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

Department : *Zoology*

Programme Name : *M.Sc.*

Academic Year :2022-23

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

Sr. No.	Course Code	Name of the Course
01.	LZT-303 E	Occupational and Environmental Toxicity
02.	LZT-401	Evolution and Environmental Biology
03.	LZT-404 F	Prenatal Diagnosis and Pre-implantation Genetics
04.	ZOPBTA1	Research Methodology

HEAD
Department of Zoology
Guru Ghasidas Vishwavidyalaya, Bilaspur

DSE: A *Biochemistry and Molecular Biology*	LZT 303A	Biochemistry of Intermediary Metabolism	4	4	40	60	100
DSE: A *Biochemistry and Molecular Biology*	LZT 304A	Molecular Biology of Information Pathway: Nucleic Acids	4	4	40	60	100
DSE: B *Mammalian Reproductive Physiology and Endocrinology*	LZT 303B	Neuroendocrinology and Non-Classical Hormones	4	4	40	60	100
DSE: B *Mammalian Reproductive Physiology and Endocrinology*	LZT 304B	Male and Female Reproduction	4	4	40	60	100
DSE: C *Fish Biology*	LZT 303C	Fish Culture and Pathology	4	4	40	60	100
DSE: C *Fish Biology*	LZT 304C	Fish Anatomy and Physiology	4	4	40	60	100
DSE: D *Neuroscience*	LZT 303D	Brain and Neuron	4	4	40	60	100
DSE: D *Neuroscience*	LZT 304D	Developmental Neurobiology	4	4	40	60	100
DSE: E *Toxicology*	LZT 303E	Occupational and Environmental Toxicity	4	4	40	60	100
DSE: E *Toxicology*	LZT 304E	Mechanism of Toxicology	4	4	40	60	100
DSE: F *Epidemiology and Molecular Genetics*	LZT 303F	Basic Epidemiology	4	4	40	60	100
DSE: F *Epidemiology and Molecular Genetics*	LZT 304F	Clinical Epidemiology	4	4	40	60	100
Core Course Practical 5	LZL 305	Lab. Exercises based on courses LZT 301 and 302	6	3	40	60	100
DSE Practical (Elective)	LZL 306	Lab. Exercises based on courses LZT 303 and 304 (A-F)	6	3	40	60	100
				22	**240**	**360**	**600**
		Semester IVth					
Core Course 11	LZT 401	Evolution and Environmental Biology	4	4	40	60	100
Core Course 12	LZT 402	Biostatistics OR Discrete Data Analysis: MOOC	4	4	40	60	100
DSE: A *Biochemistry and Molecular*	LZT 403A	Protein and Enzymology	4	4	40	60	100

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Biology							
DSE: A *Biochemistry and Molecular Biology*	LZT 404A	Medical Biochemistry	4	4	40	60	100
DSE: B *Mammalian Reproductive Physiology and Endocrinology*	LZT 403B	Hormone Receptors and Signaling Mechanism	4	4	40	60	100
DSE: B *Mammalian Reproductive Physiology and Endocrinology*	LZT 404B	Fertility and Sterility	4	4	40	60	100
DSE: C *Fish Biology*	LZT 403C	Fish Reproduction, Genetics and Biotechnology	4	4	40	60	100
DSE: C *Fish Biology*	LZT 404C	Capture Fishery	4	4	40	60	100
DSE: D *Neuroscience*	LZT 403D	Cellular Neurophysiology and Neurochemistry	4	4	40	60	100
DSE: D *Neuroscience*	LZT 404D	Sensory, Motor and Regulatory Systems	4	4	40	60	100
DSE: E *Toxicology*	LZT 403E	Mechanism of Toxicity	4	4	40	60	100
DSE: E *Toxicology*	LZT 403E	Systemic Toxicity	4	4	40	60	100
DSE: F *Epidemiology and Molecular Genetics*	LZT 403F	Molecular Markers and Genome Analysis	4	4	40	60	100
DSE: F *Epidemiology and Molecular Genetics*	LZT 404F	Prenatal Diagnosis and Pre-Implantation Genetics	4	4	40	60	100
DES Dissertation	LZL 405	Project work / Dissertation	12	6	80	120	200
				22	**240**	**360**	**600**

1. Discipline Specific Electives (DSE) for each session will be offered to students on the basis of availability of faculty and infrastructure.
2. Offering of DSE in any particular session will be decided after a formal meeting of faculty members of Department of Zoology.
3. Each student may elect any one out of the given electives (A, B, C, D, E and F).
4. Elective papers will be distributed among the students on the basis of merit/choice. The project work/dissertation will be carried out only in the field of respective elective papers (A, B, C, D, E and F) opted by the students.

