DAVANGERE UNIVERSITY, DAVANGERE DEPARTMENT OF ZOOLOGY



National Education Policy - 2020

Curriculum for Undergraduate Program in Zoology

(Based on model proposed by Karnataka State Higher Education Council, Bangalore)

From 2021-22 onwards

Davangere University Shivagangotri, Davangere. •

Appendix-A

Model Program Structures for the Under-Graduate Programs Bachelor of Arts (Basic/ Hons.)/ Bachelor of Science (Basic/ Hons.)/ Commerce (Basic/Hons.)/

Bachelor of Business Administration (Basic/Hons.)/Bachelor of Social Works (Basic/Hons.)/Bachelor of Computer Applications (Basic/Hons.) etc.

The Government of India has notified NEP-2020 on July 29, 2020 based on Dr. Kasturirangan Committee's Report. The objective is to bridge the gap between the current system of education and what is required in the 21st century. It is to have Holistic and Multidisciplinary Under-Graduate Education to produce employable graduates with integrated personality.

The Government of Karnataka had constituted a Task to suggest an Implementation Framework for NEP-2020. It had also constituted two sub-committees, one on Curriculum Reforms in Higher Education and the other on Governance and Regulations.

The Task Force has suggested NEP-2020 Implementation Framework for Karnataka. The State Government has accepted the action plan and taken steps to implement NEP-2020, as per the Implementation Roadmap suggested by the Task Force.

The Sub-committee on Curriculum Reforms in Higher Education had suggested a Draft Curriculum Framework for Undergraduate Programs in various disciplines. The State Govt. had also constituted Faculty-wise Committees to consider this draft framework to formulate program structures in their faculties. These Committees have submitted their reports. The latter were considered in the meetings of all the Vice Chancellors. The following Model Program Structures were designed for various Under- Graduate Programs in Arts, Science, Commerce and Management. The Subject Committees constituted to design and draft the curriculum in their subjects have followed these Model Program Structures. The Terminology used in these Program Structures are.

Discipline Core (DSC) refers to Core Courses/Papers in a Core Discipline/ Subject.

Discipline Elective (DSE) refers to Elective Courses/Papers in the Core Subject or Discipline.

Open Elective (OE) refers to Elective Courses/Papers in a non core Subject across all disciplines.

Program Structures also contain Ability Enhancement Compulsory Courses (AECC), Languages, Skill Enhancement Courses (SEC) (Both skills and value based). Pedagogy involves L+T+P model. Generally subjects with practical involve L+P, while the subjects without practical involve L+T model. The numbers in parentheses indicate credits allotted to various courses/papers as per definitions of Choice Based Credit System (CBCS). Generally 1 hour of Lecture or 2 hours of practical per week in a semester is assigned one credit. Generally core subject theory courses/papers will have 3 or 4 credits, while practical are assigned 2 or 3 credits.

COURSE PATTERNS, SCHEMES OF EXAMINATIONS AND CREDITS

T- Theory; **P-** Practical; AECC- Ability Enhancement Compulsory Courses, ES-Environmental Studies; **CoI-** Constitution of India; SEC- Skill Enhancement Courses, CC/EA & CA-Co-curricular/Extension and Cultural Activities.

1. B. Sc. Degree/ Honours Degree Programs

a) I/II/III/IV Semesters

Sem.	Subjects	Paper	Instruction	Hrs. of	Marks			
	Subjects		hrs/week	Exam	IA	Exam	Total	Credits
		1T	1x4	1x3	1x40	1x60	1x100	1x4
R	2 Core Subjects with	1P	1x4	1x(3/4)	1x15	1x35	1x50	1x2
	practicals, 6 credits	1T	1x4	1x3	1x40	1x60	1x100	1x4
	each	1P	1x4	1x(3/4)		1x35	1x50	1x2
I-IV	* One of the subjects ma	ay be sub	ject with prac	ticals, the	en			- 446
90	1 Core Subject of 6	1T	1x4	1x3	1x40	1x60	1x100	1x4
	Credits with practicals	1P	1x4	1x(3/4)	1x15	1x35	1x50	1x2
-	1 Core subject of 6 Credits without practical	1x2T	1x2x3	1x2x3	1x2x40	1x2x60	1x2x100	1x2x3
	1 Open Elective	1T	1x3	1x3	1x40	1x60	1x100	1x3
I-IV	2 Languages	2T	2x4	2x3	2x40	2x60	2x100	2x3
II /IV	ES or CoI	1T	1x3	1x2 .	1x15	1x35		21,000
III&II	SEC	T+P	1+2				1x50	1x2
I-IV	V /C			2	1x15	1x35	1x50	1x2
1-1 V	Yoga/ Sports	1P	1x2	-	1x25	-	1x25	1x1
-IV	H&W/NCC/ NSS/R&R/CA	1P	1x2	-	1x25	-	1x25	1x1

b) V/VI Semester

Sem.	Subjects	Paper	Instruction	Hrs. of	Mark	S		C 1'4
		-	hrs/ week	Exam	IA	Exam	Total	Credits
	One major subject of 10 credits	1T 1P	1x3 1x4	1x3 1x(3/4)	1x40 1x15	1x60 1x35	1x100 1x50	1x3 1x2
V/VI	without practical	1T 1P	1x3 1x4	1x3 1x(3/4)	1x40 1x15	1x60 1x35	1x100 1x50	1x3 1x2
	One Minor Subject of 5 credits with practical	1T 1P	1x3 1x4	1x3 1x(3/4)	1x40 1x15	1x60 1x35	1x100 1x50	1x3 1x2
	Vocational Course	Voc-1T	1 x 3	1 x 3	1x40	1x60	1x100	1x3
VI	Internship between 5 th & 6 th Semester	3 to 4 we	eeks	Report & presentation	1x15	1x35	1x50	1x2
V/VI	SEC	T+P	1+2	2	1x15	1x35	1x50	1x2
V/VI-CC	Yoga/ Sports	1P	1x2	_	1x25	_	1x25	1x1
	H&W/NCC/NSS/ R&R/CA	1P	1x2	-	1x25	-	1x25	1x1

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c) VII/VIII Semester

Sem.	6.11	Paper		Duration of	Marks			Credits	
	Subjects	Tuper	hrs/week	Exam(hrs)	IA	Exam	Total	Credits	
	Major	DSC-3T	3 x 3	3 x 3	3x40	3x60	3x100	3 x 3	
	subject of	DSC-2P	2 x 4	2 x 4/3	2x15	2x35	2x50	2 x 2	
VII	14 credits without practical	DSE-2T	2 x 3	2 x 3	2x40	2x60	2x100	2 x 3	
	Research Methodol ogy	1T	1x3	1x 3	1x40	1x60	1x100	1 x 3	
		DSC-3T	3 x 3	3 x 3	3x40	3x60	3x100	3 x 3	
VIII	Major	DSE-2T	2 x 3	2 x 3	2x40	2x60	2x100	2 x 3	
	Subject	Project Work*	12	Report Evaluation	60	100+40 (Viva)	1x200	1x6	

* Two Discipline Elective papers may be offered in lieu of the project work.

d) IX/X Semester

Sem.	Sem. Subjects	Paper	Instructi	Duration of	Marks	3		Credits
	Subjects		on hrs/ week	Exam(hrs.)	IA	Exam	Total	Creans
1 1	Major	DSC-3T	3 x 4	3 x 3	3x40	3x60	3x100	3 x 4
IX	subject	DSC-3P	3 x 4	3 x 4/3	3x15	3x35	3x50	3 x 2
13	with	DSE-1T	1 x 3	1 x 3	1x40	1x60	1x100	1 x 3
	practical							
		DSC-2T	2 x 3	2 x 3	2x40	2x60	2x100	2 x 3
		DSC-2P	2 x 4	2 x 4/3	2x15	2x35	2x70	2 x 2
X	Major	DSE-2T	2 x 3	2 x 3	2x40	2x60	2x100	2 x 3
	Subject	Project Work	12	Report Evaluation	60	100+40 (Viva)	1x200	1 x 6

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COMPUTATION OF SEMESTER GRADE POINT AVERAGE AND CUMULATIVE (AGGREGATE) GRADE POINT AVERAGE

1. Calculation of Semester Grade Point Average (SGPA):

The Grade Points (GP) in a course shall be assigned on the basis of marks scored in that course as per the Table I. Any fraction of mark in the borderline less than 0.50 be ignored in assigning GP and the fractions of 0.50 or more be rounded off to the next integers. The Credit Points (CP) shall then be calculated as the product of the grade points earned and the credits for the course. The total CP for a semester is the sum of CP of all the courses of the semester. The SGPA for a semester is computed by dividing the total CP of all the courses by the total credits of the semester. It is illustrated below with typical examples.

2. Calculation of Aggregate or Cumulative GPA (CGPA):

The aggregate or cumulative SGPA (CGPA) at the end of the second, fourth, sixth, eighth and tenth semesters shall be calculated as the weighted average of the semester grade point averages. The CGPA is calculated taking into account all the courses undergone over all the semesters of a programme, i.e. The CGPA is obtained by dividing the total of semester credit weightages by the maximum credits for the programme.

$$\mathbf{CGPA} = \Sigma(\mathrm{Ci} \times \mathrm{Gi}) / \Sigma \mathrm{Ci}$$

where Gi is the grade point of the ith course/ paper and Ci is the total number of credits for that course/ paper.

$$CGPA = \Sigma(Ci \times Si) / \Sigma Ci$$

where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester. An illustration is given below.

Table 1: Conversion of Percentage of Marks into Grade Points in a Course/Paper

% Marks in a paper/practical	Grade Point (GP)	% Marks in a paper/practical	Grade Point (GP)
98-100	10	63-67	6.5
93-97	9.5	58-62	6.0
88-92	9.0	53-57	5.5
83-87	8.5	48-52	5.0
78-82	8.0	43-47	4.5
73-77	7.5	40-42	4.0
68-72	7.0	Below 40	0

An Illustration of Calculation of Semester Grade Point Average (GPA):

I Semester (Typical)

Courses/Papers	C1	C2	C3	C4	C5	C6	C7	C6	C 7	C8	Total
Max. Marks	100	100	100	100	100	100	100	50	25	25	800
Marks Obtained	77	74	62	76	78	72	68	38	18	17	580
% Marks Obtained	77	74	62	76	78	72	68	76	72	68	-
Grade Points Earned (G)	7.5	7.5	6.0	7.5	8.0	7.0	7.0	7.5	7.0	7.0	-
Credits for the Course (C)	3	3	3	3	3	3	3	2	1	1	25
Credit Points, CP (G x C)	22.5	22.5	18.0	22.5	24.0	21.0	21.0	15.0	7.0	7.0	180.5

Semester Aggregate Marks:

580 / 800 = 72.5%

Classification of Result:

First Class Distinction

SGPA = Total CP / Total Credits = 180.5 / 25 = 7.22

Semester Alpha Sign Grade: A

5.4 Calculation of Cumulative Grade Point Average (CGPA):

The Cumulative Grade Point Average (CGPA) at the end of the second, fourth, sixth, eighth and tenth semesters shall be calculated as the weighted average of the semester grade point averages (SGPA) of two, four, six, eight and ten semesters, respectively. The CGPA is obtained by dividing the total of semester credit weightages by the maximum credits for the programme.

i) Calculation of Cumulative Grade Point Average (CGPA) for Certification: Illustration I

Semester	I	II	Total
Total Marks per Semester	800	800	1400
Total Marks Secured	580	641	1221
Semester Alpha Sign Grade	A	A+	-
Semester GPA	7.22	8.02	-
Semester Credits (C)	25	25	48
Semester Credit Points (CP) (SGPA x C)	180.5	200.5	381.0
	1		

Aggregate Percentage of Marks = 1221 / 1600 = 76.31%

Classification of Result: First Class Distinction

Cumulative Grade Point Average (CGPA) = Total of Semester CP / Total Credits for the program = 381.0 / 50 = 7.62

Program Alpha Sign Grade: A

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ii) Calculation of Cumulative Grade Point Average (CGPA) for the Diploma: Illustration II

