



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

**Department : Zoology**

**Programme Name : B. Sc**

**Academic Year : 2020-21**

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

Sr. No.	Course Code	Name of the Course
01.	LS/ZOO/CC- 501 P	Molecular Biology
02.	LS/ZOO/DSE- 501 (A) P	Immunology
03.	LS/ZOO/DSE- 501 (B) P	Biology of Insecta
04.	LS/ZOO/DSE- 502 (B) P	Reproductive Biology
05.	LS/ZOO/DSE- 601 (A) P	Endocrinology
06.	LS/ZOO/DSE- 601 (B) P	Fish and Fisheries

*A. V. K. Khosla*

विषयमध्यक  
HEAD  
जन्तु विज्ञान विभाग  
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## Scheme and Syllabus

### Semester-wise Theory Papers/ Practical: B.Sc. Hon's (Zoology) Department of Zoology, School of Life Science

SEMESTER I						
Course Opted	Course Code	Name of the course	Credit	Hours /week	Internal Assessment	End Semester Exam.
Core Course-1 Theory	LS/ZOO/CC-101 L	Non Chordates – I (Protista to Pseudocoelomate)	4	4	30 (15+15)	70
Core Course-1 Practical	LS/ZOO/CC-101 P	Lab Course	2	4	30 (15+15)	70
Core Course-2 Theory	LS/ZOO/CC-102 L	Principles of Ecology	4	4	30 (15+15)	70
Core Course-2 Practical	LS/ZOO/CC-102 P	Lab Course	2	4	30 (15+15)	70
Generic Elective-1 Theory	LS/ZOO/GE-101 L	Aquatic Biology	4	4	30 (15+15)	70
Generic Elective-1 Practical	LS/ZOO/GE-101 P	Lab Course	2	4	30 (15+15)	70
Ability Enhancement Compulsory Course-1 Extracurricular Activity	LS/ZOO/AE-101/EC	English Communication / Hindi Communication Tour/ Field visit/ Industrial training/ NSS/ Swachhta/ Vocational Training/ Sports/ others	4* 2	4 (2)	30 (15+15)	70
<b>TOTAL</b>			<b>24</b>	<b>28</b>	<b>30</b>	<b>70</b>
SEMESTER II						
Core Course-3 Theory	LS/ZOO/CC-201 L	Non Chordates – II (Coelomates)	4	4	30 (15+15)	70
Core Course-3 Practical	LS/ZOO/CC-201 P	Lab Course	2	4	30 (15+15)	70
Core Course-4 Theory	LS/ZOO/CC-202 L	Cell Biology	4	4	30 (15+15)	70
Core Course-4 Practical	LS/ZOO/CC-202 P	Lab Course	2	4	30 (15+15)	70
Generic Elective-2 Theory	LS/ZOO/GE-201 L	Environment and Public Health	4	4	30 (15+15)	70
Generic Elective-2 Practical	LS/ZOO/GE-201 P	Lab Course	2	4	30 (15+15)	70
Ability Enhancement Compulsory Course-2 Extracurricular Activity	LS/ZOO/AE-201/ES	Environmental Science Tour/ Field visit/ Industrial training/ NSS/ Swachhta/ Vocational Training/ Sports/ others	4* 2	4 (2)	30 (15+15)	70
<b>TOTAL</b>			<b>24</b>	<b>28</b>	<b>30</b>	<b>70</b>
<b>Summer Internship: 15 days</b>		Swayam Swachhta / NSS / Industrial/ others	2	6h/day	--	100
SEMESTER III						
Core Course-5 Theory	LS/ZOO/CC-301 L	Diversity of chordates	4	4	30 (15+15)	70
Core Course-5 Practical	LS/ZOO/CC-301 P	Lab Course	2	4	30 (15+15)	70
Core Course-6 Theory	LS/ZOO/CC-302 L	Physiology: Controlling and Coordinating systems	4	4	30 (15+15)	70
Core Course-6 Practical	LS/ZOO/CC-302 P	Lab Course	2	4	30 (15+15)	70
Core Course-7 Theory	LS/ZOO/CC-303 L	Fundamentals of Biochemistry	4	4	30 (15+15)	70

