of autoimmunity with reference to Rheumatoid Arthritis and tolerance, AIDS).

Unit 3 : Antigens 8 Lecture

Antigenicity and immunogenicity, Immunogens, B and T-cell epitopes

Unit 4 : Immunoglobulins 12 Lecture

Structure and functions of different classes of immunoglobulins, Antigen-antibody interactions,

Unit 5 : Cytokines 7 Lecture

Properties and functions of cytokines, Therapeutics Cytokines.

Unit 6 :Vaccines 3 Lecture

Various types of vaccines.

IMMUNOLOGY

PRACTICAL **(Credits 2)**

Time :- 03 Hours

- Demonstration of lymphoid organs.
- Histological study of spleen , thymus and lymph nodes through slides/photographs.
- Preparation of stained blood film to study various types of blood cells.
- ABO blood group determination.
- Cell counting and viability test from splenocytes of farm bred animals/ cell lines.
- Demonstration of
  a. ELISA
  b. Immuno electro phoresis * The experiments can be performeddepending upon usage of animal in UG courses.

Marks Distribution :-

Blood Film Preparation		**= 2**
Spoting	**4 X 2**	**= 8**
ABO blood group test		**= 5**
Records + Viva		**= 5**
Total		**= 20**

SUGGESTED READING

- Kindt, T.J., Goldsby, R.A., Osborne, B.A. and Kuby, J (2006). Immunology, VIEdition. W.H. Freeman and Company.
- David, M., Jonathan, B., David, R.B. and Ivan R. (2006). Immunology, VIIEdition, Mosby, Elsevier Publication.
- Abbas, K. Abul and Lechtman H. Andrew (2003). Cellular and MolecularImmunology. V Edition. Saunders Publication.
- Immunology by Kubey

B. Sc. ZOOLOGY SEMESTER-8
ADVANCED MAJOR 3
PARASITOLOGY

THEORY **CREDITS 4**

Unit 1 : Introduction to Parasitology 3 Lecture

Brief introduction of Parasitism, Parasite, Parasitoid and Vectors (mechanical and biological vector) Host parasite relationship.

Unit II : Parasitic Protists 15 Lecture

Study of Morphology, Life Cycle, prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of Entamoeba histolytica, Trypanosoma gambiense, Leishmania donovani.

Unit III : Parasitic Platyhelminthes 15 Lecture

Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of Fasciolo bibiscus, Taenia solium .

Unit IV : Parasitic Nematodes 15 Lecture

Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of Wuchereria bancrofti and Trichinella spiralis.

Unit V : Parasitic Arthropoda 10 Lecture

Biology, importance and control of ticks, mites, Pediculus humanus (head and body louse).

Unit VI : Parasitic Vertebrates 2 Lecture

A brief account of parasitic vertebrates.

PARASITOLOGY

PRACTICAL **(Credits 2)**

Time :- 03 Hours

1. Study of life stages of Entamoeba histolytica, Trypanosoma gambiense, Leishmania donovani and Plasmodium vivax through permanent slides/ micro photographs.
2. Study of adult and life stages of Fasciola buski, Schistosoma haematobium, Taenia solium through hpermanent slides/micro photographs. (1,2[6marks])
3. Study of adult and life stages of Ascaris lumbricoides, Wuchereria bancrofti through permanent slides/ micro photographs.
4. Study of plant parasitic Meloidogyne from the soil sample.(3,4[6 marks]
5. Study of Pediculus humanus (Head louse and Body louse) through permanent slides/photographs.
6. Study of monogenea from the gills of fresh/marine fish [Gills can be procured from fish market as by product of the industry].(5,6[4 marks])
7. RECORD + VIVA- [4 marks]

Submission of a brief report on parasitic vertebrates.