Semester	I	II	III	IV	Total
Total Marks per Semester	800	800	800	800	3200
Total Marks Secured	580	641	664	684	2569
Semester Alpha Sign Grade	A	A+	A+	A+	-
Semester GPA	7.22	8.02	8.30	8.55	_
Semester Credits (C)	25	25	25	25	100
Semester Credit Points (CP) (SGPA x C)	180.5	200.5	207.5	213.8	802.3

Aggregate Percentage of Marks = 2569 / 3200 = 80.28%

Classification of Result: First Class Exemplary

Cumulative Grade Point Average (CGPA) = Total of Semester CP / Total Credits for the program = 802.3 / 100 = 8.02

Program Alpha Sign Grade: A+

iii) Calculation of Cumulative Grade Point Average (CGPA) for the Bachelor Degree: Illustration III

Semester	I	II	III	IV	V	VI	Total
Total Marks per Semester	800	800	800	800	600	600	4400
Total Marks Secured	580	641	664	684	490 -	499	3558
Semester Alpha Sign Grade	A	A+	A+	A+	A+	A+	-
Semester GPA	7.22	8.02	8.30	8.55	8.17	8.32	-
Semester Credits (C)	25	25	25	25	24	24	148
Semester Credit Points (CP) (SGPA x C)	180.5	200.5	207.5	213.8	196.1	199.7	1198.1

Aggregate Percentage of Marks = 3558 / 4400 = 80.86%

Classification of Result: First Class Exemplary

Cumulative Grade Point Average (CGPA) = Total of Semester CP / Total Credits for the program = 1198.1 /148 = 8.10

Program Alpha Sign Grade: A+

iv) Calculation of Cumulative Grade Point Average (CGPA) for the Bachelor Degree with Honours: Illustration IV

Semester	I	п	Ш	IV	V	VI	VII	VIII	Total
Total Marks per Semester	800	800	800	800	600	600	600	600	5600
Total Marks Secured	580	641	664	684	490	499	467	506	4531
Semester Alpha Sign Grade	A	A+	A+	A+	A+	A+	A	A+	-
Semester GPA	7.22	8.02	8.30	8.55	8.17	8.32	7.78	8.43	-
Semester Credits (C)	25	25	25	25	·24	24	22	22	192
Semester Credit Points (CP) (SGPA x C)	180.5	200.5	207.5	213.8	196.1	199.7	171.2.	185.5	1554.8

Aggregate Percentage of Marks = 4531 /5600 = 80.91%

Classification of Result: First Class Exemplary

Cumulative Grade Point Average (CGPA) = Total of Semester CP /Total Credits for the program = 1554.8 /192 = 8.10

Program Alpha Sign Grade: A+

iv) Calculation of Cumulative Grade Point Average (CGPA) for the Integrated Master's Degree: Illustration ${\bf V}$

Semester	I	П	Ш	IV	V	VI	VII	VIII	IX	X	Total
Total Marks per Semester	800	800	800	800	600	600	600	600	600	600	6800
Total Marks Secured	580	641	664	684	490	499	467	506	481	513	5525
Semester Alpha Sign Grade	Α	A+	A+	A+	A+	A+	A	A+	A+	A+	-
Semester GPA	7.22	8.02	8.30	8.55	8.17	8.32	7.78	8.43	8.02	8.55	-
Semester Credits (C)	25	25	25	25	24	24	22	22	22	22	236
Semester Credit Points (CP) (SGPA x C)	180.5	200.5	207.5	213.8	196.1	199.7	171.2	185.5	176.4	188.1	1919.3

Aggregate Percentage of Marks = 5525 / 6800 = 81.25%

Classification of Result: First Class Exemplary

Cumulative Grade Point Average (CGPA) = Total of Semester CP /Total Credits for the program = 1919.3 /236 = **8.13**

Program Alpha Sign Grade: A+

These are the sample illustrations of computing Semester Grade Point Averages (SGPA) and Cumulative Grade Point Averages (CGPA) and the Alpha – Sign Grades assigned.

Model Curriculum Structure for Degree Program

B. Sc., Hons in Zoology

Name of the Degree Program: B. Sc., Hons

Discipline Core: Zoology Total Credits for the

Program:50/100/142/184/268Starting year of implementation: 2021-22

PROGRAM OBJECTIVES (POs)

POs1-The Program offers both classical as well as modern concepts of Zoology in higher

POs2-It enables the students to study animal diversity in both local and global

POs3-Tomakethestudy of animals more interesting and relevant to human studies more emphasis is given to branches like behavioural biology, evolutionary biology and economic

POs4-More of upcoming areas in cell biology, genetics, molecular biology, biochemistry, genetic engineering and bioinformatics have been also included.

POs5-Equal importance is given to practical learning and presentation skills of students.

POs6-The lab courses provide the students necessary skills required for their employability.

POs7-Skill enhancement courses in classical and applied branches of Zoology enhance

enterprising skills of students. POs8-The global practices in terms of academic standards and evaluation strategies.

POs9- Provides opportunity for the mobility of the student both within and across the

POs 10-The uniform grading system will benefit the students to move across institutions within India to begin with and across countries.

POs11-It will also enable potential employers in assessing the performance of the candidates across the world.

Credit distribution for the course

Assessment:

Weightage for assessments (in percentage)

Weightage for asses	sments (in percentage)	Morks
Type of Course	Formative Assessment / IA Marks	Summative Assessment Marks
Theory	40	35
Practical	15 50	100
Projects	30	
Experiential Learning		
(Internships etc.)		

^{*}In lieu of the research Project, two additional elective papers/ Internship may be offered

B1. Model Program Structure for Bachelor of Science (Basic/Hons.) Program with Botany as Major and Zoology as Minor (both subjects with practical)

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Sem.	Discipline	Discipline Elective	Ability Enhancement	ement	Skill En	nancement	Skill Enhancement Courses (SEC)	Total
	Core (DSC) (Credits) (L+T+P)	(DSE) / Open Elective (OE) (Credits) (L+T+P)	Compulsory Co Languages (Cr	Compulsory Courses (AECC), Languages (Credits) (L+T+P)	Compulsory Courses (AECC), Skill based (Credits) Languages (Credits) (L+T+P)	Value base	Value based (Credits) (L+T+P)	Credits
_	Botany C1(4+2) Zoology C1(4+2)	OE-1 (3)	L1-1(3), L2- 1(3) (4 hrs. each)		SEC-1: Digital Fluency (2) (1+0+2)	Yoga (1) (0+0+2)	Health & Wellness (1) (0+0+2)	25
=	Botany C2(4+2) Zoology C2(4+2)	OE-2 (3)	L1-2(3), L2-2(3) 2(3) (4 hrs. each)	Environmental Studies (2)		Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1)(0+0+2)	25
		Exit	it option with Ce	rtificate (with a n	t option with Certificate (with a minimum of 50 credits)			
Ξ	Botany C3(4+2) Zoology C3(4+2)	OE-3 (3)	L1-3(3), L2-3(3)		SEC-2: AI or some other SEC (2)	Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	25
			(4 hrs. each)		(1+0+2)			
≥	Botany C4(4+2)	OE-4(3)	L1-4(3), L2-	Constitution		Sports (1)	NCC/NSS/R&R(S&G)/	25
ž.s.	Zoology C4(4+2)		4(3) (4 hrs. each)	of India (2)		(0+0+2)	Cultural (1) (0+0+2)	
	xit option with Dipl	oma in Science (with a n	minimum of 100	credits) OR Choc	ose any one of the core	subjects as l	Exit option with Diploma in Science (with a minimum of 100 credits) OR Choose any one of the core subjects as Major and the other as Minor	inor
>	Botany C5(3+2)	Vocational-1 (3)			SEC-3: Cyber	Sports (1)	NCC/NSS/R&R(S&G)/	22
	Botany C6(3+2)				Security	(0+0+5)	Cultural (1) (0+0+2)	
	Zoology C5(3+2)				or some other SEC (2) (1+0+2)			
<u> </u>	Botany C7(3+2) Botany C8(3+2)	Vocational-2 (3) Internship (2)	-		SEC-4: Professional	Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	24
	Zoology C6(3+2)				Communication (2) (1+0+2)		(7 (A) (1) mmm)	
	Exit option with	Exit option with Bachelor of Science, B.	1000000	h a minimum of	146 credits) or continue	studies with	Sc. Degree (with a minimum of 146 credits) or continue studies with the Major in the 4" year	
VII	Botany C9(3+2)	Botany E-1 (3)						22
	Botany e C11(3)	Res. Methodology (3)						
VIII	Botany C12(3)	Botany E-3 (3)						21
	Botany C13(3)	Botany E-4 (3)						
	Botany C14(3)	Research Project (6)*						
	Award of Bachele	Award of Bachelor of Science Degree with	h Honours, B.Sc	. (Hons.) Degree	Honours, B.Sc. (Hons.) Degree in Botany (with a minimum of 189 credits)	mum of 189	credits)	
*								

*In lieu of the research Project, two additional elective papers/ Internship may be offered.



B2. Model Programme Structure for Bachelor of Science (Basic/Hons.) Programme with Zoology as Major and Botany as Minor (both subjects with practical)

Credits Total 25 25 25 25 22 Exit option with Diploma in Science (with a minimum of 100 credits) OR Choose any one of the core subjects as Major and the other as Minor NCC/NSS/R&R(S&G)/ NCC/NSS/R&R(S&G)/ Cultural (1)(0+0+2) NCC/NSS/R&R(S&G)/ NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2) Cultural (1) (0+0+2) Skill based (Credits) | Value based (Credits) (L+T+P) Cultural (1) (0+0+2) Health & Wellness Skill Enhancement Courses (SEC) (1)(0+0+2)Sports (1) (0+0+2) Sports (1) (0+0+2) Sports (1) (0+0+2) Sports (1) (0+0+2) Yoga (1) (0+0+2) Exit option with Certificate (with a minimum of 50 credits) SEC-2: AI or some SEC-1: Digital other SEC (2) SEC-3: Cyber (2)(1+0+2)Languages (Credits) (L+T+P) | (L+T+P) Fluency (1+0+2)Security Compulsory Courses (AECC), L1-2(3), L2-2(3) Environment (4 hrs. each) al Studies (2) Constitution of India (2) Ability Enhancement L1-3(3), L2-3(3) (4 hrs. each) L1-4(3), L2-4(3) L1-1(3), L2-1(3) (4 hrs. each) (4 hrs. each) Elective(DSE) / Open Credits) (L+T+P) Vocational-1 (3) Elective (OE) Discipline OE-1 (3) OE-2 (3) OE-3 (3) OE-4 (3) Zoology C2(4+2) Botany C2(4+2) Zoology C3(4+2) Zoology CI(4+2) Zoology C4(4+2) Botany C4(4+2) Zoology C5(3+2) Botany C1(4+2) Zoology C6(3+2) Botany C3(4+2) Core (DSC) Discipline (Credits) (L+T+P)Sem. __ \geq = >

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- -	VI Loology C/(3+2) Vocational-2 (3)	Vocational-2 (3)			SEC-4:	Sports (1)	Sports (1) NCC/NSS/R&R(S&G)/ 24	24
	Zoology C8(3+2)	Internship (2)			Professional	(0+0+2)	Cultural (1) (0+0+2)	
	Botany C6(3+2)				Communication (2)	,	,	
					(1+0+2)			
	Exit option with	h Bachelor of Science, B	. Sc. Degree (with	a mininum of	146 credits) or continu	e studies wit	Exit option with Bachelor of Science, B. Sc. Degree (with a minimum of 146 credits) or continue studies with the Major in the 4" year	
ΝII	Z	Zoology E-1 (3)						22
	Zoology C10(3+2) Zoology E-2 (3)	Zoology E-2 (3)	- WY					
•	Zoology C11(3)	Zoology C11(3) Res. Methodology (3)						
NIII V	Zoology C12(3) Zoology E-3 (3)	Zoology E-3 (3)						21
	Zoology C13(3)	Zoology E-4 (3)						
	Zoology C14(3)	Zoology C14(3) Research Project (6)*						
249	Award of Bachel	Award of Bachelor of Science Degree with Honours, B.Sc. (Hons.) Degree in Zoology (with a minimum of 189 credits)	h Honours, B.Sc. (Hons.) Degree	in Zoology (with a mit	nimum of 18	9 credits)	

Botany C5(3+2)

or some other SEC

(2)(1+0+2)

*In lieu of the research Project, two additional elective papers/ Internship may be offered.

