List of Revised Courses

Department : Zoology

Programme Name : B.Sc.

Academic Year : 2024-25

List of Revised Courses

Sr. No.	Course Code	Name of the Course
01.	ZOUAMDT1	Introductory Zoology
02.	ZOUASET1	Aquaculture
03.	ZOUAVAT1	Bhartiya Vigyan ka Itihas
04.	ZOUBMDT1	Essentials of Zoology
05.	ZOUDMJT1	Microbiology and Parasitology
06.	ZOUDVOT1	Medical Diagnostics

HEAD
Department of Zoology
Guru Ghasidas Vishwavidyalaya, Bilaspur

Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year : 2024-25

School : *Life Sciences*

Department : *Zoology*

Date and Time : *14-02-2025 – 12:00 noon*

Venue : *Meeting room*

The scheduled meeting of member of Board of Studies (BoS) of Department of Zoology, School of Studies of Life Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur was held to design and discuss the contents of each paper of U.G (NEP) by members (both internal and external).

The following members were present in the meeting:

1. Prof. Poonam Sharma (External Expert Member BoS, Dept. of Zoology, IGNTU, Amarkantak, MP)
2. Prof. Seema Rai (HOD, Dept. of Zoology-cum Chairman, BOS)
3. Prof. Monika Bhadauria (Member BoS, Dept. of Zoology)
4. Prof. LVKS Bhaskar (Member BoS, Dept. of Zoology)
5. Dr. Santosh Singh (Member, Assistant Professor, Dept. of Zoology)
6. Dr. Hasansab Nadaf (Industry Expert)

Following points were discussed during the meeting

The committee discussed and approved the scheme and syllabi. The following courses were revised in the B. Sc. (I, II, and IV Semesters) :

1.	ZOUAMDT1	Introductory Zoology
2.	ZOUASET1	Aquaculture
3.	ZOUAVAT1	Bhartiya Vigyan ka Itihas
4.	ZOUBMDT1	Essentials of Zoology
5.	ZOUDMJT1	Microbiology and Parasitology
6.	ZOUDVOT1	Medical Diagnostics

HEAD
Department of Zoology
Guru Ghasidas Vishwavidyalaya, Bilaspur

Signature & Seal of HoD

SCHEME AND SYLLABUS

FOR

- **UG Certificate in Zoology: 1 year**
- **UG Diploma in Zoology: 2 years**
- **UGDegree in Zoology: 3 years**
- **UG (honours with research)in Zoology: 04 years**
- **UG (honours) in Zoology: 04 years**

Under

National Education Policy 2020

Department of Zoology, School Of Life Sciences
Guru Ghasidas Vishwavidyalaya, Bilaspur (CG)

2024-25

14/02/2025 14/02/25 14/02/2025

Scheme and Syllabus for UG Courses in Zoology

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

Semester	Courses	Name of courses	Code	Number of courses	Level	Credits	Total Credits
I	Major	**Animal Diversity of Non chordates (Protista to Pseudocoelomate)**	ZOUAMJT1	1	2	3	18
		Lab Course	ZOUAMJL1			1	
	Minor	**Minor 1** To be offered to the students of other departments	ZOUAMNT1	1	2	3	
		Lab Course	ZOUAMNL1			1	
	Multidisciplinary	**Multidisciplinary 1** To be offered to the students of other disciplines (except Natural and Physical Sciences)	ZOUAMDT1	1	1	3	
	SEC	**SEC 1** To be offered to students of Zoology/other departments at University level	ZOUASET1	1	1	2	
		Lab Course	ZOUASEL1			1	
	VAC	**VAC 1** To be offered tothe students of Zoology/other departments at University level	ZOUAVAT1	2	1	2	
	AEC	**Language** To be offered by Hindi/English Department for student of Zoology		1	1	2	
II	Major	**Animal Diversity of Non chordates (Coelomates)**	ZOUBMJT1	1	2	3	18
		Lab Course	ZOUBMJL1			1	
	Minor	**Minor 2** To be offered to the students of other departments	ZOUBMNT1	1	2	3	
	/	Lab Course	ZOUBMNL1			1	
	Vocational	**Vocational 1** To be offered to the students of Zoology/other departments at University level	ZOUBVOT1			1	
		Ornamental Fish Culture Lab Course	ZOUBVOL1			3	
	Multidisciplinary	**Multidisciplinary 2** To be offered to the students of other disciplines (except Natural and Physical Sciences)	ZOUBMDT1	1	1	3	
	SEC	**SEC 2** To be offered to the students of Zoology/other departments at University level	ZOUBSET1	1	1	2	
		Lab Course	ZOUBSEL1			1	
	VAC	**VAC 2** To be offered to the students of Zoology/other departments at University level	ZOUBVAT1	2	1	2	
	AEC	**Language** To be offered by Hindi/English Department for student of Zoology		1	1	2	
The student must complete the 4 credits vocational course/Internship during summer term to get UG Certificate if he wishes to exit the program after first 2 semesters.							