Marks Distribution :-

Life History	**= 10**
Project	**= 5**
Records + Viva	**= 5**
Total	**= 20**

SUGGESTED READING

- Arora, D.R. and Arora, B. (2001) *MedicalParasitology*. 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 LalIchhpujani and Rajesh Bhatia. Medical Parasitology,III edition, Jaypee Brothers MedicalPublishers (P) Ltd., New Delhi
- Meyer, Olsen & Schmidt's Essential of Parasitology, Murray,
- D. Dailey, W.C. Brown Publishers
- K.D. Chatterjee (2009). Parasitology : Protozoology and Helminthology. XIII Edition, CBS Publishers & Distributors (P) Ltd.
- C.C. Chatterjee

B. Sc. ZOOLOGY SEMESTER-8
ADVANCED MAJOR 4
WILDLIFE CONSERVATION AND MANAGEMENT

THEORY **CREDITS 4**

Unit 1 : Introduction to Wild Life 10 Lecture

Values of wild life-positive and negative; Conservation ethics; importance ofconservation; Causes of depletion; World conservation strategies.

Unit 2 : Evaluation and Management of wild life 10 Lecture

Habit analysis, Physical parameters : Topography, Geology, Soil and water; Biological Parameters : food, cover, forage, browse and cover estimation; Standard evaluation procedure :remote sensing and GIS.

Unit 3 : Management of habitats 10 Lecture

Setting back succession; Grazing logging; Mechanical treatment; Advancing the succession process; Cover construction.

Unit 4 : Population estimation 10 Lecture

Population density, Natality, Birth rate, Mortality, Fertility schedules and sex ratio computation;

Unit 5 : Management planning of wild life in protected areas 10 Lecture

Estimation of carrying capacity; Eco tourism/wild life tourism in forests; Concept ofclimax persistence; Ecology of perturbence.

Unit 6 : Protected areas 10 Lecture

National parks & sanctuaries, Community reserve; Important features of protectedareas in India; Tiger conservation- Tiger reserves in India; Management challenges in Tiger reserve.

WILD LIFE CONSERVATION AND MANAGEMENT

PRACTICALS **(Credits2)**

Time :- 03 Hours

- Identification of flora, mammalian fauna, avian fauna, herpeto-fauna.
- Demonstration of basic equipment needed in wildlife studies use, care and maintenance. (Compass, Binoculars, Spotting scope, Range Finders, Global Positioning System, Various types of cameras and lenses).
- Familiarization and study of animal evidences in the field; identification of animals through pug marks, hoof marks, scats, pellet groups, nest, antlers.
- Demonstration of different field techniques for flora and fauna.

Marks Distribution :-

Identification	**= 5**
Equipment	**= 5**
Project	**= 5**
Records + Viva	**= 5**
Total	**= 20**

SUGGESTED READINGS

- Caughley, G., and Sinclair, A.R.E. (1994). Wildlife Ecology andManagement. Blackwell Science.
- Woodroffe R., Thirgood, S. And Rabinowitz, A. (2005). People and Wildlife, Conflict or Co-existence? Cambridge University.
- Bookhout, T.A. (1996). Research and Management Techniques for Wildlife and Habitats, 5th edition. The Wildlife Society, Allen Press.
- Sutherland, W.J.(2000). The Conservation Handbook : Research, Management and Policy. Blackwell Sciences.
- Hunter M.L., Gibbs, J.B. and Sterling, E.J.(2008). Problem-Solving in Conservation Biology and Wildlife Management : Exercise for Class, Field, and Laboratory. Blackwell Publishing.

B. Sc. ZOOLOGY (SEMESTER - 4)

MINOR – 1

FULL MARKS -50

Group A –Non-Chordata

- Bionomics, general character and classification (upto classes) of the followingphyla : Protozoa, Porifera, Coelenterata, Platyhelminthes, Aschelminthes.
- Detailed study of the structure and life history of the following types :-
- Protozoa – Paramecium
- Porifera – Sycon
- Coelenterata – Obelia
- Platyhelminthes – Fasciola
- Aschelminthes – Ascaris

Group B - Ecology

Unit 1 : Introduction to Ecology

History of ecology, Autoecology and synecology, Levels of organization, Laws oflimiting factors, Study of physical factors.

Unit 2 : Community

Community characteristics : species richness, dominance, diversity, abundance,vertical stratification, Ecotone and edge effect ; Ecological succession with one example

Unit 3: Ecosystem

Types of ecosystem with one example in detail,

Food chain : Detritus and grazing food chains, Linear and Y-shaped food chains.