B3. Model Programme Structure for Bachelor of Science (Basic/Hons.) Programme with both Botany and Zoology as Majors (subjects with practical) in the 3rd year

Total	Credits	25	25		25		25			24				22			2.2	7		21			
Skill Enhancement Courses (SEC)	l (Credits) (L+T+P)	Health & Wellness (1) (0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1)(0+0+2)		NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)		3	Cultural (1) (0+0+2)	ind continue the study	5	Cultural (1) (0+0+2)					to Maine in the All now	re raujors in the 4 year						f 189 crodits)
nancement (Value based	Yoga (1)(0+0+2)	Sports (1) (0+0+2)		Sports (1)	î .	Sports (1)	(0+0+5)	s as Majors	Sports (1)	(0+0+2)					to be one of the	m one of m						o mininim o
Skill Enl	Skill based (Credits) Value based (Credits) (L+T+P)	SEC-1: Digital Fluency (2) (1+0+2)							both the core subjects	Cyber		other SEC (2)	(1+0+2)	SEC-4: Professional	Communication	(2)	or commune stantes a						ree in Zooloon (with a
Ability Enhancement	Elective (DSE) / Open Compulsory Courses (AECC), Elective (OE) Languages (Credits) (L+T+P) (Credits)	L1-1(3), L2-1(3) (4 hrs. each)	L1-2(3), L2-2(3) Environmental (4 hrs. each) Studies (2)	Exit option with Certificate (with a minimum of 50 credits)	L1-3(3), L2-3(3)		.L1-4(3), L2-4(3) Constitution	(4 hrs. each) of India (2)	nimum of 100 credits) OR Choose both the core subjects as Majors and continue the study			25			120	(2)							Award of Rachelor of Science Degree with Honours R Se (Hons) Degree in Zoolom (with a minimum of 180 credits)
Discipline	Elective(DSE) / Open Elective (OE) (Credits)	OE-1 (3)	OE-2 (3)	Exi	OE-3 (3)		OE-4 (3)		Exit option with Diploma in Science (with a mini							Evit ontion with Racholor of Science R Sc Darras	Zoology E-1 (3)	Zoology E-2 (3)	Res. Methodology (3)	Zoology E-3 (3)	Zoology E-4 (3)	Research Project (6)*	helor of Science Degree
Discipline Core	(DSC) (Credits)	Botany C1(4+2) Zoology C1(4+2)	Botany C2(4+2) Zoology C2(4+2)		Botany C3(4+2) Zoology C3(4+2)	(Botany C4(4+2)	Zoology C4(4+2)	xit option with Diplon			Zoology C5(3+2)		Botany C7(3+2) Botany C8(3+2)		ontion with Racholor	Zoology C9(3+2)	Zoology C10(3+2)	Zoology C11(3)	Zoology C12(3)	Zoology C13(3)	Zoology C14(3)	Award of Back
Sem.		-	II		II		IV		E.	>			1	5		Frit	VII			VIII			

*In lieu of the research Project, two additional elective papers/ Internship may be offered.

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SEMESTER WISE CURRICULUM STRUCTURE OF COURSES

Semester	Name of the	R WISE CURRI What all	Pre-	Concurrent	Pedagogy	Assessment
	course/credits	program outcomes the course addresses (not exceeding three per course)	requisite course(s)	course		
1 Semester C1 Major course	Cytology, Genetics and Infectious Diseases (4)	1. The structure and functions of animal cell, cell organelles, cell-cell interactions, process of reproduction leading to new organisms. 2. The principles of inheritance, Mendel's laws and the deviations. 3. Inheritance of chromosomal aberrations in humans by pedigree analysis in families.	Student must have studied Biology or equivalent subjects in Class 12.	Lab on Cell Biology and Genetics (2)	Lectures/Videos/ Seminars/Case study/Project/ Group discussion/Proble m Solving/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
1 Semester C1 Minor course	Biology of Non-Chordates (4)	. 1. Learn the systematics and biology of non-chordates through their adaptive features. 2. Study the functional biology of non-chordates through their body organization. 3. Comprehend identification of species and their evolutionary relationships.	Student must have studied Biology or equivalent subjects in Class 12.	Lab on Biology of Non- Chordates (2)	Lectures/Videos/ Seminars/Case study/Project/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
1 Semester OE1 Open Elective course	Economic Zoology (3)	1. Acquaint the knowledge about basic procedure and methodology of integrated animal rearing. 2. Students can start their own business i.e. self employments. 3. Get	Student must have studied Biology or equivalent subjects in Class 12.		Lectures/Videos/ Seminars/Case study/Project/ Group discussion/ Problem Solving/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.

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SEC-1 Skill Enhancement course	SEC 1 Digital fluency/ Vermiculture (2)	employment in different sectors of Applied Zoology	Student must have studied Biology or equivalent subjects in Class 12.		Lectures/Videos/ Seminars/Case study/Project/ Group discussion/ Problem Solving/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
2 Semester C2 Major course	Biochemistry and Physiology (4)	1. In depth understanding of structure of biomolecules like proteins, lipids and carbohydrates. 2. The thermodynamics of enzyme catalyzed reactions. 3. To know various physiological processes of animals.	Student must have studied Biology or equivalent subjects in Class 12.	A2 Lab on Biochemistry, Physiology and Hematology (2)	Lectures/Videos/ Seminar/Case study/Project/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
2 Semester C2 Minor Course	Biology of Chordates (4)	1. Learn the systematics and biology of Chordates through their adaptive features. 2. Study the functional biology of Chordates through their body organization. 3. Comprehend identification of Chordate species and their evolutionary relationships.	Student must have studied Biology or equivalent subjects in Class 12.	Lab on Biology of Chordates (2)	Lectures/Videos/ Seminar/Case study/Project/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
2 Semester OE2 Open Elective course	Parasitology (3)		Student must have studied Biology or equivalent subjects in Class 12.		Lectures/Videos/ Seminar/Case study/Project/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.

Skill Enhancement course	Environmental Studies (2) Sericulture (2)	1. Sericulture is an agro-based industry which gives economic empowerment to the students. 2. Sericulture may be taken up as a small scale industry by the small farmers and unemployed youth. 3. Get jobs in teaching profession, silk board and other Govt. institutions as technicians.	Student must have studied Biology or equivalent subjects in Class 12.		Lectures/Videos/ Seminar/Case study/Project/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Ev aluation/ Analysis of result/ Application of Heutagogy.
		EXIT OPTION W	ITH CERTIF	TICATE (50 CRED	ITS)	
3 Semester C3 Major Core Course	Molecular Biolog Bioinstrumentati & Techniques in Biology (4)	on	Certificate Course in Zoology	Lab on Molecular Biology, Bioinstrumentat- ion & Techniques in Biology (2)	/ Seminars/Case study/Project/ Group discussion/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
3 Semester C3 Minor Core Course	Comparative Anatomy and Microanatomy (4)		Certificate Course in Zoology	Lab on Comparative Anatomy and Microanatomy (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
3 Semester OE-3 Open Elective course	Endocrinology (3)		Certificate Course in Zoology	a como a sea ella si	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
3 Semester SEC-2 Skill Enhancement course	Artificial Intelligence / Apiculture (2)		Certificate Course in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.

4 Semester C4 Major Core course	Gene Technology, Immunology and Computational Biology (4)		Certificate Course in Zoology	Lab on Genetic Engineering And Counselling (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to industry/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
4 Semester C4 Minor Core Course	Cell Biology and Genetics (4)		Certificate Course in Zoology	Lab on Cell Biology and Genetics (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to industry/Formati ve Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
4 Semester OE-4 Open Elective Course	Animal Behaviour (3)		Certificate Course in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
4 Semester Skill Enhancement course	Constitution of India(2) Poultry (2)		Certificate Course in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
		EXIT OPTION V	VITH DIP.	LOMA (100 CREDIT	(3)	
5 Semester C5 Major Core Course	Non-Chordates and Economic Zoology (4)	e e e e e e e e e e e e e e e e e e e	Diploma in Zoology	Lab on Non- Chordates and Economic Zoology (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Zoo/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
5 Semester C6 Major Core Course	Chordates and Comparative Anatomy (3)		Diploma in Zoology	(Virtual Dissection) and Comparative Anatomy (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Zoo/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.

5 Semester C5 Minor Core Course	Animal Physiology and Animal Biotechnology (3)	Diploma in Zoology	Lab on Animal Physiology and Animal Biotechnology (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Zoo/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
5 Semester 5 DSEC-1	Vocational -1 Aquatic Biology (3)	Diploma in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
5 Semester SEC-3 Skill Enhancement course	Cyber Security/ Integrated AnimalRearing (2)	Diploma in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
6 Semester C7 Major Core Course	Evolutionary and Developmental Biology (3)	Diploma in Zoology	Lab on Evolutionary and Developmental Biology (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/ Visit to Institute/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
6 Semester C8 Major Core Course	Environmental Biology, Wildlife management and Conservation (3)	Diploma in Zoology	Lab on Environmental Biology, Wildlife management and Conservation (2)	/ Seminars/Case study/Project/ Group discussion/Visit to Zoo/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
6 Semester C6 Minor Core Course	Animal Behaviour (3)	Diploma in Zoology	Lab on Animal Behaviour (2)	Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Zoo/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.

6 DSEC-2	Vocational-2 Entomology (3) Internship (2)	Diploma in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
SEC-4 Skill Enhancement Course	Professional Communication/ Ornamental Fish Culture (2)	Diploma in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
	EX	IT OPTION WITH B. Sc. I	DEGREE (146 CREL	OITS)	
7 Semester C9 Major Core Course	Ethology (3)	Degree in Bachelor Of Science in Zoology	Lab on Ethology (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Zoo/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Ev aluation/ Analysis of result/ Application of Heutagogy.
7 Semester C10 Major Core Course	Evolution and Zoogeography (3)	Degree in Bachelor Of Science in Zoology	Lab on Evolution and Zoogeography (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Zoo/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
7 Semester C11Major Core Course	Genetics and Computational Biology (3)	Degree in Bachelor Of Science in Zoology	Lab on Advanced Genetics and Computational Biology (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.

7 Sem *er 7 DS_C	Research Methodology (3)	Degree in Bachelor of Science in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to research lab/Formative Assessment/ Summative Assessment	Analysis of result/ Application of Heutagogy.
7 DSEC-1	Zoology E-1 Radiation Biology (3)	Degree in Bachelor of Science in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
7 DSEC-1	Zoology E-2 Zoo Management (3)	Degree in Bachelor Of Science in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Ev aluation/ Analysis of result/ Application of Heutagogy.
8 Semester C12 Major Core Course	Immunology and Stem Cell Biology (3)	Degree in Bachelor of Science in Zoology	Lab on Immunology and Stem Cell Biology 2	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
8 Semester C13' Major Core Course	Advanced Molecular Biology and Biostatistics (3)	 Degree in Bachelor Of Science in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
8 Semester C 14 Major Core Course	Genomics and Proteomics (3)	Degree in Bachelor of Science in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.

8 DSEC	Research Project (6)	Degree in Bachelor of Science in Zoology	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit To Industry/ Formative Assessment/ Evaluation/ Analysis of result/ Application of
8 DSEC-1 Any one of the two choices from E-3	E-3 Neurosciences (3)	Degree in Bachelor of Science in Zoology	Assessment/ Summative Assessment Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment/ Summative Assessment/ Summative Assessment
	E-3 Parasitology (3)	Degree in Bachelor of Science in Zoology	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment Assessment Lectures/Videos Summative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy.
8 DSEC-2 Any one of the two choices from E-4	and Ethics (3)	Degree in Bachelor of Science in Zoology	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment Summative Assessment
	E-4 Behavioural Biology (3)	Degree in Bachelor of Science in Zoology	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/ Formative Assessment/ Summative Assessment Lectures/Videos Summative Assessment/ Summative Assessment Formative Assessment Formative Assessment Formative Assessment
	EXIT OPTION	WITH B. Sc. HONOURS DEGR	EE (189 CREDITS)

Course content under I Semester B.Sc Zoology (2021-22 onwards)

Core Course Content

Course Title/Code: Cytology, Genetics and Infectious Diseases	Course Credits: 4
Course Code: DSCC5Z00T1	L-T-P per week: 4-0-0
Total Contact Hours: 56	Duration of ESA: 3 Hours
Formative Assessment Marks: 40	Summative Assessment Marks: 60
Model Syllabus Authors:	

Core Course prerequisite: To study Zoology in undergraduate, student must have studied Biology or equivalent subject in Class 12.