14/02/2025 14/02/2025 14/2/2025

III	Major	**Diversity of Chordates**	ZOUCMJT1	2	3	3	20
		Lab Course	ZOUCMJL1			1	
		Cell biology	ZOUCMJT2			3	
		Lab Course	ZOUCMJL2			1	
	Minor / Vocational	**Minor3** To be offered to the students of other departments	ZOUCMNT1	1	3	3	
		Lab Course	ZOUCMNL1			1	
		Vocational 2 To be offered to the student of Zoology/other departments at University level	ZOUCVOT1			1	
		Histological Techniques and Light Microscopy-Lab Course	ZOUCVOL1			3	
	Multidisciplinary	**Multidisciplinary 2** To be offered to the students of other disciplines (except Natural and Physical Sciences)		1	1	3	
	SEC	**SEC 3** To be offered to the students of Zoology/other departments at University level	ZOUCSET1	1	1	2	
		Lab Course	ZOUCSEL1			1	
	AEC	**Language** To be offered by Hindi/English Department for student of Zoology		1	1	2	
IV	Major	**Microbiology and Parasitology**	ZOUDMJT1	3	3	3	20
		Lab Course	ZOUDMJL1			1	
		Fundamental Biochemistry	ZOUDMJT2			3	
		Lab Course	ZOUDMJL2			2	
		Ecosystem Dynamics and Conservation / Complex ecosystem Dynamics (MOOCS)	ZOUDMJT3			3	
		Lab Course	ZOUDMJL3			2	
	Minor / Vocational	**Minor 4** To be offered to the students of other departments	ZOUDMNT1	1	3	2	
		Lab Course	ZOUDMNL1			3	
		Vocational 3 To be offered to the students of Zoology/other departments at University level	ZOUDVOT1			1	
		Medical diagnostics Lab Course	ZOUDVOL1			3	
	AEC	**Language** To be offered by Hindi/English Department for student of Zoology		1	1	2	
The student must complete the 4credits vocational course/Internship either after first year or second year during summer term to get UG Diploma if he wishes to exit the program after first 4 semesters.							
V	Major	**Physiology of Basic Life Process**	ZOUEMJT1	3	4	3	21
		Lab Course	ZOUEMJL1			2	
		Bioinstrumentation	ZOUEMJT2			3	
		Lab Course	ZOUEMJL2			2	
		Principle of Genetics and Evolution	ZOUEMJT3			3	
		Lab Course	ZOUEMJL3			2	
	Minor	**Minor 5** (To be offered to the students of other departments)	ZOUEMNT1	1	4	3	
		Lab Course	ZOUEMNL1			1	

