V.V.VANNIAPERUMAL COLLEGE FOR WOMEN

(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM REGULATIONS AND SYLLABUS
(with effect from Academic Year 2023 - 2024)

V.V.Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 13 UG Programmes (Aided), 15 UG Programmes (SF), 15 PG Programmes and 6 Ph.D. Programmes. The curricula for all these Programmes, except Ph.D. Programmes, have been framed as per the guidelines given by the University Grants Commission (UGC) &Tamil Nadu State Council for Higher Education (TANSCHE) under Choice Based Credit System (CBCS) and the guidelines for Outcome Based Education (OBE).

The Departments of Commerce, English, History, Mathematics, Biochemistry and Tamil upgraded as Research Centres offer Ph.D. Programmes as per the norms and regulations of Madurai Kamaraj University, Madurai and do not come under the purview of CBCS.

A. CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose Courses from the prescribed Courses. The CBCS is followed as per the guidelines formulated by the UGC. The performance of students is evaluated based on the uniform grading system. Computation of the Cumulative Grade Point Average (CGPA) is made to ensure uniformity in evaluation system.

List of Programmes in which CBCS/Elective Course System is implemented

UG PROGRAMMES

Arts & Humanities	:	History (E.M. & T.M.), English, Tamil
Physical & Life Sciences	:	Mathematics, Zoology, Chemistry, Physics, Biochemistry, Home Science - Nutrition and Dietetics, Costume Design and Fashion, Microbiology, Biotechnology, Computer Science, Information Technology, Data Science, Computer Applications and Computer Applications - Graphic Design
Commerce & Management	:	Commerce, Commerce (Computer Applications), Commerce (Professional Accounting), Business Administration

PG PROGRAMMES

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Physics, Chemistry, Zoology, Biochemistry, Home Science - Nutrition and Dietetics, Biotechnology, Computer Science, Computer Science (Data Science) and Computer Applications (MCA) *
Commerce & Management	:	Commerce, Business Administration (MBA) *

* AICTE approved Programmes

OUTLINE OF CHOICE BASED CREDIT SYSTEM – UG

1. Core Courses
2. Elective Courses
   - Generic Elective Courses
   - Discipline Specific Elective Courses (DSEC)
   - Non Major Elective Courses (NMEC)
3. Skill Enhancement Courses (SEC)
4. Environmental Studies (EVS)
5. Value Education
6. Self Study Courses (Online)
7. Extra Credit Courses (Self Study Courses) (Optional)

List of Non Major Elective Courses (NME)

(2023-2024 onwards)

UG PROGRAMMES

Name of the Course	Course Code	Semester	Department
Introduction to Tourism	23UHIN11	I	History(EM)
Indian Constitution	23UHIN21	II	History(EM)
சுற்றுலா ஓர் அறிமுகம்	23UHIN11	I	History (TM)
இந்திய அரசியலமைப்பு	23UHIN21	II	History(TM)
Popular Literature and Culture	23UENN11	I	English
English for Professions	23UENN21	II	
பேச்சுக்கலைத்திறன்	23UTAN11	I	Tamil
பயன்முறைத் தமிழ்	23UTAN21	II	
Practical Banking Basic Accounting Principles	23UCON11 23UCON22	I II	Commerce (Aided)
Financial Literacy-I Financial Literacy -II	23UCON12 23UCON21	I II	Commerce (SF)
Self-Employment and Startup Business	23UCCN11	I	Commerce CA (SF)