*S.K. Shrivastava*

*Bhambhani*

*S.K. Shrivastava*

*Ramesh*



Core Course-7 Practical	LS/ZOO/CC-303 P	Lab Course	2	4	30 (15+15)	70
Generic Elective-3 Theory	LS/ZOO/GE-301 L	Food Nutrition and Health	4	4	30 (15+15)	70
Generic Elective-3 Practical	LS/ZOO/GE-301 P	Lab Course	2	4	30 (15+15)	70
Skill Enhancement Course-1	LS/ZOO/SEC-301 L	Sericulture	2	2	30 (15+15)	70
Skill Enhancement Course-1	LS/ZOO/SEC-301 P	Lab Course	2	4	30 (15+15)	70
<b>TOTAL</b>			<b>18</b>	<b>34</b>	<b>30</b>	<b>70</b>
<b>SEMESTER IV</b>						
Core Course-8 Theory	LS/ZOO/CC-401 L	Comparative anatomy of vertebrates	4	4	30 (15+15)	70
Core Course-8 Practical	LS/ZOO/CC-401 P	Lab Course	2	4	30 (15+15)	70
Core Course-9 Theory	LS/ZOO/CC-402 L	Physiology: Life Sustaining Systems	4	4	30 (15+15)	70
Core Course-9 Practical	LS/ZOO/CC-402 P	Lab Course	2	4	30 (15+15)	70
Core Course-10 Theory	LS/ZOO/CC-403 L	Biochemistry of Metabolic Processes	4	4	30 (15+15)	70
Core Course-10 Practical	LS/ZOO/CC-403 P	Lab Course	2	4	30 (15+15)	70
Generic Elective-4 Theory	LS/ZOO/GE-401 L	Insect Vectors and Diseases	4	4	30 (15+15)	70
Generic Elective-4 Practical	LS/ZOO/GE-401 P	Lab Course	2	4	30 (15+15)	70
Skill Enhancement Course-2	LS/ZOO/SE-401	Medical Diagnostics	2	2	30 (15+15)	70
Skill Enhancement Course-2	LS/ZOO/SE-401	Lab Course	2	4	30 (15+15)	70
<b>TOTAL</b>			<b>28</b>	<b>34</b>	<b>30</b>	<b>70</b>
Summer Internship: 15 days	Swayam Swachhita / NSS / Industrial/ others		2	60/day	--	100
<b>SEMESTER V</b>						
Core Course-11 Theory	LS/ZOO/CC-501 L	Molecular Biology	4	4	30 (15+15)	70
Core Course-11 Practical	LS/ZOO/CC-501 P	Lab Course	2	4	30 (15+15)	70
Core Course-12 Theory	LS/ZOO/CC-502 L	Principles of Genetics	4	4	30 (15+15)	70
Core Course-12 Practical	LS/ZOO/CC-502 P	Lab Course	2	4	30 (15+15)	70
Discipline Specific Elective-1 Theory	LS/ZOO/DSE-501(A) L	*A. Biology of Insect (MOOCS)	4	4	30 (15+15)	70
	LS/ZOO/DSE-501(B) L	*B. Immunology (MOOCS)				
Discipline Specific Elective-1 Practical	LS/ZOO/DSE-501(A) P	Lab Course A	2	4	30 (15+15)	70
	LS/ZOO/DSE-501(B) P	Lab Course B				
Discipline Specific Elective-2 Theory	LS/ZOO/DSE-502(A) L	A. Basics of Neuroscience	4	4	30 (15+15)	70
	LS/ZOO/DSE-502(B) L	B. Reproductive Biology				
Discipline Specific Elective-2 Practical	LS/ZOO/DSE-502(A) P	Lab Course A	2	4	30 (15+15)	70
	LS/ZOO/DSE-502(B) P	Lab Course B				
<b>TOTAL</b>			<b>14</b>	<b>32</b>		

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SEMESTER VI						
Core Course-13 Theory	LS/ZOO/CC-601 L	Developmental Biology	4	4	30 (15+15)	70
Core Course-13 Practical	LS/ZOO/CC-601 P	Lab Course	2	4	30 (15+15)	70
Core Course-14 Theory	LS/ZOO/CC-602 L	Evolutionary Biology	4	4	30 (15+15)	70
Core Course-14 Practical	LS/ZOO/CC-602 P	Lab Course	2	4	30 (15+15)	70
Discipline Specific Elective-3 Theory	LS/ZOO/DSE-601(A) L	A. Endocrinology	4	4	30 (15+15)	70
	LS/ZOO/DSE-601(B) L	B. Fish and Fisheries				
Discipline Specific Elective-3 Practical	LS/ZOO/DSE-601(A) P	Lab Course A	2	4	30 (15+15)	70
	LS/ZOO/DSE-601(B) P	Lab Course B				
Disertation/ Project work / Academic Visit followed by report submission and seminar	LS/ZOO/DW/PW/AV		3 + 1 = 6	8	30 (15+15)	70
<b>TOTAL</b>			<b>14</b>	<b>32</b>		
<b>TOTAL CREDITS</b>			<b>152 + 4 (SI)</b>			

As per UGC CBCS guidelines, University / departments have liberty to offer GE and SEC courses offered by any department to students of other departments. The No. of GE course is four. One GE course is compulsory in first 4 semesters each. In present scheme it is proposed to have minimum two GE courses (from one subject) in first two semester after which student shall change two GE for another subject in III<sup>rd</sup> and IV<sup>th</sup> semester, so that all the student can have exposure of one additional subject.