As per NEP-2020, Department of Zoology will offer minor courses, multidisciplinary courses (MDC), ability enhancement courses (AEC), skill enhancement courses (SEC), value added courses (VAC) and vocational courses (VOC) to students of other departments.
Similarly, student of Department of Zoology will study these courses from the coursed offered by other departments/ as per University decision.
Pool for minor course, multidisciplinary course, AEC, SEC, VAC and vocational course will be given by University.
Two AEC courses are compulsory in first 2 semesters (One in each semester).
Three SEC courses are compulsory in first 3 semesters (One in each semester).
Three Multidisciplinary courses are compulsory in first 3 semesters (One in each semester).
Four VAC courses are compulsory in first 2 semesters (Two in each semester).
One vocational course for certificate and diploma courses, three vocational courses for 3/ 4 year degree are compulsory.
List of minor courses, multidisciplinary courses, AEC, SEC, VAC and vocational courses offered by the department of zoology (in University pool) is as follows:

Minor Courses

S. N.	Title	Course Name
1.	Minor 1	Animal Diversity of Non chordates (Protista to Pseudocoelomate)
2.	Minor 2	Animal Diversity of Non chordates (Coelomates)
3.	Minor 3	Diversity of Chordates
4.	Minor 4	Microbiology and Parasitology
5.	Minor 5	Physiology of Basic Life Processes
6.	Minor 6	Physiology of Regulatory Life Process
7.	Minor 7	Immunology
8.	Minor 8	Research Methodology and Biostatistics
9.	Minor 9	Applied Zoology

Multidisciplinary Courses

S. N.	Title	Course Name
1.	Multidisciplinary 1	Introductory Zoology
2.	Multidisciplinary 2	Essentials of Zoology

Skill Enhancement Courses

S. N.	Title	Course Name
1.	SEC 1	Aquaculture
2.	SEC 2	Apiculture
3.	SEC 3	Sericulture

Value Added Courses

S. N.	Title	Course Name
1.	VAC 1	Bhartiya Vigyan Ka Itihas
2.	VAC 2	Food Nutrition and Health (Health & wellness)

Vocational Courses

S. N.	Title	Course Name
1.	VOC 1	Ornamental Fish Culture
2.	VOC 2	Histological Techniques and Light Microscopy
3.	VOC 3	Medical Diagnostics

Department may offer at least one paper in whole UG program on MOOC's platform and it will be compulsory to all students.
Summer and/or winter internship: duration will be 2-4 weeks (minimum 90 working hours).

Abbreviations:
AEC= Ability enhancement course; SEC= Skill enhancement course; VAC= Value added course
(Subject to approval by the competent authority)

Multidisciplinary Course: ZOUAMDT1

Semester	Multidisciplinary Course	Course Title	Credits
I	MDC-1	Introductory Zoology	Theory: 03

About the course

The course provides a detailed insight into basic concepts of biomoleculesand their importance; cellular structure and function. It also gives an account of genetics and evolutionary mechanism.

Course Outcomes

1. Understand the functioning of nucleus and extra nuclear organelles and understand the intricate cellular mechanisms involved.
2. Understand about the importance and scope of biomolecules. Understand the structure and biological significance of carbohydrates, proteins, lipids and nucleic acids.
3. Understand how DNA encodes genetic information and the function of mRNA and tRNA. Apply the principles of Mendelian inheritance.
4. Understand how developmental processes and gene functions within a particular tissue or organism can provide insight into functions during evolution.

Course Outcomes and their mapping with Programme Outcomes:

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

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

Theory

Unit 1: Biomolecules **10 Lectures**

Chemical foundation of life. Principle of bimolecular organization, configuration and conformation. Water as biological solvent. Structure and biological importance of carbohydrates, lipids, proteins and nucleic acids.

Unit 2: Cell **10 Lectures**

General structure of prokaryotes, bacteria, archaea and eukaryotes. Cell theory. Structure and functions of endoplasmic reticulum, ribosome, Golgi apparatus, lysosome, peroxisomes, mitochondria, cytoskeleton, and nucleus. Cell cycle, cell division- mitosis and meiosis.