Fundamentals of Marketing	23UCCN21	II	
Women Protection Laws	23UCPN11	I	Commerce (Professional Accounting)
Basic Labour Laws	23UCPN21	II	
Basics of Event Management	23UBAN11	I	Business Administration
Business Management	23UBAN21	II	
Quantitative Aptitude I	23UMTN11	I	Mathematics
Quantitative Aptitude II	23UMTN21	II	
Physics for Everyday life -I	23UPHN11	I	Physics
Physics for Everyday life -II	23UPHN21	II	
Food Chemistry	23UCHN11	I	Chemistry
Drugs and Natural Products	23UCHN21	II	
Ornamental fish farming and Management	23UZYN11	I	Zoology
Biocomposting for Entrepreneurship	23UZYN21	II	
Foundations of Baking and Confectionery	23UHSN11	I	Home Science – Nutrition and Dietetics
Basic Nutrition and Dietetics	23UHSN21	II	
Nutrition and Health	23UBCN11	I	Biochemistry
Life Style Diseases	23UBCN21	II	
Social and Preventive Medicine	23UMBN11	I	Microbiology
Nutrition & Health Hygiene	23UMBN21	II	
Herbal Medicine	23UBON11	I	Biotechnology
Organic farming and Health Management	23UBON21	II	
Basics of Fashion	23UCFN11	I	Costume Design And Fashion
Interior Designing	23UCFN21	II	
Office Automation	23UCSN11	I	Computer Science
Introduction to Internet and HTML 5	23UCSN21	II	
Office Automation	23UITN11	I	Information Technology
Introduction to HTML	23UITN21	II	
Introduction to HTML	23UCAN11	I	Computer Applications
Fundamentals of Computers	23UCAN21	II	
Introduction to HTML	23UGDN11	I	Computer Applications - Graphic Design
Fundamentals of Computers	23UGDN21	II	
Organic Farming	23UBYN11	I	Botany
Nursery and Landscaping	23UBYN12		
Mushroom Cultivation	23UBYN21	II	
Medicinal Botany	23UBYN22		
Cadet Corps for Career Development I	23UNCN11	I	National Cadet Corps
Cadet Corps for Career Development II	23UNCN21	II	

B. OUTCOME BASED EDUCATION (OBE) FRAMEWORK

The core philosophy of Outcome Based Education rests in employing a student - centric learning approach to measure the performance of students based on a set of pre-determined outcomes. The significant advantage of OBE is that it enables a revamp of the curriculum based on the learning outcomes, upgrade of academic resources, quality enhancement in research and integration of technology in the teaching –learning process. It also helps in bringing clarity

among students as to what is expected of them after completion of the Programme in general and the Course in particular. The OBE directs the teachers to channelize their teaching methodologies and evaluation strategies to attain the PEOs and fulfill the Vision and Mission of the Institution.

Vision of the Institution

The founding vision of the Institution is to impart Quality Education to the rural womenfolk and to empower them with knowledge and leadership quality.

Mission of the Institution

The mission of the Institution is to impart liberal education committed to quality and excellence. Its quest is to mould learners into globally competent individuals instilling in them life-oriented skills, personal integrity, leadership qualities and service mindedness.

B.1 Programme Educational Objectives, Programme Outcomes and Programme Specific Outcomes

It is imperative for the institution to set the Programme Educational Objectives (PEOs), Programme Outcomes (POs) and Course Outcomes (COs), consistent with its Vision and Mission statements. The PEOs and the POs should be driven by the mission of the institution and should provide distinctive paths to achieve the stated goals. The PEOs for each Programme have to fulfill the Vision and Mission of the Department offering the Programme.

Vision of the Department of Zoology

- To cater the students to be competent in the field of life science and responsible for the betterment of society.

Mission of the Department of Zoology

- To impart the quality education to meet out the needs of rural women folk.
- To motivate them to apply the academic skills for the improvement of society.
- To mould the students to be responsible and successful citizens.

B.1.1 Programme Educational Objectives (PEOs)

PEOs are broad statements that describe the career and professional achievements that the Programme is preparing the graduates to achieve within the first few years after graduation. PEOs are framed for each Programme and should be consistent with the mission of the Institution.

Programme Educational Objectives (PEOs) of B.Sc. Zoology Programme

The students will be able to

- To mould the students into efficient professionals in educational Institutions, Research centres, Medical laboratory, Zoos, Museums etc.
- To empower the learners with skills to promote self-employment opportunities.
- To uphold the moral standards of students to enable them to face challenges in life and to be better citizens.