(Subject to approval by the competent authority)

\*These two courses will be offered to students depending upon the availability and commencement in the respective semester in MOCOS and syllabus of MOCOS will be followed. In case of unavailability of these two courses, the same will be taught as usual DSE courses.

  
Prof. S K Prasad  
(External Expert)

  
Dr. Rohit Seth  
(Member)

  
Dr. S K Verma  
(Member)

  
Prof. LVKS Bhaskar  
(HOD)



Department of Zoology, School of Life Sciences, GGV, Bilaspur (CG)

**CORE COURSE XI**

**LS/ZOO/CC-501 P**

**MOLECULAR BIOLOGY**

**PRACTICALS**

(Credits 2)

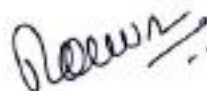
1. Study the structure of nucleotides, DNA and RNA through model/ charts.
2. Study of Polytene chromosomes from Chironomous / Drosophila larvae
3. Preparation of agar culture plate and raise culture of bacteria (*E. coli*)
4. Preparation of liquid culture medium
5. Demonstration of DNA extraction process
6. Demonstration of RNA extraction process
7. Study and interpretation of electron micrographs/ photograph showing  
(a) DNA replication  
(b) Transcription  
(c) Split genes

**SUGGESTED READINGS**

- Becker, W.M., Kleinsmith, L.I., Hardin. J. and Berton, G. P. (2009). *The World of the Cell*, VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.
- Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter. *Molecular Biology of the Cell*, IV Edition.
- Cooper G. M. and Robert E. Hausman R. E. *The Cell: A Molecular Approach*, V Edition, ASM Press and Sinauer Associates.
- De Robertis, E.D.P. and De Robertis, E.M.F. (2006). *Cell and Molecular Biology*. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
- Karp, G. (2010) *Cell and Molecular Biology: Concepts and Experiments*. VI Edition. John Wiley and Sons. Inc.
- Lewin B. (2008). *Gene XI*, Jones and Bartlett.
- McLennan A., Bates A., Turner, P. and White M. (2015). *Molecular Biology* IV Edition. GS, Taylor and Francis Group, New York and London.

  
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**DISCIPLINE SPECIFIC ELECTIVE COURSE**

**LS/ZOO/DSE-501(A) P**

**IMMUNOLOGY\***

**PRACTICALS**

**(Credits 2)**

1. Demonstration of lymphoid organs.
2. Histological study of spleen, thymus and lymph nodes through slides/photographs
3. Preparation of stained blood film to study various types of blood cells.
4. ABO blood group determination.
5. Cell counting and viability test from splenocytes of farm bred animals/cell lines.
6. Demonstration of  
a. ELISA/ RIA  
b. Immunoelectrophoresis/ Immunohistochemistry

**SUGGESTED READINGS**

- Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006). *Immunology*, VI Edition. W.H. Freeman and Company.
- David, M., Jonathan, B., David, R. B. and Ivan R. (2006). *Immunology*, VII Edition, Mosby, Elsevier Publication.
- Abbas, K. Abul and Lichtman H. Andrew (2003.) *Cellular and Molecular Immunology*. V Edition. Saunders Publication.

\*This course will be offered to students depending upon the availability and commencement in the respective semester in MOOCS and syllabus of MOOCS will be followed. In case of unavailability of this course, the same will be taught as usual DSE courses and the given syllabus will be followed.



Department of Zoology, School of Life Sciences, GGV, Bilaspur (CG)

**DISCIPLINE SPECIFIC ELECTIVE COURSE**

**LS/ZOO/DSE-501(B) P**

**BIOLOGY OF INSECTA\***

**PRACTICALS**

(Credits 2)

1. Study of one specimen from each insect order.
2. Study of different kinds of antennae, legs and mouth parts of insects.
3. Study of head and sclerites of any one insect. 4. Study of insect wings and their venation.
5. Study of insect spiracles.
6. Methodology of collection, preservation and identification of insects.
7. Morphological studies of various castes of *Apis*, *Camponotus* (ant) and *Odontotermes* ( termite)
8. Study of any three insect pests and their damages. 9. Study of any three beneficial insects and their products.
9. Field study of insects and submission of a project report on the insect diversity.