Unit 3: Genetics **10 Lectures**

Mendel's laws of inheritance; Exceptions to Mendelian Inheritance: Incomplete dominance, Codominance, Multiple allelism ; Concept of Gene; Elementary idea of gene expression and regulation; Mutation; Genetic disorders: chromosomal aneuploidy (Down, Turner and Klinefelter syndromes), chromosome translocation (Chronic Myeloid Leukemia) and deletion (cry of cat syndrome), gene mutation (sickle cell anemia).

Unit 4: Evolutionary biology **10 Lectures**

Origin of life on earth, Miller-Urey Experiment;Oparin-Haldane theory; Sources and types of variations; Theories of evolution: Lamarckism; Darwinism; Mutation theory, Modern synthetic theory; Natural selection (Example: Industrial melanism); Types of natural selection (Directional, Stabilizing, Disruptive); Isolating mechanisms and modes of speciation.

Skill Enhancement Course (SEC): ZOUASET1 and ZOUASEL1

Semester	SEC	Course Title	Credits
I	SEC-1	Aquaculture	Theory: 02 Practical: 01

About the course

This course will give the students an understanding of the principles of aquaculture, including production systems, water quality, nutrition, spawning, larval culture and culture methodologies with special reference to fish, and prawn. The course will include an opportunity to conduct hands-on activities related to culture and husbandry of animals

Course outcomes

After completing this course the learners will be able to

1. Understand the aquaculture systems
2. Understand pond management to increase fish production
3. Understand fish breeding and health management
4. Understand the environmental impacts on aquaculture

Course Outcomes and their mapping with Programme Outcomes

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

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

Theory

Unit 1: Freshwater aquaculture systems **08 Lecture**

Aquaculture concept, Culture systems: Freshwater prawn culture, fish culture in paddy fields, Culture of Catfishes. Composite fish culture: Techniques of composite culture. Composite fish farming in India. Mariculture: Brackish water prawn culture. Mussel culture. Culture of aquatic weeds.

Unit 2: Preparation and management of fish culture ponds **08 Lecture**

Fish culture ponds. Pond management: Fish toxicants. Predatory and Weed fishes and their control. Aquatic insects and their control. Fish manures. Water quality. Culture: Pond culture. Monoculture. Monosex culture. Supplementary feeding. Harvesting: Fishing techniques, preservation & processing of fish.

Unit 3: Fish breeding, Transportation and Pathology **09 Lecture**

Fish breeding: Natural and artificial. Fish transportation: Methods for packaging and transport of fish.Transport of fish seed and Brood fish. Causes of mortality in transport. Use of chemicals in live fish transport: Anesthetic drugs. Antiseptics and Antibiotics. Fish diseases: Bacterial, fungal, protozoan and helminthes diseases. Non parasitic diseases.

Unit 4: Technologies in Fisheries development **10 Lecture**

Pearl culture: Introduction, Pearl producing mollusks, pearl formation, collection of oysters, Rearing of oysters, insertion of nucleus, harvesting of pearls, composition & quality of pearl. Recirculation technology. Geographic Information System (GIS) technology. Passive Acoustics in fisheries, Use of Information Communication Technology (ICT) in fishes: production aspects, marketing aspects.

Value Added Courses: ZOUAVAT1

Semester	VAC	Course Title	Credits
I	VAC-1	Bhartiya Vigyan Ka Itihas	Theory: 02

About the course

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

Course outcomes

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

Course Outcomes and their mapping with Programme Outcomes

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

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

Theory

Unit1: Science in ancient and medieval India **10 Lecture**

History of development in astronomy, mathematics, engineering and medicine subjects in Ancient India, Influence of the Islamic world and Europe on developments in the fields of mathematics, chemistry, astronomy and medicine.

