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List of Employability/ Entrepreneurship/ Skill Development Courses with Course Contents

| Colour Codes | | |
|----------------------------|------------|--|
| Name of the Subjects | Yellow | |
| Employability Contents | Green | |
| Entrepreneurship Contents | Light Blue | |
| Skill Development Contents | Pink | |



**List of Courses Focus on Employability/ Entrepreneurship/
Skill Development**

Department : Zoology

Programme Name : M. Sc

Academic Year : 2018-19

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

| Sr. No. | Course Code | Name of the Course |
|---------|------------------------|---|
| 01. | LZT 303 C | Fish Culture and Pathology |
| 02. | LZL 305: Lab Exercises | Biostatistics |
| 03. | LZL 306 A | Biochemistry of Intermediary Metabolism and Molecular Biology of Information Pathway: Nucleic acids |
| 04. | LZL 306 B | Neuroendocrinology and Non-classical Hormones, Male Reproduction and Female Reproduction |
| 05. | LZL 306 C | Fish Biology |
| 06. | LZL 404 | Animal Behavior |

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Scheme and Syllabus

NEW-2017-18

Department of Zoology, GGV, Bilaspur (CG)

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Approved Scheme of Examination, 2017-18

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M.Sc. Zoology

Semester-wise Theory Papers/ Practical/ Skill Component

| Type of Course | Course Code | Title of the Course | Lecture-Tutorial-Practical/week | No. of credits | Continuous Comprehensiv Assessment (CCA) | End-Semester Examination (ESE) [University-Examination] | Total |
|----------------|-------------|---------------------|---------------------------------|----------------|--|---|-------|
|----------------|-------------|---------------------|---------------------------------|----------------|--|---|-------|

Semester – Ist

| | | | | | | | | |
|-------------------------|---------|---|---|---|----|-----|-----|-----|
| Core Course 1 | LZT 101 | Comparative Anatomy of Vertebrates | 4 | 4 | 40 | 60 | 100 | |
| Core Course 2 | LZT 102 | Cell Biology and Evolution | 4 | 4 | 40 | 60 | 100 | |
| Core Course 3 | LZT 103 | Reproduction and Developmental Biology | 4 | 4 | 40 | 60 | 100 | |
| Core Course 4 | LZT 104 | Basic Mammalian Physiology | 4 | 4 | 40 | 60 | 100 | |
| Core Course Practical 1 | LZL 105 | Lab. Exercises based on courses LZT 101 & 102 | 6 | 3 | 40 | 60 | 100 | |
| Core Course Practical 2 | LZL 106 | Lab. Exercises based on courses LZT 103 & 104 | 6 | 3 | 40 | 60 | 100 | |
| Skill Course 1 | LZS 107 | Scientific writing skills | 2 | | | | | |
| | | | | | 22 | 240 | 360 | 600 |

Semester IInd

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|-------------------------|---------|--|---|---|----|----|-----|
| Core Course 5 | LZT 201 | Biochemistry and Molecular Biology | 4 | 4 | 40 | 60 | 100 |
| Core Course 6 | LZT 202 | Regulatory Mammalian Physiology | 4 | 4 | 40 | 60 | 100 |
| Core Course 7 | LZT 203 | Endocrinology | 4 | 4 | 40 | 60 | 100 |
| Core Course 8 | LZT 204 | Biotechniques and Bioinformatics | 4 | 4 | 40 | 60 | 100 |
| Core Course Practical 3 | LZL 205 | Lab. Exercises based on course LZT 201 and 202 | 6 | 3 | 40 | 60 | 100 |