Key components of mission statement	PEO1	PEO2	PEO3
To impart quality education to meet out the needs of rural women folk.	√	√	-
To mould the students to be responsible and successful citizens.		√	√
To motivate them to apply the academic skills for the improvement of society.	√	√	√

B.1.2 Programme Outcomes (POs)

POs shall be based on Graduate Attributes (GAs) of the Programme. The GAs are the attributes expected of a graduate from a Programme in terms of knowledge, skills, attitude and values. The Graduate Attributes include Disciplinary Knowledge, Communication Skills, Critical Thinking, Problem Solving, Analytical Reasoning, Research Related Skills, Co-operation/Team Work, Scientific Reasoning, Reflective Thinking, Information/Digital Literacy, Multicultural Competence, Moral and Ethical Awareness/Reasoning, Leadership Qualities and Lifelong Learning.

On successful completion of the Programme, the students will be able to

1 apply effectively the acquired knowledge and skill in the field of Arts, Physical Science, Life Science, Computer Science, Commerce and Management for higher studies and employment. (*Disciplinary Knowledge*)

2 articulate innovative thoughts and ideas proficiently in both in spoken and written forms. (*Communication Skills)*

3 identify, formulate and solve problems in real life situations scientifically / systematically by adapting updated skills in using modern tools and techniques. (*Scientific Reasoning and Problem Solving)*

4 critically analyse, synthesize and evaluate data, theories and ideas to provide valid suggestions through assignments, case studies, Internship and projects for the fullfillment of the local, national and global developmental needs. (*Critical Thinking and Analytical Reasoning)*

5 use ICT in a variety of self-directed lifelong learning activities to face career challenges in the changing environment. (*Digital Literacy, Self - directed and Lifelong Learning)*

6 self-manage and function efficiently as a member or a leader in diverse teams in a multicultural society for nation building. (*Co-operation/Team Work and Multicultural Competence)*

7 uphold the imbibed ethical and moral values in personal, professional and social life for sustainable environment. (*Moral and Ethical Awareness)*

B.1.3 Programme Specific Outcomes (PSOs)

Based on the Programme Outcomes, Programme Specific Outcomes are framed for each UG Programme**.** Programme Specific Outcomes denote what the students would be able to do at the time of graduation. They are Programme specific. It is mandatory that each PO should be mapped to the respective PSO.

On completion of B.Sc. Zoology Programme, the students will be able to

PO1- *Disciplinary Knowledge*

PSO 1.a: Apply their knowledge of fundamental principles in biological sciences to pursue higher studies in interdisciplinary subjects and compete in their profession.

PSO 1.b: Use their practical skills gained in various branches of Biology to promote their career, entrepreneurial skills and research activities.

PO2-*Communication Skills*

PSO 2: Communicate the biological concepts confidently in interviews and career for their personal betterment and extension programmes to create awareness among the villagers.

PO3- *Scientific Reasoning and Problem Solving*

PSO 3.a: Identify the causes for the environmental and health issues by the application of biological principles.

PSO 3.b: Solve the problems in the management of quality of environmental resources and culture units of economically valuable animals by adapting the scientific methods.

PO4 - *Critical thinking and Analytical Reasoning*

PSO 4.a: Design innovative projects for the betterment of their research endeavors in the various branches of animal sciences.

PSO 4.b: Design self employment units with the knowledge gained in applied biology to promote self employment and entrepreneurship in the society.

PSO5- *Digital Literacy, Self - directed and Lifelong Learning*

PSO 5: Use their computer skills in M.S Office to compete in their higher education, competitive examinations and career.

PO6 - *Cooperation/Team Work and Multi-Cultural Competence*

PSO 6: Work efficiently with team spirit in a team for its success by the skills acquired through internship programmes and group practicals and assignments.

PO7 –*Moral and Ethical Awareness*

PSO 7: Could develop scientific responsibilities regarding the disposal of wastes, usage of natural products instead of chemicals in day today life and preservation of fauna in their locality.