Unit 2: Prominent Indian scientists **12Lecture**

Eminent scholars in mathematics and astronomy: Baudhayana, Aryabhatta, Brahmgupta, Bhaskaracharya, Varahamihira, and Nagarjuna, Medical science of Ancient India (Ayurveda and Yoga): Susruta, Charak. Scientists of Modern India: Srinivas Ramanujan, C.V. Raman, Jagdish Chandra Bose, Homi Jehangir Bhabha,Vikram Sarabhai etc.

Unit III: Indian science in before and after Independence **13 Lecture**

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

Recommended readings

1. Kuppuram, G. (1990) History of Science and Technology in India, South Asia Books.
2. Handa, O.C. (2014) Reflections on the history of Indian Science and Technology, Pentagon Press.
3. Basu, A. (2006) Chemical Science in Colonial India: The Science in Social History, K.P. Bagchi & Co.
4. Habib, I. (2016) A people's history of India 20: Technology in Medieval India, 5th Edition, Tulika Books.
5. Rahman, A. et al (1982) Science and Technology in Medieval India – A Bibliography of Source Materials in Sanskrit, Arabic and Persian, New Delhi: Indian National Science Academy.

Multidisciplinary Course: ZOUDMDT1

Semester	Multidisciplinary Course	Course Title	Credits
II	MDC-11	Essentials of Zoology	Theory: 03

About the course

The course provides an insight into elementary biology for non biology background learners.

Course outcomes

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

1. Able to identify and differentiate different types of tissue.
2. Understand the structure and function of respiratory and circulatory systems.
3. Able to understand functioning of digestive and excretory system.
4. Understand the structure and function of reproductive system and importance of endocrine system in our daily life processes.

Course outcomes and their mapping with programme outcomes

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

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

Theory

Unit 1: Animal tissue **10 Lectures**

General introduction of tissue;Epithelial tissue: Characteristics and types; Connective tissue: connective tissue proper; vascular tissue (composition and functions of blood and bone); muscular tissue (types, characteristics and functions); nervous tissue (types and functions).

Unit 2: Respiratory and circulatory system **10 Lectures**

Structural organization and functions of respiratory system; general concept of breathing and respiration; Respiratory pigment: Structure and functions of hemoglobin.

Structure and functions of mammalian heart; Circulation; Origin and conduction of cardiac impulses; Cardiac cycle; Blood clotting; Blood groups.

Unit 3: Digestive and excretory system **10 Lectures**

Structural organization and functions of gastrointestinal tract and associated glands; Digestion and absorption of food (carbohydrates, lipids, proteins and vitamins); Balance diet.

Structure of kidney and its functional unit; general mechanism of urine formation; Kidney function test.

Unit 4: Reproductive system and endocrinology **10 Lectures**

Modes of reproduction- asexual and sexual reproduction; Male and female reproductive organs, Accessory sex organs; Reproductive cycles; Gametogenesis; Fertilization.Definition and Classes of hormones; General structure and function of endocrine glands; Brief idea about regulation of hormone action.

Recommended readings

1. Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. W.B. Saunders Company.
2. Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons,
3. Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII Edition. Lippincott W. & Wilkins.
4. Vander A, Sherman J. and Luciano D. (2014). Vander's Human Physiology: The Mechanism of Body Function. XIII Edition, McGraw Hills

Major Courses: ZOUDMJT1 and ZOUDMJL1

Semester	Major Course	Course Title	Credits
IV	5	Microbiology and Parasitology	Theory: 03 Practical: 01

About the course

This is a composite course with remarkable utility and importance. Microbiology being the study of microorganisms such as viruses, bacteria etc., covers theoretical studies and practical proficiency training which may help in their placement at a clinical microbiological laboratory. Parasitology component takes care of the parasites and parasitism, emphasizing the influence of parasites on the ecology and evolution of free living species, and the role of parasites in global, public, health.