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| Core Course Practical 4 | LZL 206 | Lab. Exercises based on course LZT 203 and 204 | 6 | 3 | 40 | 60 | 100 |
| Skill Course II | LZS 207 | Scientific Presentation skill (Oral & Poster) | 2 | | | | |
| | | | | 22 | 240 | 360 | 600 |
| Semester IIIrd | | | | | | | |
| Core Course 9 | LZT 301 | Molecular Genetics | 4 | 4 | 40 | 60 | 100 |
| Core Course 10 | LZT 302 | Histological Techniques and Biostatistics | 4 | 4 | 40 | 60 | 100 |
| Discipline Specific Elective - <i>Biochemistry and Molecular Biology (A) - 1</i> | LZT 303 A | Biochemistry of Intermediary Metabolism | 4 | 4 | 40 | 60 | 100 |
| Discipline Specific Elective - <i>Biochemistry and Molecular Biology (A) - 2</i> | LZT 304 A | Molecular Biology of Information Pathway: Nucleic Acids | 4 | 4 | 40 | 60 | 100 |
| Discipline Specific Elective - <i>Mammalian Reproductive Physiology and Endocrinology (B)- 1</i> | LZT 303 B | Neuroendocrinology and Non-Classical Hormones | 4 | 4 | 40 | 60 | 100 |

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|--|-----------|---|---|---|----|----|-----|
| Discipline Specific Elective - <i>Mammalian Reproductive Physiology and Endocrinology</i> (B)- 2 | LZT 304 B | Male and Female Reproduction | 4 | 4 | 40 | 60 | 100 |
| Discipline Specific Elective - <i>Fish Biology</i> (C)-1 | LZT 303 C | Fish Culture and Pathology | 4 | 4 | 40 | 60 | 100 |
| Discipline Specific Elective - <i>Fish Biology</i> (C)-2 | LZT 304 C | Fish Anatomy and Physiology | 4 | 4 | 40 | 60 | 100 |
| Discipline Specific Elective - <i>Neuroscience</i> (D)1 | LZT 303 D | Brain and Neuron | 4 | 4 | 40 | 60 | 100 |
| Discipline Specific Elective - <i>Neuroscience</i> (D)2 | LZT 304 D | Developmental Neurobiology | 4 | 4 | 40 | 60 | 100 |
| Discipline Specific Elective - (E) <i>Toxicology</i> 1 | LZT 303 E | An Introduction to Toxicology | 4 | 4 | 40 | 60 | 100 |
| Discipline Specific Elective - (E) <i>Toxicology</i> 2 | LZT 304 E | Occupational and Environmental Toxicity | 4 | 4 | 40 | 60 | 100 |

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| Discipline Specific Elective - <i>Mammalian Reproductive Physiology and Endocrinology</i> (B)- 4 | LZT 403 B | Fertility and Sterility | 4 | 4 | 40 | 60 | 100 |
| Discipline Specific Elective - <i>Fish Biology</i> (C)-3 | LZT 402 C | Fish Reproduction, Genetics and Biotechnology | 4 | 4 | 40 | 60 | 100 |
| Discipline Specific Elective - <i>Fish Biology</i> (C)-4 | LZT 403 C | Capture Fishery | 4 | 4 | 40 | 60 | 100 |
| Discipline Specific Elective - <i>Neuroscience</i> (D)3 | LZT 402 D | Cellular Neurophysiology and Neurochemistry | 4 | 4 | 40 | 60 | 100 |
| Discipline Specific Elective - <i>Neuroscience</i> (D)4 | LZT 403 D | Sensory, Motor Systems and Regulatory System | 4 | 4 | 40 | 60 | 100 |
| Discipline Specific Elective - (E) <i>Toxicology</i> 3 | LZT 402 E | Mechanism of Toxicity | 4 | 4 | 40 | 60 | 100 |
| Discipline Specific Elective - (E) <i>Toxicology</i> 4 | LZT 403 E | Systemic Toxicology | 4 | 4 | 40 | 60 | 100 |

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| Core Course Practical 6 | LZL 405 | Lab. Exercises based on courses LZT 401 | 6 | 3 | 40 | 60 | 100 |
| Discipline Specific Elective Dissertation | LZL 404 | Project work/Dissertation | 12 | 6 | 80 | 120 | 200 |
| | | | | 21 | 220 | 380 | 600 |

1. Each student will opt any one out of the five elective papers (A,B,C,D & E). Elective papers will be distributed among the students on the basis of merit/choice
2. The project work/dissertation will be carried out only in the field of respective elective papers (A,B,C,D & E) opted by the students.