Course Outcomes (COs):

At the end of the course the student should be able to understand:

- 1. The structure and function of the cell organelles.
- 2. The chromatin structure and its location.
- 3. The basic principle of life, including the mechanism and significance of cell division
- 4. Cell-cell communication mechanisms.
- 5. The principles of inheritance, Mendel's laws and the deviations.
- 6. The interaction between environment and genetic factors.
- 7. The impact of chromosomal aberrations in humans and analysis of the family pedigrees.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

Course Outcomes (COs) / ProgramOutcomes (POs)	CC T1	CC 2	CC 3	CC 4	CC 5	CC 6	CC 7	CC 8	CC 9	CC 10	CC 11
I Core competency	X										
II Critical thinking	X										
III Analytical reasoning	X										
IV Research skills	X										
V Team work	X										

Note: Course Articulation Matrix relates course outcomes of course with the corresponding programoutcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

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Semester I

Zoology Core Course Content

	Content	Hot
	Unit I	14
Chapter 1. Structure and Function of Cell	Organelles I in Animal cell	
Chapter 2 Plasma membrane: chemical structure 3 Endomembrane sustant and structure 3 Endomembrane sustant and structure and stru	cture—lipids and proteins	ĺ
exocytosis	argeting and sorting, transport, endocytosis and	
Chapter 2. Structure and Function of Call	O	_
Cytoskeleton: microtubules microtubules microtubules	Organelles II in Animal Cell	
Cytoskeleton: microtubules, microt Mitochondria: Structure, evidetime	maments, intermediate filaments	İ
Peroxisome and Ribosome: structure	phosphorylation; electron transport system	
	Unit II	
Chapter 3. Nucleus and Chromatin Structu		14
Structure and function of nucleus in	re	
Chemical structure and base compo	cition of DNA 1 DNA	ŀ
DNA supercoiling chromatin argan	isation of DNA and RNA	
DNA supercoiling, chromatin organ Types of DNA and RNA	ization, structure of chromosomes	
Chapter 4. Cell cycle, Cell Division and Cell	Signaling	-
Cell division: mitosis and meiosis	ognantig	į
Introduction to Cell cycle and its reg	gulation, apoptosis	
Signal transduction: intracellular 11 s	ignaling and cell surface receptors, via G-protein	
mixed receptors		İ
Cell-cell interaction: cell adhesion me	olecules, cellular junctions	
	Unit III	14
hapter 5. Mendelism and Sex Determination	On .	17
Basic principles of heredity: Mendel	's laws- monohybrid cross and hybrid cross	
Complete and Incomplete Dominanc	e	
Penetrance and expressivity		
Genetic Sex-Determining Systems, E	nvironmental Sex Determination, Sex Determination	
and meeting in the oscillation meeting	OUASIPP	
Sex-linked characteristics in humans	and dosage compensation	
hapter 6. Extensions of Mendelism, Genes a	and Environment	
Extensions of Mendelism: Multiple A	Illeles, Gene Interaction	
The Interaction Between Sex and Her Characteristics	edity: Sex-Influenced and Sex-Limited	
Cytoplasmic Inheritance, Genetic Ma	townol ITCC - 4	
Interaction between Genes and Environment	ternal Effects.	
Inheritance of Continuous Characteri	onment: Environmental Effects on Gene Expression, stics.	
	Jnit IV	14
apter 7. Human Chromosomes and Pattern	ns of Inheritance	14
Patterns of inheritance: autosomal don	ninance, autosomal recessive, X-linked recessive,	
v-mrea aominant.		
Chromosomal anomalies: Structural ar	nd numerical aberrations with examples.	
Human karyotyping and Pedigree anal	ysis.	
apter 8. Infectious Diseases		
Introduction to pathogenic organisms:	viruses, bacteria, fungi, protozoa and worms. cluding diseases, causes, symptoms and control of	

Suggested Readings:

- 1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
- 2. Alberts et al: Molecular Biology of the Cell: Garland (2002).
- 3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
- 4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
- 5. Lewin B. Genes VIII. Pearson (2004).
- 6. Watson et al. Molecular Biology of the Gene. Pearson (2004).
- 7. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis Kuby-Kuby Immunology. W H Freeman(2007).
- 8. Delves Peter J., Martin Seamus J., Burton Dennis R., Roitt Ivan M. Roitt's Essential Immunology, 13th Edition. Wiley Blackwell (2017).
- 9. Principles of Genetics by B. D. Singh
- 10. Cell-Biology by C. B. Pawar, Kalyani Publications
- 11. Economic Zoology by Shukla and Upadhyaya

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test (I and II)	20
Written Assignment/Presentation/Project / Term Papers/Seminar	15
Class performance/Participation	05
Total	40

Date:

Course Co-ordinator

Subject Committee Chairperson

Zoology Core Lab Course Content

Semester I

Course Title: Cell Biology & Cytogenetic La	b Course Credits: 2
Course Code: DSCC5Z00P1	L-T-P per week: 0-0-4
Total Contact Hours: 56	Duration of ESA: 3 Hours
Formative Assessment Marks: 15	Summative Assessment Marks: 35
Model Syllabus Authors:	The state of the s

Course Outcomes (COs):

At the end of the course, the student should be able to:

- 1. Use simple and compound microscopes.
- 2. Prepare stained slides to observe the cell organelles.
- 3. Be familiar with the basic principle of life, and the process of cell division.
- 4. Detect chromosomal aberrations by preparing karyotypes.
- 5. Analyze the family pedigrees.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

Course Outcomes (COs) / Program Outcomes(POs)	CC P1	CC 2	CC 3	CC 4	CC 5	CC 6	CC 7	CC 8	CC 9	CC 10	CC 11
I Core competency	X			·							
II Critical thinking	X								l		
III Analytical reasoning	X										
IV Research skills	X										
V Team work	X										<u>, , , , , , , , , , , , , , , , , , , </u>

Note: Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Lab Course Content

List of labs to be conducted	56 h rs.
1. Understanding of simple and compound microscopes.	
2. To study different cell types such as buccal epithelial cells, neurons, striated muscle cells using 3. Methylene blue/any suitable stain (virtual/ slaughtered tissue).	
3. To study the different stages of Mitosis in root tip of Allium cepa.	
4. To study the different stages of Meiosis in grasshopper testis (virtual).	
5. To check the permeability of cells using salt solution of different concentrations.	
Study of parasites in humans (e.g. Protozoans, Helminthes in compliance with examples being studied in theory) permanent microslides.	
7. To learn the procedures of preparation of temporary and permanent stained slides, with available mounting material.	
8. Study of mutant phenotypes of <i>Drosophila</i> sp. (from Cultures or Photographs).	
9. Preparation of polytene chromosomes (Chironomus larva or Drosophila larva).	
10. Preparation of human karyotype and study the chromosomal structural and numerical aberrations from the pictures provided. (Virtual/optional).	
11. To prepare family pedigrees.	
12. https://www.vlab.co.in	
13. https://zoologysan.blogspot.com	
14. www.vlab.iitb.ac.in/vlab	
15. www.onlinelabs.in	
_16www.powershow.com	
17. https://vlab.amrita.eduhttps://sites.dartmouth.edu/	

Suggested Readings:

- 1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
- 2. Alberts et al: Molecular Biology of the Cell: Garland (2002).
- 3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
- 4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
- 5. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis Kuby- Kuby Immunology. W H Freeman (2007).
- 6. Kesar, Saroj and Vasishta N. 2007. Experimental Physiology: Comprehensive Manual. Heritage Publishers, New Delhi.

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	05
Written Assignment/Presentation/Project / Term Papers/Seminar	05
Class performance/Participation	05
Total	15

Date: Course co-ordinator Subject committee Chairperson

Minor Course Content

I Semester: B. Sc., (Hons) Zoology

Course Title: Biology of Non-chordates	Course Code: MDC5ZOOT1
Course Type: Minor Discipline Core Theory, L-T-P: 4-0-0	Course Credits: 4
Total Contact Hours: 56	Duration of ESA: 3 Hrs
Formative Assessment Marks: 40	Summative Assessment Marks: 60
Model Syllabus Authors:	

Course Outcomes (COs):

At the end of the course the student should be able to:

- 1. Learn the structural biology of non-chordates through their adaptive features.
- 2. Study the functional biology of non-chordates through their body organization and its function.
- 3. Comprehend identification of species and their evolutionary relationships.
- 4. Acquire research skills such as critical thinking.
- 5. Develop abilities required for industrial employment as well as self-employment.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs)/(POs)	MDC5ZOO T1	MDC5ZOO T2	MDC5ZOO T3	MDC5ZOO T4	MDC5ZOO T5	MDC5ZOO T6
I Core competency	Х					
II Critical thinking	X		_			
III Analytical reasoning	X					
IV Research skills	Х					
V Team work	X					

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Course Content						
Unit I						
Chapter 1. Animal Architecture						
Body symmetry- asymmetry, radial, biradial and bilateral symmetry with suitable exampleand Significance.						
Body organization- Protoplasmic, cellular, tissue and organ level of organization withsuitable examples and Significance.						
Diploblasty (apparent and absolute) and Triploblasty with suitable Examples and Significance.						
Coelom- Acoelom, Pseudocoelom, and Eucoelom with suitable examples and Significance.						
Metamerism- Psuedometamerism (Strobilization), Eumetamerism with suitable examples and Significance.						
Cephalization- origin and significance.						
Chapter 2. General characters and classification of major Invertebrate phyla- Protozoa, Porifera, Coelenterata, Helminthes, Annelida, Arthropoda, Mollusca and Echinodermata upto the level of classes with suitable examples.						

Unit II	14
Chapter 3. Diversity of life sustaining systems in nonchordates: (with an example for each type of system)	
Locomotion: Protozoa- amoeboid (Sol-Gel theory), Flagellar, euglenoid and ciliarymovements.	
Hydrostatic movements in Annelida-Earthworm and Echinodermata-starfish. Nutrition: In Protozoa.	
Feeding apparatus and mechanism: In Annelida-filter feeding, Arthropoda-Prawn, Mollusca-Pila and Echinodermata-Sea Star.	
Respiration: In Protozoa-diffusion, Helminthes-parasitic, Annelida-cutaneous, Arthropoda	
(any one type), Mollusca (Gill) and Echinodermata (Dermal papillae and Tube feet).	
Circulation: In Protozoa (cyclosis), Annelida- Earthworm, Arthropoda-Prawn, Mollusca-Pila and Echinodermata- Sea Star.	
Osmoregulation and excretion: In Protozoa-Contractile vacuoles, Platyhelminthes- Flamecells,	
Annelida-Nephridia and Arthropoda-Green glands.	
Unit III	14
Chapter 4. Diversity of coordinating systems and generative systems in nonchordates: (with an	
example for each type of system)	
Nervous system in Coelenterata, Platyhelmintes, Annelida, Arthropoda, Mollusca and	
Echinodermata.	
Neuroendocrine system and pheromones in Insecta.	
Sense organs: Mechanoreceptors, Photoreceptors, Chemoreceptors, thigmoreceptors,	
rheoreceptors and proprioreceptors.	
Reproduction: Asexual and sexual reproduction in Protozoa, Porifera, Coelenterate, Annelida and	
Echinodermata.	
Metamorphosis in Insecta.	
Larval forms of Coelenterata, Annelida and Echinodermata.	
Unit IV	14
Chapter 5. Beneficial non-chordates:	
Non-chordates used as food; Arthropoda and Mollusca.	
Non-chordates in Industry and Industrial products; Silkworm-silk, Lac Insect-shellac,	
Honey bees-bee wax, Pearl Oysters- pearls, Corals, sponges, shells dyes and pigments.	
Non-chordates in medicinal use-Leeches, Maggot larva and honey.	
Non-chordates in agriculture-earthworms, pollinators and pest controllers.	
Non-chordates in food chain and as scavengers.	
Chapter 6. Harmful non-chordates	
Parasitic Platyhelminthes.	
Soil Nematodes.	
Agricultural, veterinary and human pests of Arachnida.	
Agricultural, veterinary and human pests of Arthropoda.	