Course outcomes

- Carry out common procedures for culturing, purifying and diagnostics of micro-organisms and understand the disease-causing potential of bacteria and viruses.
- Describe the mechanism for transmittance, virulence, and pathogenecity in pathogenic micro-organisms.
- Diagnose the causative agents, describe pathogenesity and treatment for diseases like malaria, leishmaniasis, trypanosomiasis, toxoplasmosis, schistosomiasis, cysticercosis, filariasis etc.
- Understand the variation amongst parasites, parasitic invasion in both plants and animals; applicable to medical and agriculture aspects.
- Help to know the stages of the life cycles of the parasites and the respective infective stages. Develop ecological model, know population dynamics of parasite, establishment of parasite population in host body, adaptive radiations and methods adopted by parasite to combat with the host immune system.

Course Outcomes and their mapping with Programme Outcomes

COs	POs						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	3	1	2	3	3	1	1
CO2	3	3	1	-	1	1	3	1	1
CO3	3	2	3	-	1	1	3	1	-
CO4	3	2	1	-	-	-	2	-	-
CO5	3	2	1	-	-	-	2	-	-

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

Theory

Unit 1: Microbiology: A brief account of pathogenic bacteria. **13 Lectures**

Brief history of microbiology- germ theory of disease, discovery of penicillin. Diversity of microbes-viruses and bacteria. Host pathogen interaction: invasion, antigenic heterogeneity, toxins and enzymes secretions. Kinetics of bacterial growth and staining techniques.

Unit 2: Microbiology: A brief account of pathogenic viruses **13 Lectures**

Viral diseases: polio, rabies, hepatitis, influenza, dengue, AIDS, chicken pox, swine flu with emphasis on their causative agents, pathogenesis, diagnosis, prophylaxis. Bacterial diseases caused by Streptococcus pneumoniae, Salmonella typhi, Escherichia coli, Helicobacter pylori, Mycobacterium tuberculosis, Vibrio cholerae. Fungal diseases: Ringworm infection, aspergillosis, candidiasis.

Unit 3: Introduction to Parasitology **13 Lectures**

Brief introduction of Parasitism, Parasite, Parasitoid and Vectors (mechanical and biological vector) Host parasite relationship, Population dynamics of parasite and establishment of parasite population in host body, evolution of parasitism, evolution and coevolution of parasite with respect to host strategy.

Unit 4: Parasitic Protists and Platyhelminthes **12 Lectures**

Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of *Entamoeba histolytica, Giardia intestinalis, Trypanosoma gambiense, Leishmania donovani, Plasmodium vivax, Fasciolopsis buski, Schistosoma haematobium, Taenia solium.*

Unit 5: Parasitic Nematodes and Arthropoda **12 Lectures**

Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of *Ascaris lumbricoides, Ancylostoma duodenale, Wuchereria bancrofti and Trichinella spiralis*. Biology, importance and control of ticks, mites, *Pediculus humanus* (Head andBody louse), *Xenopsylla cheopis* and *Cimex lectularius.*

Practical

Practical

1. Study of permanent slides and specimens of parasitic protozoans and helminthes.
2. Pathological examination of sputum, blood, urine and stool.
3. Blood: Erythrocyte Sedimentation Rate (ESR), Haematocrit.
4. Staining and identification of Gram positive and Gram negative bacteria.
5. Preparation of thin and thick blood films to diagnose Plasmodium infections.
6. Preparation of temporary and permanent slides of faecal matter by saline preparation and concentration techniques to identify cysts of parasitic protozoans and helminthes eggs.
7. Group discussion or Seminar presentation on one or two related topics to those provided in the list.
8. Study of life stages of Entamoeba histolytica, Giardia intestinalis, *Trypanosoma gambiense*, *Leishmania donovani* and *Plasmodium vivax* through permanents lides/micro photographs.
9. Study of adult and life stages of *Fasciolopsis buski*, *Schistosoma haematobium* and *Taenia solium* through permanents lides/microphotographs.
10. Study of adult and life stages of *Ascaris lumbricoides*, *Ancylostoma duodenale*, *Wuchereria bancrofti* and *Trichinella spiralis* through permanent slides/microphotographs.
11. Study of *Pediculus humanus* (Head louse and Body louse), *Xenopsylla cheopis* and *Cimex lectularius* through permanent slides/ photographs.
12. Study of nematode/cestode parasites from the intestines of Poultry bird [Intestine can be procured from poultry/market as by product]