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Major Elective Course C: Fish Biology

LZT 303 C: Fish Culture and Pathology

Unit 1: Fish culture systems: Different ponds of a fish farm, Formulation and operation of different types of hatcheries, Fish culture in paddy fields, Sewage-fed fisheries, Larvivorous fishes, Weed fishes, Hill stream adaptations in fishes.

Unit 2: Pond management: Physico-chemical properties of pond water and their maintenance, Manuring (organic and inorganic) and liming, Composite fish farming, Predatory and weed fishes and their eradication, Aquatic vegetation and its control.

Unit 3: Exotic fishes and their role in fish farming, Criteria of selection of cultivable fishes, Age and growth: Growth rate and aging, Length weight relationship, gonadosomatic index.

Unit 4: Fish pathology, prophylaxis and therapy: Main causes of disease in farmed fish, Preventing diseases through proper management, Common disease symptoms in fish, Protozoan diseases: Cyclochaetiasis, Costiasis, (sliminess of skin), Helminth parasites: *Gyrodactylus*, *Dactylogyrus*.

Unit 5: Crustacean parasites: *Ergasilus*, Fungal diseases: Branchiomycosis (gill rot), Bacterial diseases: Tail and Fin rot, Furunculosis, Viral diseases: Papillomatosis (cauliflower disease), Nutritional diseases: Avitaminoses.

Books Recommended

1. Chakroff, M.: Freshwater Fish Pond Culture and Management, Scientific Publishers, 1987.
2. Davis, H. S.: Culture and Diseases of Game Fishes, University of California Press, 1956
3. Duijn, C. V.: Diseases of Fishes, London Hiffe Books Ltd, 1967.
4. Hall, C. B.: Ponds and Fish Culture, Agro Botanical Publishers, 1994
5. Hora, S. L. and Pillay, T.V. R.: Handbook on Fish Culture in the Indo-Pacific Region, Fisheries Division, Biology Branch, FAO, 1962.
6. Jhingran, V.G.: Fish and Fisheries of India, Hindustan Publishing Corporation, New Delhi, 1985.
7. Khanna S. S. and H. R. Singh.: A textbook of Fish Biology and Fisheries, Narendra Publishing House, 2003
8. Ribelin, W. E. & Migaki, G.: The Pathology of Fishes, The Univ. of Wisconsin Press, 1975.

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LZL 305: Lab exercises based on papers LZT 301 and LZT 302

Genetics:

1. Handling of *Drosophila* and study of its life cycle
2. Study of meiosis in grasshopper testes by squashing method
3. Temporary squash preparation of polytene chromosomes from salivary glands of *Drosophila* larvae
4. Study of colchicinated metaphase chromosomes in bone marrow of rodent by air dry method
5. Preparation of human karyotype
6. Study of sex chromatin in human female from buccal epithelial and hair bud cells
7. Examination of wild type (males and females) and mutants of *Drosophila*
8. Sex linked inheritance in *Drosophila melanogaster*
9. Linkage and crossing over in *Drosophila melanogaster*

Histology and Histochemistry

1. Paraffin sectioning: Fixation of tissue (intestine and stomach of rat), dehydration, clearing and embedding of tissue. Sectioning and spreading of sections. Histological staining of paraffin sections using haematoxylin and eosin method.
2. Histochemical staining of paraffin sections for demonstration of acidic glycoproteins by Alcian Blue pH 2.5 method. Histochemical staining for lipids using: Sudan black B method, Sudan III method, Sudan IV method.

Biostatistics

1. Analysis of Mean, Median and Mode in given exercise.
2. Analysis of Standard Deviation and Standard Error in given exercise.
3. Analysis of Variance in given exercise.
4. Exercise to find out statistical significance of an experimental data using T-Test, Newmann Keuls and Tukey's test for significance.