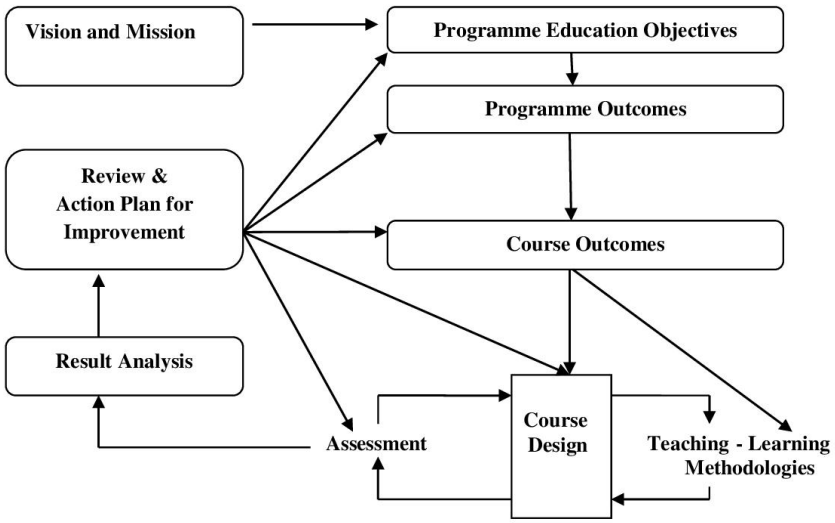
PO-PEO Mapping Matrix

Attainment of PEOs can be measured by a PO-PEO matrix. PEOs should evolve through constant feedback from alumnae, students, industry, management, *etc*. It is mandatory that each PEO should be mapped to at least one of the POs.

PEOs / POs/PSOs	PEO1	PEO2	PEO3
PO1/PSO1.a	-	✓	✓
PO1/PSO1.b	✓	✓	✓
PO2/PSO2.a	✓	✓	-
PO2/PSO2.b	✓	✓	-
PO3/PSO3	-	✓	✓
PO4/PSO4.a	-	✓	✓
PO4/PSO4.b	✓	✓	-
PO5/PSO5	✓	✓	-
PO6/PSO6	-	✓	✓
PO7/PSO7	-	-	✓

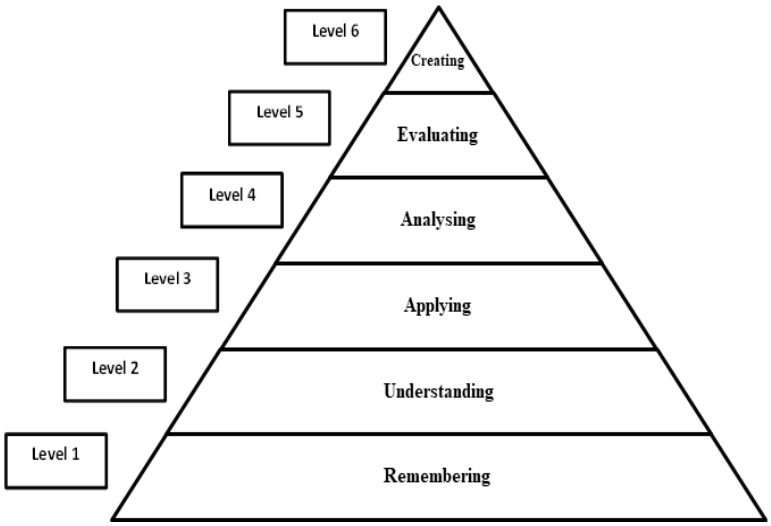
B.1.4 Course Outcomes (COs)

Course Outcomes are narrow statements restricted to the Course contents given in five units. Course Outcomes describe what students would be capable of, after learning the contents of the Course. They reflect the level of knowledge gained, skills acquired and attributes developed by the students after learning of Course contents. COs are measurable, attainable and manageable in number. COs contribute to attain POs in such a way that each CO addresses at least one of the POs and also each PO is reasonably addressed by adequate number of COs.



It is important to determine the methods of assessment. A comprehensive assessment strategy may be outlined using the revised Bloom's Taxonomy levels.