Practicals

F.M- 20 **Time : 3 Hrs**

- Dissection
- Temporary mounting/Study ofPlanktons
- Identification
- Permanent slides-2
  (a) Museum specimen-2
  (b) Plankton slide 1
- Practical Record & Viva.

B. Sc. ZOOLOGY (SEMESTER-5)

MINOR – 2

FULL MARKS -50 **Time : 3 Hrs**

Group A-Nonchordates

- Binomics , General character and classification (upto orders) of the following phyla : Annelida, Arthropoda, Mollusca, Echinodermata.

- Detailed study of the structure and life history of the following types

    - Annelida – Pheritima
    - Arthropoda—Palaemon
    - Mollusca—Pila
    - Echinodermata—Asterias

Group B-Cell Biology

- Diversity of cell size & shape
- Cell theory
- Structure & function of Plasma membrane & cytoplasmic organelles.

- Cell division.
- Cell cycle.

PRACTICALS

F.M-20 Time : 3 Hrs

- Dissection
- Temporary mounting/Cytology
- Identification
- Permanent slides-2
  (b) Museum specimens-2
  (c) Cytological slides-1 (Meiosis/Mitosis.)
- Practical Record & Viva.

B. Sc. ZOOLOGY (SEMESTER-6)

MINOR – 3

FULL MARKS -50 **Time : 3 Hrs**

Embryology

Gametogenesis, Fertilization, Parthenogenesis

Physiology

Digestion, Respiration, Excretion.

Endocrinology

Histophysiology of following endocrine organs – Pituitary,Thyroid, Adrenal,Testis, Ovary and islets of Langerhans.

Evolution

Sources of hereditary variations and their role in evolution
Darwin's theory o natural selection & Neo Darwinism (c) Isolatingmechanism & their role in evolution

PRACTICALS

Marks : 25 **Time : 3 hours**

Experiments

- Haematology
- Physiology
- Identification
- Record & Viva

Details o Experiments

- Haematology –Bleeding & Clotting time, Blood group, Hb%
- Physiology—Pulse Rate Counting (Manmmal),Frog-Rate of Heartbeat by Chimograph, Earthworm reflex action (Photoreceptors)
    - Identification
- Embryological Slides-3
    - Endocrinological Slides-2

Panel of Examiners (UG):

- Mrs. Anita Shukla, HOD, Dept. of Zoology, Jamshedpur Women's College, Jamshedpur
- Prof. Dr. Noor Alam, Rtd. University Professor and Head, Univ. Department of Zoology, Vinoba Bhave University
- Dr. Anjali Shrivastava, Ret. Associate Professor, Jamshedpur Women's University
- Dr. Satya Ranjan Pal, Assistant Professor, Dept. of Zoology, Jamshedpur Women's College,Jamshedpur
- Mrs. Pranati P. Ekka, HOD, Dept. of Zoology, GSCW, Jamshedpur
- Dr. Manisha Sisodia, Dept. of Zoology, GSCW, Jamshedpur
- Mrs. Farjana Nahim, Dept. of Zoology, GSCW, Jamshedpur
- Dr. Saraswati Sarkar, Assistant Professor, Dept. of Zoology, Jamshedpur Co-oparative College
- Dr. Sangita Kumari, Assistant Professor, Dept. of Zoology, Jamshedpur Co-oparative College
- Dr. Anjana Khalko, HOD, Dept. of Zoology, Mahila College, Chaibasa
- Dr. Swati Soren, Jamshedpur Co-operative College
- Dr. Shovit Ranjan,Assistant Professor, University Department of Zoology, Kolhan University, Chaibasa

JAMSHEDPUR WOMEN'S UNIVERSITY HONS. / RESEARCH

FORMAT OF QUESTION PAPER FOR SEMESTER INTERNAL EXAMINATION

Question format for 10 Marks:

Subject / Code

F.M.=10 **Time=1Hr.** **Exam Year**

General Instructions:

I. Group A carries very short answer type compulsory questions.
II. Answer 1 out of 2 subjective / descriptive questions given in group B.
III. Answer in your own words as far as practicable.
IV. Answer all sub parts of a question at one place.
V. Numbers in right indicate full marks of the question.