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

Semester-wise Theory Papers/ Practical
Masters ofScience in Zoology(CBCS)
Department of Zoology, School of Life Science

Course Opted	Course Code	Name of the Course	T-L-D /Week	Credits	CCA	ESE	Total
		Semester – Ist					
CC 1	ZOPATT1	Comparative Anatomy of Vertebrates	T-3	3	30	70	100
CC 1	ZOPALT1	Comparative Anatomy of Vertebrates	L-4	2	15	35	50
CC 2	ZOPATT2	Cell Biology	T-3	3	30	70	100
CC 2	ZOPALT2	Cell Biology	L-4	2	15	35	50
CC 3	ZOPATT3	Endocrinology	T-3	3	30	70	100
CC 3	ZOPALT3	Endocrinology	L-4	2	15	35	50
OE 1	ZOPATO1	To be drawn from the pool of OE	T-3	3	30	70	100
OE 1	ZOPALO1	To be drawn from the pool of OE	L-4	2	15	35	50
	*Certificate	UACE, VAC, CC, OCC and others offered by university					
			28H/W	20	180	420	600
		Semester IInd					
CC 4	ZOPBTT1	Biochemistry and Molecular Biology	T-3	3	30	70	100
CC 4	ZOPBLT1	Biochemistry and Molecular Biology	L-4	2	15	35	50
CC 5	ZOPBTT2	Basic Mammalian Physiology	T-3	3	30	70	100
CC 5	ZOPBLT2	Basic Mammalian Physiology	L-4	2	15	35	50
CC 6	ZOPBTT3	Animal behavior	T-3	3	30	70	100
CC 6	ZOPBLT3	Animal behavior	L-4	2	15	35	50
DSE: 1	ZOPBTD1	Molecular Genetics	T-3	3	30	70	100
DSE: 1	ZOPBLD1	Molecular Genetics	L-4	2	15	35	50
RM	ZOPBTA1	Research Methodology	T-2	2	30	70	100
	*Certificate	UACE, VAC, CC, OCC and others offered by university					
			30H/W	22	210	490	700
		Semester IIIrd					
CC 7	ZOPCTT1	Developmental Biology	T-3	3	30	70	100
CC 7	ZOPCLT1	Developmental Biology	L-4	2	15	35	50
CC 8	ZOPCTT2	Regulatory Mammalian Physiology	T-3	3	30	70	100
CC 8	ZOPCLT2	Regulatory Mammalian Physiology	L-4	2	15	35	50
CC 9	ZOPCTT3	Evolution, Environmental Biology and Sustainable Development	T-3	3	30	70	100
CC 9	ZOPCLT3	Evolution, Environmental Biology and Sustainable Development	L-4	2	15	35	50
DSE: 2	ZOPCTD1	Brain function and Mental Awareness	T-3	3	30	70	100
DSE: 2	ZOPCLD1	Brain function and Mental Awareness	L-4	2	15	35	50
	*Certificate	UACE, VAC, CC, OCC and others offered by university					
			28H/W	20	180	420	600
		Semester IVth					
CC 10	ZOPDTT1	Biotechniques	T-3	3	30	70	100

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

Department of Zoology, GGV, Bilaspur (CG)

SEMESTER III

Major Elective Course E: Toxicology

LZT 303 E: ENVIRONMENTAL AND OCCUPATIONAL TOXICOLOGY

Unit 1: Introduction to toxicology: History and scope of toxicology; Different areas of modern toxicology; Classification of toxic substance; Various definitions of toxicological significance.

Unit 2: Exposure and response to toxicants: Types and characteristics of exposure; routes and site, dose, duration and frequency; Dose-response relationship; LD50, LC50, TD50 and therapeutic index, Variation in toxic responses; Descriptive animal toxicity tests; Aquatic toxicology; Bioaccumulation and biomagnification.

Unit 3: Metal toxicity: Metal- Ligand interactions in biological fluids, metal ion interactions with macromolecules; Metal protein interaction; metal nucleic acid interactions; Induction of metallothionein, heat shock proteins, cytoskeletal effects, heamporphyrin metabolism.

Unit 4: Occupational hazards and related diseases: Physical hazards, Chemical hazards, Biological hazards, Mechanical hazards, Psychosocial hazards; Pneumoconiosis, silicosis, asbestosis, anthracosis, byssinosis, bagassosis, Farmers' lung; Occupational Cancer: Skin, lung and bladder cancer, leukaemia.

Unit 5: Prevention of occupational diseases: Medical measures, Engineering measures, Legislative measures, Occupational health in India.