BLOOM'S TAXONOMY



CO – PO Mapping of Courses

After framing the CO statements, the COs framed for each Course is mapped with POs based on the relationship that exists between them. The COs which are not related to any of the

POs is indicated with (-), signifying Nil. Measurement Mapping is based on Four Points Scale [High (H), Medium (M), Low (L) and Nil (-)]. For calculating weighted percentage of contribution of each Course in the attainment of the respective POs, the weights assigned for H, M and L are 3, 2and 1 respectively.

CO-PO/PSO Mapping Table (Course Articulation Matrix)

PO/PSOs / COs	PO1/ PSO1	PO2/ PSO2	PO3/ PSO3	PO4/ PSO4	PO5/ PSO5	PO6/ PSO6	PO7/ PSO7
CO1							
CO2							
CO3							
CO4							
CO5							

ELIGIBILITY FOR ADMISSION

The candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Tamil Nadu or any other equivalent examination accepted by the Academic Council with Biology or Zoology and Botany as one of the subjects in Higher Secondary Course.

DURATION OF THE PROGRAMME

The candidates shall undergo the prescribed Programme of study for a period of three academic years (six semesters).

MEDIUM OF INSTRUCTION

English

COURSES OFFERED

Part I	:	Tamil/Hindi Course
Part II	:	English
Part III	:	Core Courses
		Elective Courses • Generic Elective Courses • Discipline Specific Elective Courses
		Self Study Course - online
Part IV	:	Skill Enhancement Courses (SEC)
		Elective Course (NMEC)
		Environmental Studies Value Education
		Field Project/Internship
		Self Study Course - online
Part V	:	National Service Scheme/ Physical Education/ Youth Red Cross Society/ Red Ribbon Club/ Science Forum/ Eco Club/ Library and Information Science/ Consumer Club/ Health and Fitness Club/ National Cadet Corps/ Rotaract Club

B.2 EVALUATION SCHEME

B.2.1.PART II

Components	Internal Assessment Marks	Summative ExaminationMarks	Total Marks
Theory	15	60	100
Practical	5	15	
Assignment	5	-	

Three Periodic Tests - Average of the best two will be considered

B.2.2.Part I & PART III - Core Courses, Elective Courses (Generic, DSEC)

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Theory	25	75	**100**

INTERNAL ASSESSMENT

Distribution of Marks

Theory

Mode of Evaluation			Marks
Periodic Test		:	15
Assignment	K3 Level	:	5
Quiz	K1 Level	:	5
Total		**:**	**25**

Three Periodic Tests - Average of the best two will be considered

Two Assignments - Better of the two will be considered

Three Quiz Tests - Best of the three will be considered

Practical

Mode of Evaluation		Marks
Practical Test*	:	30
Record & Performance	:	10
Total	**:**	**40**

*Average of the two Practical Tests will be considered

Question Pattern for Internal Tests **Duration: 2 Hours**

Section	Q. No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 4	Multiple Choice	4	4	1	4
B	5 -6	Internal Choice - Either … or Type	3	3	7	21
C	8 -9	Internal Choice - Either… or Type	2	2	10	20
					Total	**45***

*The total marks obtained in the Periodic Test will be calculated for 15 marks

SUMMATIVE EXAMINATION

Question Pattern **Duration: 3 Hours**

Section	Q. No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 -10	Multiple Choice	10	10	1	10
B	11 - 15	Internal Choice – Either …or Type	5	5	7	35
C	16 - 18	Internal Choice – Either… or Type	3	3	10	30
					Total	**75**

PROJECT

Assessment by Internal Examiner Only

Internal Assessment

Distribution of Marks

Mode of Evaluation	:	Marks
Project work and Report	:	60
Presentation and Viva –Voce	:	40
Total	:	100

B.2.3 PART IV - Skill Enhancement Courses, Non Major Elective Courses and Foundation Course

B.2.3.1 FOUNDATATION COURSE

INTERNAL ASSESSMENT
Distribution of Marks
Theory

Mode of Evaluation			**Marks**
Periodic Test		:	15
Assignment	K2 Level	:	5
Quiz	K1 Level	:	5
Total		**:**	**25**