Topics Suggested for Assignment/Formative Assessment:

Animal connecting links.
 Polymorphism.
 Parasitic adaptations.
 Metamorphosis.
 Freshwater sponges.
 Molluscans of industrial value.
 Coral reefs and their role in ecosystem generation.
 Invertebrate minor phyla.
 Regeneration in sponges and *Planaria*.
 Soil and water protozoa.

Recommended Books:

- Barnes, R. S. K, Calow, P, Olive, P. J. W, Golding, D. W, Spicer, J. I. (2002) TheInvertebrates: a Synthesis, Blackwell Publishing.
- Hickman, C, Roberts, L.S, Keen, S.L, Larson, A. and Eisenhour, D. (2018) AnimalDiversity, McGraw-Hill.
- Holland, P. (2011) The Animal Kingdom: A Very Short Introduction, OxfordUniversity Press. Barrington, E.J.W. (1979) Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson.
- Boradale, L.A. and Potts, E.A. (1961) Invertebrates: A Manual for the use of Students. Asia Publishing Home.
- Bushbaum, R. (1964) Animals without Backbones. University of Chicago Press.

Web Sources:

Animal Diversity (https://swayam.gov.in/courses/5686-animal-diversity) Advances in Animal Diversity, Systematics and Evolution (https://swayam.gov.in/courses/5300-zoology)

ePGPathshala (MHRD)Module 10, 18, 19 of the paper P-08 (Biology of Parasitism)

https://epgp.inflibnet.ac.in/ahl.php?csrno=35

Pedagogy: Lectures, Presentations, videos, Assignments and Weekly Formative Assessment Tests.

Formatiy	7e Assessment
Assessment Occasion	Weightage in Marks
Assignment/ Field Report/ Project	15 Marks
Test (I and II)	20 Marks
Participation in class	05 marks
Total	40 Marks

Date:

Course Co-ordinator

Subject Committee Chairperson

Semester: I

Minor Course Lab Content

Course Title: Lab on Biology of Non-chordates	Course Credits: 02
Course Type: Minor Discipline Core Practical, L-T-P: 0-0-4	Corse Code: MDC5ZOOP1
Total Contact Hours: 56	Duration of ESA: 03 Hours
Formative Assessment Marks: 15	Summative Assessment Marks: 35
Model Syllabus Authors:	

Course Outcomes (COs):

At the end of the course the student should be able to:

- 1. Understand basics of classification of non-chordates.
- 2. Learn the diversity of habit and habitat of these species.
- 3. Develop the skills to identify different classes and species of animals.
- 4. Know uniqueness of a particular animal and its importance
- 5. Enhancement of basic laboratory skill like keen observation and drawing.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	MDC5ZOO P1	MDC5ZOO P2	MDC5ZOO P3	MDC5ZOO P4	MDC5ZOO P5	MDC5ZOO P6
I Core competency	X			TOTAL COL		
II Critical thinking	Χ.					
III Analytical reasoning	Х					
IV Research skills	Х			***************************************		
V Team work	х					·········

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Lab I Course Content

	List of labs to be conducted	Hours
1.	Preparation and observation of protozoan culture.	56
2.	Protozoa: Systematics of <i>Amoeba</i> , <i>Euglena</i> , <i>Noctiluca</i> , <i>Paramecium</i> and <i>Vorticella</i> (Permanent slides).	
3.	Porifera: Systematics of <i>Sycon, Euplectella, Hyalonema, Spongilla</i> and <i>Euspongia</i> (Specimens). Study of permanent slides of T.S of <i>Sycon</i> , spicules and gemmules.	
4.	Cnidaria: Systematics of Aurelia and Metridium (Specimens). Slides of Hydra, Obelia-polyp and medusa, and Ephyra larva. T.S. of Metridium passing through mesenteries.	
5.	Study of Corals-Astraea, Fungia, Meandrina, Corallium, Gorgonia, Millepora and Pennatula.	

- Helminthes: Systematics of Planaria, Fasciola hepatica and Taenia solium, Ascaris-Male and female (Specimens). Slides of T.S. of Planaria, T.S of male and female Ascaris.
- 7. Annelida: Systematics of *Nereis, Heteronereis, Sabella, Aphrodite* (Specimens). Slide of T.S. of Earth worm through typhlosole.
- 8. Arthropoda: Systematics of Panaeus, Palaemon, Astracus, Scorpion, Spider, Limulus, Peripatus, Millipede, Centipede, Praying mantis, Termite Queen, Moth, Butterfly, Dung beetle/Rhinocerous beetle (Any six specimens). Slide of Larvae-Nauplius, Zoea, Mysis.
- Mollusca: Systematics of Chiton, Mytilus, Aplysia, Pila, Octopus, Sepia, Glochidiumlarva (Specimens).
- Shell Pattern-Unio, Ostrea, Cypria, Murex, Nautilus, Patella, Dentalium, Cuttle bone.
- 11. Echinodermata: Systematics of Sea star, Brittle star, Sea Urchin, Sea cucumber, Sea lilly (Specimens). Slide of Bipinnaria larva, Echinopluteus larva and Pedicellaria.
- 12. Harmful Nonchordates: Soil Nematodes. Agricultural, veterinary and human pestsof Arachnida. Agricultural, veterinary and human pests of Arthropoda.
- 13. Beneficial Nonchordates:
- 14. Sericulture: Life cycle of Bombyxmori, Uzi fly, Cocoon, Raw silk.
- 15. Apiculture: Any 2 Species of honey bee, bee wax.
- 16. Pearl Culture: Pearl Oyster and Natural Pearls.
- Virtual Dissection/Cultured specimens: Earthworm Nervous system Leech-Digestive System
- Virtual Dissection/ Cultured specimens: Prawn Nervous system. Cockroach-Salivary Apparatus and Digestive system.

Recommended Books:

- Barnes, R. S. K, Calow, P, Olive, P. J. W. Golding, D. W, Spicer, J. I. (2002) The Invertebrates: a Synthesis, Blackwell Publishing.
- •Hickman, C, Roberts, L.S, Keen, S.L, Larson, A. and Eisenhour, D. (2018) Animal Diversity, McGraw-Hill.
- •Holland, P. (2011) The Animal Kingdom: A Very Short Introduction. Oxford University Press.
- Barrington, E.J.W. (1979) Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson.
- •Boradale, L.A. and Potts, E.A. (1961) Invertebrates: A Manual for the use of Students. Asia Publishing Home.
- •Bushbaum, R. (1964) Animals without Backbones. University of Chicago Press.

Web References:

Anatomy of earthworm: The dissection works (CD); www.neosci.com Cockroach dissection-www.ento.vt.edu

Pedagogy: Lectures, Presentations, videos, Labs, Assignments, Tests, Individual or group Field oriented ProjectReport on, Visit to one research institute/ one wild life sanctuary / museum / zoo.

TOPICS RECOMMENDED FOR PROJECT/ MONOGRAPH PREPARATION

- 1) General account of protozoan. 2) Monograph on sea anemones.
- 3) Monograph on polychaetes. 4) Monograph on leeches.

Assessment Occasion	Weightage in Marks
Assignment/Monograph	05
Test	05
Participation in class	05
Total	15

Date:

Course Co-ordinator

Subject Committee Chairperson

Open Elective Course Content

Semester: I

Course Title: Economic Zoology Course Code: OEC5ZOOT1	Course Credits: 3
Total Contact Hours: 42	Duration of ESA: 3 Hours
Formative Assessment Marks: 40	Summative Assessment Marks: 60
Model Syllabus Authors:	

Course Outcomes (COs):

At the end of the course, the student will be able to:

- 1. Gain knowledge about silkworm rearing and their products.
- 2. Gain knowledge on Bee keeping equipment and apiary management.
- 3. Acquire knowledge on dairy animal management, the breeds and diseases of cattle and learn the testing of egg and milk quality.
- 4. Acquire knowledge about the culture techniques of fish and poultry.
- 5. Understand the basic procedure and methodology of vremiculture.
- 6. Learn various concepts of lac cultivation.
- 7. Start their own business i.e. self-employments.
- 8. Get employment in different applied sectors

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

Course Outcomes (COs) /Program Outcomes (POs)	CC1	CC2	CC3	CC4	CC5	CC6	CC 7	CC8	CC 9	CC 10	CC 11	CC 12
I Core competency	X	ı										· · · · · · · · · · · · · · · · · · ·
II Critical thinking	X											
III Analytical reasoning	X											
IV Research skills	X			:								
V Team work	Х											

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Course Content

Content	Hrs
Unit I	14
Chapter 1. Sericulture: History and present status of sericulture in India Mulberry and non-mulberry species in Karnataka and India Mulberry cultivation Morphology and life cycle of Bombyx mori Silkworm rearing techniques: Processing of cocoon, reeling Silkworm diseases and pest control Chapter 2. Apiculture: Introduction and present status of apiculture	
 Species of honey bees in India, life cycle of Apis indica Colony organization, division of labour and communication Bee keeping as an agro based industry; methods and equipments: indigenous methods, extraction appliances, extraction of honey from the comb and processing Bee pasturage, honey and bees wax and their uses Pests and diseases of bees and their management Unit II	14
Chapter 3. Live Stock Management:	14
 Dairy: Introduction to common dairy animals and techniques of dairy management Types, loose housing system and conventional barn system; advantages and limitations of dairy farming Establishment of dairy farm and choosing suitable dairy animals-cattle Cattle feeds, milk and milk products Cattle diseases Poultry: Types of breeds and their rearing methods Feed formulations for chicks Nutritive value of egg and meat Disease of poultry and control measures Chapter 4. Aquaculture: Aquaculture in India: An overview and present status and scope of aquaculture Types of aquaculture: Pond culture: Construction, maintenance and management; carp culture, shrimp culture, shellfish culture, composite fish culture and pearl culture 	
Unit - 3	
Chapter 5. Fish culture: Common fishes used for culture. Fishing crafts and gears. Construction and maintenance of aquarium: Construction of home aquarium, materials used, setting up of freshwater aquaria, aquarium plants, ornamental objects, cleaning the aquarium, maintenance of water quality. control of snail and algal growth. Modern techniques of fish seed production Chapter 6. Prawn culture: Culture of fresh and marine water prawns. Preparation of farm. Preservation and processing of prawn, export of prawn. Chapter 7. Vermiculture: Scope of vermiculture. Types of earthworms. Habit categories - epigeic, endogeic and anecic; indigenous and exotic species. Methodology of vermicomposting: containers for culturing, raw materials	14

required, preparation of bed, environmental pre-requisites, feeding, harvesting and storage of vermicompost.

- Advantages of vermicomposting.
- Diseases and pests of earthworms.

Chapter 8. Lac Culture:

- History of lac and its organization, lac production in India.
- Life cycle, host plants and strains of lac insect.
- Lac cultivation: Local practice, improved practice, propagation of lac insect, inoculation period, harvesting of lac.
- Lac composition, processing, products, uses and their pests.