Books Recommended

1. Klassen CD(2008) Cassarett and Doull's Toxicology: The Basic Science of The Poisons, 7th Ed. McGraw Hill Publisher.
2. Timbrell J (2000) Principles of Biochemical Toxicology, 3rd Ed. Taylor and Francis Publishers.
3. Karen S and Brown TM (2006) Principles of Toxicology, 2nd Ed. CRC press.
4. Lu FC and Kacew S (2009) Lu's Basic Toxicology: Fundamentals target organ and risk assessment, 5th Ed. Informa Health care.
5. Hodgson E (2010) A Textbook of Modern Toxicology, 4th Ed. John Wiley & Sons.
6. McQueen CA (2018) Compreh. Toxicology-Vol 1: General principle 3rd Ed. Elsevier.
7. Manahan SE (2003) Toxicological Chemistry and Biochemistry, 3rd Edition, Lewis Publishers, CRC Press Company
8. Stine KE and Brown TM (2006) Principles of Toxicology, 2nd Ed. Taylor & Francis.

Percent Change From Previous Syllabus: 50.0 %

Course Objective:
To be acquainted with the history and scope of toxicology, metal toxicity and occupational health hazards so that student may develop reasoning behind the effect of environment.

Course Outcomes:
Student will be able to understand toxicology and its scope in life, to identify different types of toxicants and create understanding about effects of toxic agents present in environment.

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Department of Zoology, GGV, Bilaspur (CG)

SEMESTER III
DISCIPLINE SPECIFIC ELECTIVE 1

ZOPCTD1: EVOLUTION, ENVIRONMENTAL BIOLOGY AND SUSTAINABLE DEVELOPMENT

Unit 1: Life's Beginnings: Chemogeny, RNA world, Biogeny, Origin of photosynthesis, Evolution of eukaryotes;An overview of evolutionary thoughts: Lamarckism, Darwinism and Neo Darwinism; Modern synthetic theory;Evolution of horse, Geological time scale,Sources of variations: Heritable variations and the its role in evolution.Neutral theory, Molecular clock.Phylogenetic trees,Convergentand divergent evolution.

Unit 2: Population genetics: Hardy-Weinberg equilibrium (statement and derivation of equation); Evolutionary forces upsetting H-W equilibrium: Mutation, Natural selection.Genetic Drift mechanism, Role of Migration and Mutation in changing allele frequencies.Isolating mechanisms: Concepts of species and models of speciation,Adaptive radiation/macroevolution (exemplified by Galapagos finches).

Unit 3: Ecosystem dynamics: Ecological hierarchy in nature, Biotic and abiotic factors of environment, Ecosystem functioning-concept of trophic level, food chain, food web, ecological pyramids, energy flow in ecosystem, ecological efficiency.

Unit 4: Population ecology: Population dynamics, Population growth form, r- and k-selections and carrying capacity, Biological communities and species interactions, Types of interactions between two species, Interspecific competition.

Unit 5: Human impact on the environment and sustainable development: Concept of sustainable development, Environmental degradation (habitat destruction, fragmentation, biological invasions) and management, Forest, water and mineral resources, Biodiversity conservation and concept of ecosystem services, Global environmental changes (ozone depletion, acid deposition, greenhouse gas emissions and global warming), Environmental impact assessment.

Books Recommended

1. Bergstorm CT and Dujatkin LA (2012) Evolution 1st Ed. WW Norton and Co.
2. Freeman S and Herron JC (2016) Evolutionary Analysis.Pearson Education Ltd, India.
3. Futuyma DJ (1997) Evolutionary Biology, 3rd Ed. Sinauer Associates.
4. Gillespie JH (1998) Population Genetics: a Concise Guide, John Hopkins Univ Press.
5. Hall BK and Hallgrimson B (2008) Stirckberger's Evolution, 4th Ed. Jones and Barlett.
6. Page RDM and Holmes EC (1998) Molecular Evolution: A Phylogenetic Approach. Blackwell Sc.
7. Kardong K (2004) An Introduction to Biological Evolution, McGraw Hill.
8. Smith JM (1998) Evolutionary Genetics 2nd Ed. Oxford University Press.

Percent Change From Previous Syllabus: 05.00 %

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SEMESTER IV

Major Elective Course F: Epidemiology and Molecular Genetics

LZT 404F: PRENATAL DIAGNOSIS AND PRE-IMPLANTATION GENETICS

Unit 1: Prenatal Diagnosis: Indications, Non-invasive PND: Ultra sound markers for fetal abnormalities Invasive methods of PND; Recent advances in PND; Current knowledge of prenatal diagnosed genetic disorders, treatment: current practices and future prospectus.

Unit 2: Clinical Genetics and Genetic Counseling: Principles and practice, case management in genetic counseling, Genetic Counseling for PND; Dysmorphology and clinical teratology.