**SUGGESTED READINGS**

- Imms , A. D. (1977). A general text book of entomology. Chapman & Hall, UK.
- Chapman, R. F.(1998). The Insects: Structure and function. Cambridge University Press, UK.
- Snodgrass, R. E. Principles of Insect Morphology. Cornell Univ. Press, USA.
- Borror, D. J., Triplehorn, C. A., and Johnson, N. F. Introduction to the study of insects. M Saunders College Publication, USA.
- Wilson, E. O. The Insect Societies. Harward Univ. Press, UK.
- Bernays, E. A., and Chapman, R. F. Host Selection by Phytophagous insects. Chapman and Hall, New York, USA.
- Klowden, M. J., Physiological system in Insects. Academic Press, USA.
- Gullan, P. J., and Cranston, P. S. The Insects, An outline of Entomology. Wiley Blackwell, UK.
- Nation, J. L. Insect Physiology and Biochemistry. CRC Press, USA.

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**DISCIPLINE SPECIFIC ELECTIVE COURSE**

**LS/ZOO/DSE-502(B) P**

**REPRODUCTIVE BIOLOGY**

**PRACTICALS**

**(Credits 2)**

1. Study of animal house: set up and maintenance of animal house, breeding techniques, care of normal and experimental animals.
2. Examination of vaginal smear rats from live animals.
3. Surgical techniques: principles of surgery in endocrinology. Ovariectomy, hysterectomy, castration and vasectomy in rats.
4. Examination of histological sections from photomicrographs/ permanent slides of rat/human: testis, epididymis and accessory glands of male reproductive systems; Sections of ovary, fallopian tube, uterus (proliferative and secretory stages), cervix and vagina.
5. Human vaginal exfoliate cytology.
6. Sperm count and sperm motility in rat
7. Study of modern contraceptive devices
8. Mini projects involving survey, data collection, statistical analysis, and submission of a project report on reproductive health of a small human population.

**SUGGESTED READINGS**

- Austin, C.R. and Short, R.V. reproduction in Mammals. Cambridge University Press.
- Degroot, L.J. and Jameson, J.L. (eds). Endocrinology. W.B. Saunders and Company.
- Knobil, E. et al. (eds). The Physiology of Reproduction, Raven Press Ltd.
- Hatcher, R.A. et al. The Essentials of Contraceptive Technology. Population Information Programme.





Department of Zoology, School of Life Sciences, GGV, Bilaspur (CG)

**DISCIPLINE SPECIFIC ELECTIVE COURSE**

**LS/ZOO/DSE-601(A) P**

**ENDOCRINOLOGY**

**PRACTICALS**

(Credits 2)

1. Dissect and display of Endocrine glands in laboratory bred rat.
2. Study of the permanent slides of all the endocrine glands.
3. Compensatory ovarian/ adrenal hypertrophy *in vivo* bioassay in laboratory bred rat.
4. Demonstration of Castration/ ovariectomy in laboratory bred rat.
5. Estimation of plasma level of any hormone using ELISA.
6. Paper chromatographic separation of steroid hormones.
7. Survey based project on any prevalent endocrine disorder.

**SUGGESTED READINGS**

- General Endocrinology C. Donnell Turner Pub- Saunders Toppan
- Endocrinology: An Integrated Approach; Stephen Nussey and Saffron Whitehead.
- Oxford: BIOS Scientific Publishers; 2001.
- Hadley, M.E. and Levine J.E. 2007. Endocrinology, 6th Edition. Pearson Prentice Hall, Pearson Education Inc., New Jersey.
- Vertebrate Endocrinology by David O. Norris



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**DISCIPLINE SPECIFIC ELECTIVE COURSE**

**LS/ZOO/DSE-601(B) P**

**FISH AND FISHERIES**

**PRACTICALS**

**(Credits 2)**

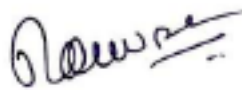
1. Morphometric and meristic characters of fishes
2. Study of *Petromyzon*, *Myxine*, *Pristis*, *Chimaera*, *Exocoetus*, *Hippocampus*, *Gambusia*, *Labeo*, *Heteropneustes*, *Anabas*
3. Study of different types of scales (through permanent slides/ photographs).
4. Study of crafts and gears used in Fisheries
5. Study of air breathing organs in *Channa*, *Heteropneustes*, *Anabas* and *Clarias*
6. Study of ventilation rate of an air-breathing fish under different experimental conditions.
7. Determination of gonadosomatic index
8. Demonstration of induced breeding in Fishes (video)
9. Demonstration of parental care in fishes (video)
10. Project Report on a visit to any fish farm/ pisciculture unit/Zebrafish rearing Lab.

**SUGGESTED READINGS**

- Q Bone and R Moore, Biology of Fishes, Talyor and Francis Group, CRC Press, U.K.
- D. H. Evans and J. D. Claiborne, The Physiology of Fishes, Taylor and Francis Group, CRC Press, UK von der Emde, R.J. Mogdans and B.G. Kapoor. The Senses of Fish: Adaptations 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

  
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