Suggested Readings:

- 1. Eikichi, H. (1999). Silkworm Breeding (Translated from Japanese). Oxford & IBH Publishing Co.Pvt. Ltd., New Delhi.
- 2. Ganga, G. (2003). Comprehensive Sericulture Vol-II: Silkworm Rearing and Silk Reeling.
- 3. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
- 4. Mahadevappa, D., Halliyal, V.G., Shankar, D.G. and Bhandiwad, R., (2000). Mulberry Silk
- 5. Reeling Technology Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
- Roger, M (1990). The ABC and Xyz of Bee Culture: An Encyclopedia of Beekeeping, KindleEdition.
- 7. Shukla and Upadhyaya (2002). Economic Zoology, Rastogi Publishers
- 8. Yadav Manju (2003). Economic Zoology, Discovery Publishing House.
- 9. Jabde Pradip V (2005). Textbook of applied Zoology, Discovery Publishing House, New Delhi.
- 10. Cherian & Ramachandran Bee keeping in-South Indian Govt. Press, Madras.
- 11. Sathe, T.V. Vermiculture and Organic farming.
- 12. Bard. J (1986). Handbook of Tropical Aquaculture.
- 13. Santhanam, R. A. Manual of Aquaculture.
- 14. Zuka. R.1 and Hamiyn (1971). Aquarium fishes and plants
- 15. Jabde, P.V. (2005) Text Book of Applied Zoology: Vermiculture, Apiculture, Sericulture, Lacculture.
- 16. Animal Disease-Bairagi K. N. Anmol Publications Pvt.Ltd 2014
- 17. Economics Of Aquaculture Singh(R.K.P) Danika Publishing Company 2003
- 18. Applied and Economic Zoology (SWAYAM) web https://swayam.gov.in/nd2 cec20 ge23/preview

References: Course Books published in English and Kannada may be prescribed by the Universities and College

Pedagogy: Chalk and Talk, PPT, Group discussion, Seminar, Field visit

	Formative Assessment
Assessment Occasion	Weightage in Marks
House Examination/Test (I and II)	20
Written Assignment/Presentation/Project / Term Papers/Seminar	15
Class performance/Participation	05
Total	40

Date:

Course co-ordinator

Subject Committee Chairperson

Skill Enhancement Course in Zoology

Course Content

Semester: I	
Course Title: Vermiculture	Course Credits: 2
Code: VEC5ZOOP1	
Total Contact Hours: 56 Hours	Duration of ESA: 3 Hrs
Formative Assessment Marks: 15	Summative Assessment Marks: 35
Model Syllabus Authors:	

Course Outcomes (COs):

At the end of the course the student will be able to:

- 1. Understand the importance of earthworms in maintaining soil quality.
- 2. Learn that the vermicomposting is an effective organic solid waste management method.
- 3. Get acquainted with the importance of earthworms in agro-based economic activity.
- 4. Know that vermicomposting leads to organic farming and healthy food production.
- 5. Understand that vermicomposting may be taken up as a small scale industry by the farmers and unemployed youth.
- 6. Get jobs in teaching institutions or vermiculture units as technicians.
- 7. Learn the concept of vermicomposting as bio fertilizers thus student can become an entrepreneur after completion of the course.
- 8. Get best opportunity for self-employment and lifelong learning with farmers.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Cour Progr	se Outcomes (COs) / ram Outcomes (POs)	VEC5 ZOOP1	2	3	4	5	6	7	8	9	10	11	12
i	Core competancy.	X											
ii	Critical thinking.	X			-		_						
iii	Analytical reasoning.	X											
iv	Research skill.	X								_			
v	Team work.	X											

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Course Content

	List of labs to be conducted	56 Hrs
1	Collection of native earth worm species to study habit and habitat.	
2	Keys to identify different species of earth worm.	
3	Externals and Life cycle of Eisenia fetida and Eudrilus eugeniae.	
4	Dissection of digestive and reproductive system.	
5	Study of vermicomposting equipments and devices.	
6	Preparation of vermibeds and their maintenance.	
7	Study of different vermicomposting methods.	
8	Harvesting, separation of worms, packaging, transport and storage ofvarmicompost.	
9	Vermi-wash collection and processing.	
10	Small scale earth worm farming for home gardens and studying the effect ofvermicompost on garden plants.	
11	Budget and cost scenario of vermiculture (Project).	
12	Diseases and natural enemies of earth worms and their control measures.	
13	Role of vermitechnology in environmental protection.	
14	Economics and Marketing of vermicompost and vermi wash.	
15	Visit to vermiculture farm to acquaint with latest techniques.	

Text Books and references

- 1. Bhatt J.V. & S.R. Khambata (1959) -Role of Earthworms in Agriculture. Indian Council of Agricultural Research, New Delhi.
- Edwards, C.A. and J.R. Lofty (1977) -Biology of Earthwormsi Chapman and Hall Ltd., London.
- 3. Lee, K.E. (1985) -Earthworms: Their ecology and Relationship with Soils and Land Use. Academic Press, Sydney.
- 4. Dash, M.C., B.K.Senapati, P.C. Mishra (1980) Verms and Vermicomposting Proceedings of the National Seminar on Organic Waste Utilization and Vermicomposting Dec. 5-8, 1984, (Part B), School of Life Sciences, Sambalpur University, JyotiVihar, Orissa.
- Kevin, A and K.E.Lee (1989) Earthworm for Gardeners and Fisherman (CSIRO, Australia, Division of Soils)
- 6. Satchel, J.E. (1983) -Earthworm Ecology. Chapman Hall, London.
- 7. Wallwork, J.A. (1983) -Earthworm Biology. Edward Arnold (Publishers) Ltd. London.

Pedagogy

- 1. Demonstration
- 2. Assignment
- 3. Group discussion
- 4. Field visit
- 5. Use of Audio-Visual aids.

Formative Assessment					
Assessment Occasion	Weightage in Marks				
Class Test	05				
Attendance and Assignments	05				
Visit to vermicompost unit and report	05				
Total	15				

Date:

Course co-ordinator

Course content for II Semester B.Sc Zoology

Semester: II

Course Title: Biochemistry and Physiology	Course Credits: 4				
Course Code: DSCC5Z00T2	L-T-P per week: 4-0-0				
Total Contact Hours: 56	Duration of ESA: 3 Hours				
Formative Assessment Marks: 40	Summative Assessment Marks: 60				
Model Syllabus Authors:	Tablesoment Marks. 00				

Course outcomes:

The student at the completion of the course will be able to:

- 1. Develop a deep understanding of structure of biomolecules like proteins, lipids and carbohydrates.
- 2. Understand how simple molecules together form complex macromolecules.
- 3. Understand the thermodynamics of enzyme catalyzed reactions.
- 4. Know mechanisms of energy production at cellular and molecular levels.
- 5. Understand various functional components of an organism.
- 6. Explore the complex network of these functional components.
- 7. Comprehend the regulatory mechanisms for maintenance of function in the body.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

Course Outcomes (COs) / ProgramOutcomes (POs)	CC1	CC T2	CC 3	CC 4	CC 5	CC 6	CC 7	CC 8	CC	CC 10	CC
I Core competency		X								10	11
II Critical thinking		$ _{\mathbf{X}}$									
III Analytical reasoning		X							-		
IV Research skills		X				_					
V Team work		X			_						

Note: Course Articulation Matrix relates course outcomes of course with the corresponding programoutcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Core Course Content

Content	Hours
Unit I	14
Chapter 1. Structure and Function of Biomolecules: • Structure and Biological importance of carbohydrates (Monosaccharides, Polysaccharides and Glycoconjugates). Disaccharides	es,
 Lipids (saturated and unsaturated Fatty acids, Tri-acyl glycerols, Phospholipids, Glycolipids and Steroids) 	
 Structure, Classification and General Properties of a-amino acids; Essential and non-essential amino acids, Levels of organization in proteins; Simple and conjugate proteins. 	
Chapter 2. Enzyme Action and Regulation	_
 Nomenclature and classification of enzymes; Cofactors; Specificity of enzyme action. 	
Isozymes; Mechanism of enzyme action	
 Enzyme kinetics; Factors affecting rate of enzyme-catalyzed reactions; Equation of Michaela's -Mendon, Concept of Km and V max, Enzymeinhibition 	
Allosteric enzymes and their kinetics; Regulation of enzyme action.	
Unit 2	14
Chapter 3. Metabolism of Carbohydrates and Lipids	
 Metabolism of Carbohydrates: glycolysis, citric acid cycle, gluconeogenesis, phosphate pentose pathway Glycogenolysis and Glycogenesis Lipids- Biosynthesis of palmitic acid; Ketogenesis, 	
 β-oxidation and omega -oxidation of saturated fatty acids with even and oddnumber of carbon atoms 	
Chapter 4. Metabolism of Proteins and Nucleotides	
 Catabolism of amino acids: Transamination, Deamination, Ureacycle, Nucleotides and vitamins 	
Peptide linkages	
Unit 3	14
Chapter 5. Digestion and Respiration in humans	
Structural organization and functions of gastrointestinal tract and associated glands.	:
Mechanical and chemical digestion of food; Absorptions of carbohydrates, lipids, proteins, water minerals and vitamins; Physiology of trachea and Lung.	,
Mechanism of respiration, Pulmonary ventilation; Respiratory volumes and capacities; Transport of oxygen and carbon dioxide in blood, Respiratory pigments, Dissociation curves and the factors influencing it;	
Control of respiration.	

CI	Components of blood and their functions; hemopoiesis Blood clotting: Blood clotting system, Blood groups: Rh-factor, ABO and MN Structure of mammalian heart Cardiac cycle; Cardiac output and its regulation, Electrocardiogram, Bloodpressure and its regulation	
•	Structure of kidney and its functional unit; Mechanism of urine formation	
Cha	Unit IV Structure of recognitions and Endocrinology in humans	14
•	Structure of neuron, resting membrane potential (RMP) Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers. Types of synapse	
•	Endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas and adrenal; hormones secreted by them.	
•	Classification of hormones; Mechanism of Hormone action.	
Cha	pter 8. Muscular System in humans	
•	Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscletwitch; Motor unit, summation and tetanus	

Suggested Readings:

- I. Nelson & Cox: Lehninger's Principles of Biochemistry: McMillan (2000)
- 2. Zubay et al: Principles of Biochemistry: WCB (1995)
- 3. Voet &Voet: Biochemistry Vols I & 2: Wiley (2004)
- 4. Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press
- 5. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, XI Edition, Hercourt Asia PTELtd. W.B. Saunders Company. (2006).
- 6. Tortora, G.J. & Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons (2006).
- 7. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education (2016).
- 8. Hill, Richard W., et al. Anima l physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).
- 9. Chatterjee CC Human Physiology Volume I & 2, 11th edition, CBS Publishers (20 I 6).

Pedagogy: Written Assignment/Presentation/Project / Term/Papers/Seminars.

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test (I and II)	20
Written Assignment/Presentation/Project / Term Papers/Seminar	15
Class performance/Participation	05
Total	40

Date:

Course co-ordinator

Zoology Semester II Core Course Lab Content

Course Title/Code: Biochemistry and Physiology	Course Credits: 2
Course Code: DSCC5Z00P2	L-T-P per week: 0-0-4
Total Contact Hours: 56	Duration of ESA: 3 Hours
Formative Assessment Marks: 15	Summative Assessment Marks: 35
Model Syllabus Authors:	

Course Outcomes (COs):

At the end of the course the student should be able to:

- Understand the basic structure of biomolecules through model making.
- Develop the skills to identify different types of blood cells.
- Develop basic laboratory skills like keen observation, analysis and discussion
- Gain knowledge about functional attributes of biomolecules in animal body.
- Understand the uniqueness of enzymes in animal body and their importance through enzyme kinetics.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	CC P1	1	CC 3	CC 4	CC 5	CC 6	CC 7	CC 8	CC 9	CC 10	CC 11
I Core competency		Х									
II Critical thinking		Х									
III Analytical reasoning		X									
IV Research skills		Х									
V Team work		Х									

Note: Course Articulation Matrix relates course outcomes of course with the corresponding programoutcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Course Content

List of labs to be conducted	Hours
1. Preparation of models of nitrogenous bases- nucleosides and nucleotides.	20
2. Preparation of models of amino acids and dipeptides.	
3. Preparation of models of DNA and RNA.	
4. Qualitative analysis of Carbohydrates, Proteins and Lipids.	
5. Qualitative analysis of Nitrogenous wastes - Ammonia, Urea and Uric acid.	ŀ
6. Separation of amino acids or proteins by paper chromatography.	ļ
7. Determination of the activity of enzyme (Urease)-Effect of [S] and determination of	15
Km and Vmax.	
8. Determination of the activity of enzyme (Urease) - Effect of temperature and time.	
9. Action of salivary amylase under optimum conditions.	
10. Quantitative estimation of oxygen consumption by fresh water Crab.	
11. Quantitative estimation of salt gain and salt loss by fresh water.	-
12. Estimation of Hemoglobin in human blood using Sahli's haemoglobinometer.	15

Counting of RBC in blood using Hemocytometer. Counting of WBC in blood using Hemocytometer. Differential staining of human blood corpuscles using Leishman stain. Recording of blood glucose level by using glucometer.					
Virtual Labs (Suggestive sites)					
https://www.vlab.co.in					
https://zoologysan.blogspot.com/www.vlab.iitb.ac.in/vlab					
www.onlinelabs.inwww.powershow.com					
https://vlab.amrita.edu					
https://sites.dartmouth.edu	ŀ				

Text Books

- 1. Nelson & Cox: Lehninger's Principles of Biochemistry: McMillan (2000)
- 2. Zubay et al: Principles of Biochemistry: WCB (1995)
- 3. Voet & Voet: Biochemistry Vols 1 & 2: Wiley (2004)
- Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press
- Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, XI Edition, Hercourt AsiaPTE Ltd. /W.B. Saunders Company. (2006).
- 6. Tortora, G.J. & Grabowski, S. Principles of Anatomy & Physiology. XI Edition JohnWiley & sons (2006).
- Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rdEdition, Pearson Education (2016).
- Hill, Richard W., et al. Anima I physiology. Vol. 2. Sunderland, MA: Sinauer Associates (2004).
- 9. Chatterjee CC Human Physiology Volume I & 2, 11th edition, CBS Publishers (2016).