Unit 3: Genetics and Society: Population screening for genetic disease, Bioethics and medical genetics: Medical ethics in India and abroad; Fetal rights Ethics: Ethics and laws in prenata, pre-implantation genetics, *In vitro* fertilization, Stem Cell Biology, Human reproduction, Genetic registries, DNA fingerprinting and paternity testing Animal handling; Future Medical ethics in India and abroad.

Unit 4: Assisted Reproductive Technology: Introduction, Clinical *in vitro* fertilization, Semen analysis and Preparation for Assisted reproductive techniques Oocyte retrieval and embryo culture, Cryopeeservation, Micromanipulation techniques.

Unit 5: Gene Therapy: Molecular Cytogenetics, Molecular characterization of Stem cells; Introduction and role of gene manipulation in rectifying genetic defects; Genetically modified stem cells in experimental Gene therapy.

Reference Books

1. Kapur BA (2019) A Comprehensive Guide to Genetic Counseling, (Nova Science Publishers, Inc., New York.
2. Mathiesen and Roy (2018) Foundations of Perinatal Genetic Counseling, Oxford University Press, Oxford, New York.
3. Fischmann and Hildt (2011) Ethical Dilemmas in Prenatal Diagnosis, Springer, New York.
4. Newman and Kohn (2019) Evidence-based diagnosis : an introduction to clinical epidemiology, Cambridge University Press, Cambridge, New York.
5. Yashon and Cummings (2012) Human Genetics and Society, Brooks/Cole, Australia, Belmont, CA.
6. Kisain et al. (2019) Assisted Reproductive Technology Surveillance, Cambridge University Press, Cambridge, United Kingdom.
7. Stevenson and Hershberger (2016) Fertility and Assisted Reproductive Technology (ART): theory, research, policy, and practice for health care practitioners, Springer Publishing Company, New York.
8. Panno (2011) Gene Therapy: Treatments and Cures for Genetic Diseases, Facts On File, New York.

Course objectives: The course goal is to familiarize students with the application of molecular information to diagnose the diseases. To an overview of various assisted reproductive techniques such as in vitro fertilization, embryo culture, Cryopreservation, Micromanipulation techniques.

Course outcome: By the end of the course, students should be able to know common genetic abnormalities, integrating the various modalities of investigation for perinatal diagnosis. Further, students will develop unique **skill set** of a genetic counselor, which **could** be applied across practice settings.

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SEMESTER IV
COMPULSORY PAPER

ZOPDTA1: RESEARCH METHODOLOGY

Unit 1: Introduction to research
Meaning of research, objectives of research, research process, criteria of good research, defining the research problem, basic principles of research design, developing a research plan, sample design, characteristics of good sampling procedure, types of data.

Unit 2: Basics of scientific communication
Types of scientific communication: research papers, review, letter to editor; Constituents of research paper: title, running title, authorships, abstracts, keywords, introduction, materials and methods, results, discussion, acknowledgements, referees, figures, table components, communication with the editors, handling referees comments, galley proofs; Intellectual Property Rights; Plagiarism.

Unit 3: Research ethics involving human participants or laboratory animals
Ethics and biomedical research: General principles on ethical considerations involving human subjects, ethical review procedures, Institutional ethics committee: its organization and functions, general ethical issues. Ethical guidelines for experimental animals: Sources of experimental animals, Laboratory animal husbandry and management, anesthesia and euthanasia, laboratory animal ethics, animal ethics committee, its organization and functions, ethical guidelines for use of animals for scientific research, CPCSEA guidelines.

Unit 4: Statistical analysis-I
Methods of data collection; Graphical representation of data; Measurement of central tendency: Definition, characteristics, types, merits and demerits; Measurement of dispersion: Range, Mean deviation, Standard deviation, Standard error

Unit 5: Statistical analysis-II
Variance, Coefficient of variation, Correlation and Regression and their coefficients; Test of significance: Student t- test, Chi-squire test; ANOVA; Elementary idea of probability.

Unit 6: Computer application
Fundamental of computer; MS Word: typing the script, inserting tables, figures and graphs, preparation of dissertation and research papers; MS Excel: application of formulae use of statistical tools, preparation of graphs, histograms and charts; MS power point: insertion of figures, graphs, charts in presentation; Preparation of posters for scientific presentations.

Suggested readings

1. National Ethical Guidelines for Biomedical and Health Research involving human participants ICMR, New Delhi 2017.
2. Guidelines for care and use of animals in scientific research. Indian National Science Academy, New Delhi.
3. Research Methodology, methods and techniques by C.R. Kothari (2009).
4. Biostatistics: A foundation for analysis in health sciences, 9th Ed. Wayne W Daniel (2008).
5. Computer fundamentals, Pradip K Singha and Priti Singha (BPB Publication).

Percent Change From Previous Syllabus: 100 % (Newly introduced)