Group A

1. . [5x1=5]
   I. …….
   II. …….
   III. …….
   IV. …….
   V. …….

Group B

2. …… [5]
3. …… [5]

Note : There may be subdivisions in each question asked in theory examination.

Question format for 20 Marks:

Subject / Code

F.M.=20 **Time=1Hr.** **Exam Year**

General Instructions:

I. Group A carries very short answer type compulsory questions.
II. Answer 1 out of 2 subjective / descriptive questions given in group B.
III. Answer in your own words as far as practicable.
IV. Answer all sub parts of a question at one place.
V. Numbers in right indicate full marks of the question.

Group A

1. [5x1=5]
   I. …….
   II. …….
   III. …….
   IV. …….
   V. …….
2…… [5]

Group B

3…… [10]
4…… [10]

Note : There may be subdivisions in each question asked in theory examination.

JAMSHEDPUR WOMEN'S UNIVERSITY HONS. / RESEARCH

FORMAT OF QUESTION PAPER FOR SEMESTER INTERNAL EXAMINATION

Question format for 50 Marks:

Subject / Code

F.M.=50 **Time=3Hr.** **Exam Year**

General Instructions:

I. Group A carries very short answer type compulsory questions.
II. Answer 3 out of 5 subjective / descriptive questions given in group B.
III. Answer in your own words as far as practicable.
IV. Answer all sub parts of a question at one place.
V. Numbers in right indicate full marks of the question.

Group A

1. [5x1=5]
   I. ……
   II. ……
   III. ……
   IV. ……
   V. ……

Group B

2…… [15]
3…… [15]
4…… [15]
5…… [15]
6…… [15]

Note : There may be subdivisions in each question asked in theory examination.

Question format for 60 Marks:

Subject / Code

F.M.=60 **Time=3Hr.** **Exam Year**

General Instructions:

I. Group A carries very short answer type compulsory questions.
II. Answer 3 out of 5 subjective / descriptive questions given in group B.
III. Answer in your own words as far as practicable.
IV. Answer all sub parts of a question at one place.
V. Numbers in right indicate full marks of the question.

Group A

1. [5x1=5]
   I. ……
   II. ……
   III. ……
   IV. ……
   V. ……

2…… [5]
3…… [5]

Group B

4…… [15]
5…… [15]
6…… [15]
7…… [15]
8…… [15]

Note : There may be subdivisions in each question asked in theory examination.

JAMSHEDPUR WOMEN'S UNIVERSITY HONS. / RESEARCH

FORMAT OF QUESTION PAPER FOR SEMESTER INTERNAL EXAMINATION

Question format for 75 Marks:

Subject / Code

F.M.=75 **Time=3Hr.** **Exam Year**

General Instructions:

I. Group A carries very short answer type compulsory questions.
II. Answer 4 out of 6 subjective / descriptive questions given in group B.
III. Answer in your own words as far as practicable.
IV. Answer all sub parts of a question at one place.
V. Numbers in right indicate full marks of the question.

Group A

1. [5x1=5]
   I. …….
   II. …….
   III. …….
   IV. …….
   V. …….
2……. [5]
3……. [5]

Group B

4…… [15]
5…… [15]
6…… [15]
7…… [15]
8…… [15]
9…… [15]

Note : There may be subdivisions in each question asked in theory examination.

Question format for 100 Marks:

Subject / Code

F.M.=100 **Time=3Hr.** **Exam Year**

General Instructions:

I. Group A carries very short answer type compulsory questions.
II. Answer 4 out of 6 subjective / descriptive questions given in group B.
III. Answer in your own words as far as practicable.
IV. Answer all sub parts of a question at one place.
V. Numbers in right indicate full marks of the question.

Group A

1. [10x1=10]
   I. ……. VI……..
   II. ……. VII……..
   III. ……. VIII……..
   IV. ……. IX……
   V. ……. X……..
2……. [5]
3……. [5]

Group B

4…… [20]
5…… [20]
6…… [20]
7…… [20]
8…… [20]
9…… [20]

Note : There may be subdivisions in each question asked in theory examination.