Web References:

• Mammalian Physiology-www.biopac.com

Pedagogy: Lectures, Presentations, videos, Virtual Labs, Assignments, Tests, Individualor group Field oriented Project Report on or visit to a research institute.

TOPICS RECOMMENDED FOR SEMINAR/PROJECT REPORT

- 1. Biochemical pathways, their evolutionary background and regulation.
- 2. Blood groups and their importance.
- 3. Vital enzymes for human body.
- 4. Essential and nonessential amino acids.
- 5. Important body lipids.
- Significance of animal proteins.
- 7. Role of carbohydrates in animal body.
- 8. Nature of proteins and nurture of animal body.
- 9. Role of lipids in structural and functional organization of body.

Formative Assessment					
Assessment Occasion	Weightage in Marks				
Assignment/Monograph	05				
Test	05				
Participation in class	05				
Total	15				

Date:

Course Co-ordinator

Course Content

II Semester B. Sc. (Hons) Zoology

Minor Core course

Course Title: Paper I - Biology of chordates	Course Code: MDC5ZOOT2
Course Type: Minor Discipline Core Theory, L-T-P: 4-0-0	Course Credits: 4
Total Contact Hours: 56	Duration of ESA: 3 Hrs.
Formative Assessment Marks: 40	Summative Assessment Marks: 60
Model Syllabus Authors:	

Course Outcomes (COs):

At the end of the course the student should be able to:

- 1. Learn the structural biology of Chordates through their adaptive features.
- 2. Study the functional biology of Chordates through their body organization and functions.
- 3. Comprehend the identification of species and their evolutionary relationships.
- 4. Acquire the research skills like critical thinking.
- 5. Develop abilities required for industrial employment as well as self-employment.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

Course Outcomes (COs)/(POs)	MDC5ZOO T1	MDC5ZOO T2	MDC5ZOO T3	MDC5ZOO T4	MDC5ZOO T5	MDC5ZOO T6
I Core competency		X				323
II Critical thinking		X				
III Analytical reasoning	R	X			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
IV Research skills		X	-		W 100	
V Team work		Х		is the second	-	

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Davangere University Shivagangotri, Davange...

Course Content	Hrs
Unit I	14
Chapter 1: Hemichordata:	
Type Study of <i>Balanoglossus</i> – Habit and Habitat, Morphology, Coelom.	
Tornaria larva and its affinities.	
Affinities and systematic position of Hemichordata.	
Chantan 1. Chandatas	
Chapter 1: Chordates: Origin of Chordates.	
Basic characters of chordates and classification up to classes.	
Dasic characters of chordates and classification up to classes.	
Chapter 3: Urochordata:	
Type Study of Herdmania-Habit and Habitat, Morphology,	
Ascidian tadpole- structure and its retrogressive metamorphosis.	
Chapter 4: Cephalochordata :	
Type Study of <i>Branchiostoma</i> (<i>Amphioxus</i>)-Habit and Habitat, Morphology,	
Digestive system, Feeding mechanism and circulatory system.	
Chantau 5, t anotha	
Chapter 5: Agnatha General characters of Agnatha and classification up to classes.	
Salient features of Cyclostomata and Ostracodermi with orders and	
examples.	
Ammocoete larva and its significance.	
Unit II	14
Chapter 6: Vertebrates:	
General characters and Classification of different classes of vertebrates (Pisces, Amphibia, Reptilia, Aves, Mammalia) up to the order withexamples. General characters of Chondrichthyes and Osteichthyes. Interesting features and evolutionary significance of Dipnoi. Salient features of Placodermi with examples. Interesting features of Sphenodon. Interesting features of Archaeopteryx. Salient features of Ratitae and Carinatae with examples. Interesting features of mammalian orders (Insectivora, Carnivora, Chiroptera, Cetacea, Proboscidia, Ungulata – Perissodactyla and Artiodactyla, and Primates – Platyrhini and Catarhini) with examples.	a a
Unit III	14
Chapter 7: General account of Chordates:	
Types of caudal fins and tails in fishes.	
Osmoregulation and Swim bladder in Fishes.	
Origin of Amphibia.	
Neoteny and Paedogenesis.	
Adaptive radiation in extinct reptiles with suitable examples.	
Temporal fossae in reptiles.	
Poison apparatus and biting mechanism in snakes. Parental care in Pisces, Amphibians, Reptiles, Birds and Mammals.	
Dentition in mammals. Evolution of molar tooth.	
Migration in Pisces, and Birds and Mammals.	
appendicular skeleton, except hands and feet) Digestive system, circulatory system,	
Chapter 8: Type study of Rattus: Morphology, Endoskeleton (Axial and	

Unit IV	14
Beneficial chordates	
Chapter 9:Pisciculture	
Meaning of Aquaculture and Pisciculture, inland and marine fisheries. Inland Pisciculture – Procedure, composite fish forming and significance. A brief account of fishing gears and crafts. Fish processing and preservation.	
Chapter 10:Poultry	
Definition, breeds of Fowls.	
Indigenous and exotic breeds with suitable examples.	
Poultry products and by-products.	
Diseases of poultry - Ranikhet, Fowl pox, Fowl Cholera, Fowl Typhoid.	
Chapter 11:Dairy	
Breeds of cattle: indigenous and exotic breeds.	
Improvements in cattle breeding – artificial insemination, MOET.	
Pasteurization and gobar gas.	
Diseases in cattle- Foot and Mouth diseases, causes and effects.	

Topics Suggested for Assignment/Formative Assessment:

1. Animal connecting links. 2. Migration in Birds 3. Communication in Primates 4. Parental Care in Animals 5. Neoteny 6. Paedogenesis 7. Poultry management 8. Dairy Management 9. Fisheries management 10. Products and by-products of Diary.

Suggested Readings:

- 1. Harvey et al: The Vertebrate Life (2006)
- Colbert et al: Colbert's Evolution of the Vertebrates: A history of the backboned animals through time (5th ed. 2002, Wiley-Liss)
- 3. Hildebrand: Analysis of Vertebrate Structure (4th ed. 1995, John Wiley)
- 4. Kenneth V. Kardong (2015) Vertebrates: Comparative Anatomy, Function, Evolution McGraw Hill
- 5. McFarland et al: Vertebrate Life (1979, Macmillan Publishing)
- 6. Parker and Haswell: Text Book of Zoology, Vol.II (1978, ELBS)
- 7. Romer and Parsons: The Vertebrate Body (6th ed. 1986, CBS Publishing Japan)
- 8. Young: The Life of vertebrates (3rd ed. 2006, ELBS/Oxford)
- 9. Weichert C. K and William Presch (1970). Elements of Chordate Anatomy, Tata McGraw Hill.

Web Sources:

- https://www.khanacademy.org/science/biology/crash-course-bioecology/crashncourse-biology-science/v/crash-course-biology-123
- 2. https://opentextbc.ca/biology2eopenstax/chapter/chordates/

Pedagogy: Lectures, Presentations, videos, Assignments and Weekly Formative AssessmentTests.

Forma	ntive Assessment
Assessment Occasion	Weightage in Marks
Assignment/ Field Report/ Project	15 Marks
Test (I and II)	20 Marks
Participation in class	· 05 marks
Total	40 Marks

Date:

Course Co-ordinator

Minor Core Course Lab Content

Semester: II Zoology

Course Title: Lab on Biology of Chordates, L-T-P: 0-0-4	Course Credits: 2
Total Contact Hours: 56	Duration of ESA: 3 Hours
Formative Assessment Marks: 15	Summative Assessment Marks: 35
Model Syllabus Authors:	

Course Outcomes (COs):

At the end of the course the student should be able to:

- 1. Understand basics of classification of Chordates.
- 2. Learn the diversity of habit and habitat of animal species.
- 3. Develop the skills to identify different classes and orders of Chordates.
- 4. Know uniqueness of particular animal and its importance
- 5. Acquire basic laboratory skills like keen observation and drawing.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

Course Outcomes(COs) / Program Outcomes (POs)	MDC5ZOO P 1	MDC5ZOO P2	MDC5ZOO P3	MDC5ZOO P4	MDC5ZOO P5	MDC5ZOO P6
I Core competency		Х				
II Critical thinking		X				
III Analytical reasoning		Х				
IV Research skills		X				
V Team work		X				

Note: Course Articulation Matrix relates course outcomes of course with the corresponding programoutcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Minor Course Lab Content

List of labs to be conducted	56 Hours
1. Protochordata:	
Balanoglossus and its T. S through proboscis.	
Ascidian / Herdmania and Amphioxus, T.S. of Amphioxus through pharynx and intestine.	
2. Cyclostomata:	
-Petromyzon, Ammocoete larva and Myxine.	
3. Pisces:	
- Cartilaginous Fishes - Narcine, Trygon, Pristis, Myolobaties	
- Bony Fishes - Zebra fish, Hippocampus, Muraena, Ostracion, Tetradon,	
Pleuronectus, Diodon, Echeneis.	
4. Ornamental fishes:	
-Siamese, Koi, Oscar, Betta Sp., Neon tetra, Guppies, Gold fish, Angle	
fish, Rainbow fish, Mollies.	
5. Accessory respiratory organs - Saccobranchus, Clarias and	
Anabas.	
6. Amphibia:	
-Frog, Bufo, Ambystoma, Axolotl larva, Necturus and Ichthyophis.	
7. Reptilia:	
-Turtle, Tortoise, Mabuya, Calotes, Chameleon, Varanus.	
snakes - Dryophis, Rat snake, Brahmini, Cobra, Krait, Russell's viper and Hydrophis; Poison	
apparatus.	1
8. Aves: Beak and feet modifications in the following examples: Duck, Crow, Sparrow,	
Humming bird, Parrot, King fisher, Eagle or Hawk.	
A 24	
9. Mammalia:	
-Mongoose, Squirrel, Pangolin, Hedge Hog, Rabbit, Rat, Monkey and Loris.	
40	
10. Virtual Dissection/Cultured specimens:	
-Shark/Bony fish: Afferent and efferent branchial systems, glossopharyngeal and	
vagus nerves.	****
ffave and to the second	
11. Virtual Dissection/Cultured specimens:	
- Frog: Origin and distribution of trigeminal nerve.	
10 V + 10 V + 40 V + 1	
12. Virtual Dissection/Cultured specimens:	
-Rat: Dissection (only demonstration) – Circulatory system (arterial and venous), urinogenital system.	
umogental system.	
Beneficial Chordates:	
13. Pisciculture:	
Cultured varieties of fishes- fresh water and marine water fishes (locally available)	
Diseases- (Bacterial, viral, fungal and parasitic)	
Products and by products - (Meat, gelatin, Insulin, Isinglass, protein and chitin)	:
* 100accs and by products- (weat, genant, mount, isingless, protein and entain)	

14. Poultry: Cultured varieties-Indigenous and exotic species.

Diseases-Bacterial and viral.