Recommended readings

1. Jawetz, M. and Adelberg (2015) Medical Microbiology (27th edition)
2. Chatterjee, K.D (2015) Parasitology (13th edition)
3. Goldsby, R.A.; Kindt, T.J. and Kuby, J. (2006) Immunology (6th edition).
4. Roitt, I.; Brostoff, J. and Male, D. (2012) Immunology (8th edition).
5. Arora, D. R and Arora, B. (2001) Medical Parasitology. II Edition. CBS Publications and Distributors
6. Noble, E.R. and Noble, G.A. (1982) Parasitology: The Biology of Animal Parasites. V Edition, Lea & Febige

Vocational Courses: ZOUDVOT1 and ZOUDVOL1

Semester	Vocational Course	Course Title	Credits
IV	VOC-3	Medical Diagnostics	Tutorial: 01 Practical: 03

Course Outcomes

This paper is focused to provide students an opportunity to study how clinicians come to a conclusion regarding disease prediction, prevention, diagnosis, and optimal treatment regimens. Students will learn about multiple diagnostic tools, techniques and technologies used in medical practices. The emphasis is on, how to select an appropriate diagnostic technique, methods and technologies to conduct analyses to understand the results and their implications in patients' diagnosis. This paper mainly focuses on clinical chemistry, hematology, diagnostic microbiology, histopathology, molecular diagnostics and diagnostic medical imaging.

Learning outcomes

1. Gain knowledge about diagnosis of various infectious, non-infectious and lifestyle diseases.
2. Understand the use of histology and biochemistry of clinical diagnostics.
3. Develop their skills in various types of tests and staining procedure involved in hematology.
4. Learn scientific approaches/techniques used in the clinical laboratories to investigate various diseases and will be skilled to work in research laboratories.
5. Acquire knowledge about common imaging technologies and their utility in the clinic to diagnose a specific disease.

COs	POs						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	3	1	2	-	3	2	1
CO2	3	3	3	1	1	-	3	2	1
CO3	3	3	2	-	1	-	3	2	-
CO4	3	2	2	-	-	-	3	1	-
CO5	3	2	1	-	-	-	3	1	-

Unit 1: Introduction to medical diagnostics and its importance **5 Lectures**

Identification of common equipment, principle and care of laboratory instruments. Basic needs of clinical laboratory technician, awareness of soft skills. NABL and SOP. Basic causes Personnel care and protection

Unit 2: Maintenance & equipment of pathology lab **5 Lectures**

Materials, Equipment & Techniques. Reagents – Preparation and their uses. Personnel care and protection Disposal of Bio-Medical waste. Sample Collection, Preservation & Labeling of Slides, Blocks, Specimens. Clinical Samples Fixatives. Preservation of reports & records.

Unit 3: Collection of specimen and disposal of waste **5 Lectures**

General principles, containers, rejection. Samples-Urine, Faeces, Sputum, Pus, Body Fluids, Swab, Blood. Importance of biomedical waste. Disposal of laboratory/hospital waste. Non-infectious waste, infected sharp waste disposal, infected non-sharp waste disposal.

Unit 4: Basic haematological techniques **5 Lectures**

Basic steps for drawing blood by vein, capillary and artery puncture. Complications during and after blood collection. Specimen rejection criteria for blood. Anticoagulants types and concentration. Transport of blood sample. Blood composition, Preparation of blood smear and blood cell counting.

Unit 5: Diagnostic methods used for urine analysis **5 Lectures**

Urine analysis: Urine collection, preservation. Physical examination of urine, Abnormal constituents, Urine culture. Urinary tract infection, kidney disease and diabetes. Urine analysis for Chemicals, Sugar, Ketone Bodies, Bile, Blood, Crystals.