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MAJOR ELECTIVE LABORATORY EXERCISES

Major Elective Course A: *Biochemistry*

LZL 306 A: Lab. Exercises based on courses LZT 303 A & 304A

Part A: *Biochemistry of Intermediary Metabolism*

1. Effect of starvation on liver glycogen content in rat/mouse
2. Estimation of blood glucose level using glucose oxidase method
3. Estimation of total cholesterol, HDL-cholesterol and triacyl glycerol
4. Estimation of amino acid concentration
5. Assay of adenine deaminase (ADA) in rat/mouse tissues

Part B: *Molecular biology of Information pathway: Nucleic acids*

1. Sterilization techniques, media preparation and agar plate preparation
2. Measurement of growth curve of *E.coli*, calculation of its generation time and viable cell counting
3. Rapid isolation of plasmid DNA (mini prep. alkaline lysis method)
4. Restriction digestion of plasmid and analysis by agarose gel electrophoresis,
5. Cloning of a DNA fragment
6. Preparation of competent cells, transformation and screening of colonies (blue-white selection)
7. Demonstration: Southern hybridization, PCR

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MAJOR ELECTIVE LABORATORY EXERCISES

Major Elective Course B: Mammalian Reproductive Physiology and Endocrinology

LZL 306 B: Lab. Exercises based on courses LZT 303 B & 304B

Neuroendocrinology and Non-classical Hormones

1. *In situ* study of pituitary (portal circulation) and pineal (associated epithalamic complex) gland
2. Study of pituitary and pineal cell types through prepared slides
3. Transplantation of pituitary in kidney capsule
5. Anatomical mapping of hypothalamic centres (SON, PVN, AR, VMO, mammillary nucleus, median eminence)
6. Ascorbic acid depletion bioassay for LH
7. ELISA/RIA of TSH or gonadotropins

Male Reproduction

1. Preparation and study of permanent slides of reproductive organs
2. Study of stages of spermatogenesis and spermiogenesis using histological slides of testis
3. Biochemical estimation of fructose and alkaline and acid phosphatases in seminal vesicle and prostate
4. Androgen bioassay by sialic acid assay
5. Biochemical estimation of 3β -hydroxysteroiddehydrogenase
6. Operations in rat: induction of cryptorchidism; vasectomy
7. Study of sperm motility, sperm morphology, and sperm count in rat
8. Effect of cadmium chloride treatment on testis

Female Reproduction

1. Studies on permanent slides of female reproductive organs
2. Tubectomy and hysterectomy
3. Induction of superovulation in mouse/rat
4. Induction of PCOS condition in rat
5. Biochemical estimation of succinate dehydrogenase and catalase activity
6. Study of rat oestrous cycle using vaginal smear preparations
7. Isolation of large antral follicle and corpus luteum
8. Isolation of egg, granulosa and theca cells
9. Demonstration of implantation sites by pontamine blue (blue dye reaction) in mouse

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10. Demonstration of SDS-PAGE for ovarian proteins

MAJOR ELECTIVE LABORATORY EXERCISES

Major Elective Course C: *Fish Biology*

LZL 306 C: Lab. Exercises based on courses LZT 303 C & 304C

1. Display of afferent and efferent branchial vessels.
2. Study of available histological slides of different structures/organs.
3. Determination and comparison of hemoglobin content of water-breathing and air breathing fish
4. Study of ventilation rate and surfacing activity of an air-breathing fish under different experimental conditions.
5. Determination of feeding habit of important edible fishes by morphological analyses of their buccopharyngeal region
6. Determination of feeding habit of carps and catfishes by analyses of their gut contents
7. Dissection of carp showing interrelationship between the gas (swim or air) bladder and Weberian ossicles.
8. Preparation of permanent stained slides of different endocrine glands and kidney of a teleost
9. Determination of protein and lipid contents in a fresh and preserved fish
10. Analysis of physical and chemical properties of water
11. Visit to a fish farm and hatchery
12. Survey of fish fauna of Chattisgarh.

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LZL 404: Practical based on LZL 401

Animal Behaviour:

1. Study the behavior of monkeys.
2. Courtship behavior in the fruit fly.
3. Study the different behavior of laboratory rats.
4. Nest making behaviour of birds.
5. Habitat preference behaviour in insects.

Environmental biology

1. Study of Zoo and Phytoplanktons in pond water
2. Preparation of temporary slides of Zooplanktons
3. Calculation of biodiversity indices
4. Physiochemical analysis of water
5. Estimation of aquatic: primary productivity using dark and light bottles
6. Study of species interactions

LZL 405: Project work/ Dissertation

Topic will be based on the major elective opted by students. Project will include laboratory/field based work followed by submission of report and presentation.

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