Products and by-products - Meat, Eggs, albumin flakes and manure.

15. Dairy: Cultured varieties-Indigenous and exotic breeds.

Diseases-Infectious, hereditary and deficiency.

Products and by-products - Milk, Cheese, Yougurt.

Suggested Readings:

- 1. Harvey et al: The Vertebrate Life (2006)
- Colbert et al: Colbert's Evolution of the Vertebrates: A history of the backboned animals through time (5th ed. 2002, Wiley-Liss)
- 3. Hildebrand: Analysis of Vertebrate Structure (4th ed. 1995, John Wiley)
- 4. Kenneth V. Kardong (2015) Vertebrates: Comparative Anatomy, Function, Evolution McGraw Hill
- 5. McFarland et al: Vertebrate Life (1979, Macmillan Publishing)
- 6. Parker and Haswell: Text Book of Zoology, Vol.II (1978, ELBS)
- Romer and Parsons: The Vertebrate Body (6th ed. 1986, CBS Publishing Japan)
- 8. Young: The Life of vertebrates (3rd ed. 2006, ELBS/Oxford)
- 9. Weichert C. K and William Presch (1970). Elements of Chordate Anatomy, Tata McGraw Hill.

Web Sources:

- 1. https://www.khanacademy.org/science/biology/crash-course-bio
- 2. https://opentextbc.ca/biology2eopenstax/chapter/chordates/

Pedagogy: Lectures, Presentations, videos, Assignments and Weekly Formative AssessmentTests.

Formati	ve Assessment
Assessment Occasion .	Weightage in Marks
Assignment/Monograph	05
Test	05
Participation in class	05
Total	15

Date:

Course Co-ordinator

Open Elective Course Content

Semester: II Zoology

Course Title: Parasitology Course Code: OEC5ZOOT2	Course Credits: 3
Total Contact Hours: 42	Duration of ESA: 3 Hours
Formative Assessment Marks: 40	Summative Assessment Marks:60
Model Syllabus Authors:	

Course Outcomes (COs):

At the end of the course the students will be able to:

- 1. Know the stages of the life cycles of the parasites and infective stages.
- 2. Develop ecological model to 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.
- 3. Develop skills and realize significance of diagnosis of parasitic infection and treatment.
- 4. Understand about diseases caused by Protozoa, Helminthes, Nematodes and Arthropods at molecular level.
- 5. Develop their future career in medical sciences and related administrative services.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

Course Outcomes (COs) / Program Outcomes (POs)	CC 1	CC 2	CC 3	CC 4	CC 5	CC 6	CC 7	CC 8	CC 9	CC 10	CC 11	CC 12
I Core competency	X											
II Critical thinking	X											
III Analytical reasoning	X											
IV Research skills	X				•							
V Team work												

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a courseoutcome addresses a particular program outcome.

Course Content

	42Hrs
Unit – 1	
Chapter 1. General Concepts	14
 Introduction, Parasites, parasitoids, host, zoonosis 	
Origin and evolution of parasites	
 Basic concept of Parasitism, symbiosis, phoresis, commensalisms and mutualism 	
Host-parasite interactions and adaptations	
Life cycle of human parasites	
Occurance, mode of infection and prophylaxis	
Chapter 2. Parasitic Platyhelminthes	
 Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of 	
• Fasciolopsisbuski]
• Schistosomahaematobium	
• Taeniasolium	
Hymenolepis nana	
Chapter 3. Parasitic Protists	
 Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of 	
Entamoeba histolytica	
Giardia intestinalis	
• Trypanosoma gambiense	
Plasmodium vivax	
Unit – 2	14
Chapter 4. Parasitic Nematodes	
Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of	
Ascaris lumbricoides	
Ancylostoma duodenale	
Wuchereria bancrofti	
Trichinella spiralis	
Nematode plant interaction; Gall formation.	
Chapter 5. Parasitic Arthropods	
Biology, importance and control of	
Ticks (Soft tick Ornithodoros, Hard tick Ixodes)	
• Mites(Sarcoptes)	
• Lice (Pediculus)	
, , ,	
Flea (Xenopsylla)Bug (Cimex)	
Parasitoid (Beetles)	
Chapter 6. Parasitic Vertebrates	
Cookicutter Shark	
Hood Mocking bird	
Vampire bat and their parasitic behavior and effect on host	
Unit – 3	14
hapter 7. Molecular diagnosis & clinical parasitology	
General concept of molecular diagnosis for parasitic infection	
Advantages and disadvantages of molecular diagnosis	
Fundamental techniques used in molecular diagnosis of endoparasites	
Immunoassay or serological techniques for laboratory diagnosis of endoparasites on the	
basis of marker molecules like G. intestinalis, B. coli, E. histolytica, L. donovani, and	
basis of marker molecules like G. intestinalis, B. coli, E. histolytica, L. donovani, and Malarial parasite using ELISA, RIA, Counter Current Immunoelectrophoresis (CCI)	
basis of marker molecules like G. intestinalis, B. coli, E. histolytica, L. donovani, and Malarial parasite using ELISA, RIA, Counter Current Immunoelectrophoresis (CCI) Complement Fixation Test (CFT) PCR, DNA, RNA probe	

Suggested Readings:

- 1. Arora, D. R and Arora, B. (2001) Medical Parasitology. II Edition. CBS Publications and Distributors.
- E.R. Noble and G.A. Noble (1982) Parasitology: The biology of animal parasites. V Edition, Lea & Febiger.
- 3. Ahmed, N., Dawson, M., Smith, C. and Wood, Ed. (2007) Biology of Disease. Taylor and Francis Group.
- 4. Parija, S. C. Textbook of medical parasitology, protozoology & helminthology (Text and colour Atlas), II Edition, All India Publishers & Distributers, Medical Books Publishers, Chennai, Delhi.
- 5. Meyer, Olsen & Schmidt's Essentials of Parasitology, Murray, D. Dailey, W.C. Brown Publishers.
- 6. K. D. Chatterjee (2009). Parasitology: Protozoology and Helminthology. XIII Edition, CBSPublishers & Distributors (P) Ltd.
- 7. Gunn, A. and Pitt, S.J. (2012). Parasitology: an Integrated Approach. Wiley Blackwell.
- 8. Noble, E. R. and G.A.Noble (1982) Parasitology: The biology of animal parasites. Vth Edition, Lea & Febiger.
- Paniker, C.K.J., Ghosh, S. (Ed) (2013). Paniker's Text Book of Medical Parasitology. Jaypee, New Delhi.
- Parija, S.C. Textbook of medical parasitology, protozoology & helminthology (Text and color Atlas), IIEdition, All India Publishers & Distributers, Medical Books Publishers, Chennai, Delhi.
- Roberts, L.S and Janovy, J. (2009). Smith & Robert's Foundation of Parasitology. 8th Edn. McGrawHill.
- 12. Bogitsh, B. J. and Cheng, T. C. (2000). Human Parasitology. 2nd Ed. Academic Press, New York.
- 13. Chandler, A. C. and Read. C. P. (1961). Introduction to Parasitology, 10th ed. John Wiley and Sons Inc.
- 14. Cheng, T. C. (1986). General Parasitology. 2nd ed. Academic Press, Inc. Orlando.U.S.A.
- Schmidt, G. D. and Roberts, L. S. (2001). Foundation of Parasitology. 3rd ed. McGraw HillPublishers.
- 16. Schmidt, G. D. (1989). Essentials of Parasitology. Wm. C. Brown Publishers (Indian print1990, Universal Book Stall).
- 17. John Hyde (1996) Molecular Parasitology Open University Press.
- J Joseph Marr and Miklos Muller (1995) Biochemistry and Molecular Biology of Parasites 2nd Ed. Academic Press.

Course Books published in English and Kannada may be prescribed by the Universities and College

Pedagogy: Chalk and Talk, PPT, Group discussion, Seminar, Interaction, virtual lab, Lab visit

Formative Assessn	nent
Assessment Occasion	Weighta ge in Marks
House Examination/Test (I and II)	20
Written Assignment/Presentation/ Project/ Term Papers/Seminar	15
Class performance/Participation	05
Total	40

Date:

Course co-ordinator

Skill Enhancement Course Content

Semester: II Zoology

Course Title: Sericulture	Course Credits: 2
Course Code: VEC5ZOOP2	
Total Contact Hours: 56 Hours	Duration of ESA: 3 Hrs.
Formative Assessment Marks: 15	Summative Assessment Marks: 35
Model Syllabus Authors:	

Course Outcomes (COs):

At the end of the course the student acquires the following knowledge:

- 1. Sericulture is an agro-based industry which gives economic empowerment to the students.
- 2. Sericulture may be taken up as a small scale industry by the small farmers and unemployed youth.
- 3. Get jobs in teaching profession, silk board and other Govt. institutions as technicians.
- 4. Student can be self-employed after successful completion of the course.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)		VEC5ZOO P1	VEC5ZOO P2	3	4	5	6	7	8	9	10	11	12
i	Core competancy.		X										
ii	Critical thinking.		X										
iii	Analytical reasoning.		X										
iv	Research skill.		X										
v	Team work.		X										

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Course Content

	List of Lab to be conducted	42 Hrs
1	Morphology and taxonomy of mulberry.	<u> </u>
2	Raising of saplings - cutting preparation, planting and maintenance ofnursery.	
3	Agronomical practices in mulberry cultivation-weeding, manuring, irrigationand harvesting.	
4	Diseases and pests of mulberry.	
5	Silk producing insects – non mulberry and mulberry silk worms.	
5	Life cycle and morphology of Bombyx mori.	
7	Dissection of digestive system and silk glands of Bombyx mori.	
3	Silk worm rearing equipments.	
)	Rearing process - incubation, chawki rearing, late age worm rearing, mounting and harvesting	

	of cocoons.	
10	Silk worm diseases and pests – Grasserie, Flacherie, Muscardine, Pebrine, Uzi fly and Beetles.	
11	Grainages – production of silk worm eggs.	
12	Physical and commercial characteristics of cocoons.	
13	Reeling and weaving process – stiffling, cooking, brushing, reeling and re-reeling, different types of looms.	
14	Visit to mulberry farm and sericulture centre.	
15	Economics of silk production (Project)	

Text Books and References

- 1. Govindan, R., Narayanswami, T.K and Devaiah, M.C.1998, Principles of silk worm pathology. Ser Publishers, Bangalore.
- 2. Tazima, Y.1964 The genetics of the silk worm Logos Press Ltd. London.
- 3. Tazima Y 1978 The silk worm an important laboratory tool Kodnasha Ltd. Tokyo.
- 4. Ganga G, Sulochana Chetty J An introduction to sericulture Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
- 5. Ullal and Narasimhanna. Hand book of practical sericulture.
- 6. FAO Mannuals on sericulture vol. 1-4.
- 7. Tazima Y 1958 Silkworm egg CSB Publication, Bombay.
- 8. Yashimoro Tanaka 1964. Sericology. CSB Publication, Bombay.

Pedagogy

- 1. Demonstration
- 2. Assignment
- 3. Group discussion
- 4. Field Visit.
- 5. Use of Audio-Visual aids.

Formative Assessment					
Assessment Occasion	Weightage in Marks				
Class Test	05				
Attendance and Assignments	05				
Visit to Mulberry Farm and Sericulture centre.	05				
Total	15				

Date:

Course co-ordinator

Subject Committee Chairperson

Davangere

Shivagangotri, Davangere.

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Davangere University

B.Sc. I & II Semester Model Question Paper MAX.MARKS:60 Zoology

Note: All Sections Are Compulsory

Section - A

1.	Answer any live of the following		5X2=10
	1.		
	2.		
	3.		
	4.		
	5.		
	6.		
	7.		
	8.		
	Section	- B	
II.	Answer any four of the following		5X4=20
	9.		071-20
	10.		
	11.		
	12.		
	13.		
	14.		
	15.		
	16.		
	Section	- C	
III.	Answer any three of the following	3	3X10=30
	17.		02110 00
	18.		
	19.		
	20.		
	21.		
		(bg.	
		Registrar	
		Registral	
		Davangere University Shivagangotri, Davangere.	
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