Three Periodic Tests - Average of the best two will be considered

Two Assignments - Better of the two will be considered

Three Quiz Tests - Best of the three will be considered

Question Pattern for Periodic Tests **Duration: 1 Hour**

Section	**Q.No.**	**Types of Question**	**No. of Questions**	**No. of Questions to be answered**	**Marks for each Question**	**Total Marks**
A	1 - 3	Internal Choice - Either …or Type	3	3	5	15
B	4	Internal Choice – Either …or Type	1	1	10	10
	Total					**25***

*The total marks obtained in the Periodic Test will be calculated for 15 marks

SUMMATIVE EXAMINATION

Mode of Evaluation		**Marks**
Summative Examination	:	50
Online Quiz (Multiple Choice Questions - K2 Level)	:	25
Total	**:**	**75**

Question Pattern **Duration: 2 Hours**

Section	Q.No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 5	Internal Choice - Either … or Type	5	5	6	30
B	6 - 7	Internal Choice – Either… or Type	2	2	10	20
	Total					**50**

B.2.3.2 Skill Enhancement Course - Entrepreneurial skills

INTERNAL ASSESSMENT ONLY
Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	15
Assignment	:	5
Quiz	:	5
Model Examinations	:	60
Online Quiz(Multiple Choice Questions - K2 Level)	:	15
Total	**:**	**100**

Question Pattern for Periodic Tests **Duration: 1 Hour**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 3)	Internal Choice – Either Or Type	3	3	6	18
B Q. No.(4)	Internal Choice – Either Or Type	1	1	12	12
Total					**30**

Two Periodic Tests - Better of the two will be considered

Two Assignments - Better of the two will be considered

Two Quiz Tests - Better of the two will be considered

Question Pattern for Model Examination **Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1-5)	Internal Choice – Either Or Type	5	5	6	30
B Q. No.(6- 8)	Internal Choice – Either Or Type	3	3	10	30
Total					**60**

B.2.3.3 Skill Enhancement Courses/ Non Major Elective Courses

INTERNAL ASSESSMENT

Distribution of Marks

Theory

Mode of Evaluation			**Marks**
Periodic Test		:	15
Assignment	K3 Level	:	5
Quiz	K2 Level	:	5
Total		**:**	**25**

Three Periodic Tests - Average of the best two will be considered

Two Assignments - Better of the two will be considered

Three Quiz Tests - Best of the three will be considered

Question Pattern for Periodic Tests **Duration: 1 Hour**

Section	Q.No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 3	Internal Choice - Either …or Type	3	3	5	15
B	4	Internal Choice – Either …or Type	1	1	10	10
	Total					**25***

*The total marks obtained in the Periodic Test will be calculated for 15 marks

SUMMATIVE EXAMINATION

Mode of Evaluation		**Marks**
Summative Examination	:	50
Online Quiz (Multiple Choice Questions - K2 Level)	:	25
Total	**:**	**75**

Question Pattern **Duration: 2 Hours**

Section	**Q.No.**	**Types of Question**	**No. of Questions**	**No. of Questions to be answered**	**Marks for each Question**	**Total Marks**
A	1 - 5	Internal Choice - Either … or Type	5	5	6	30
B	6 - 7	Internal Choice – Either… or Type	2	2	10	20
	Total					**50**

B.2.4 PART IV- ENVIRONMENTAL STUDIES / VALUE EDUCATION

INTERNAL ASSESSMENT ONLY

Evaluation Pattern

Mode of Evaluation		**Marks**
Periodic Test	:	15
Assignment (Based on the listed activities) - K3 Level	:	10
Online Quiz (Multiple Choice Questions - K2 Level)	:	25
Poster Presentation - K3 Level		10
Report on student's Awareness creation on Environmental Protection /Ethical Values - K3 Level		10
Model Examination	:	30
Total	**:**	**100**

Three Assignment - Best of the three will be considered

Question Pattern for Periodic Tests **Duration: 1 Hour**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 3)	Internal Choice – Either Or Type	3	3	6	18
B Q. No.(4)	Internal Choice – Either Or Type	1	1	12	12
Total					**30***

Two Periodic tests - Better of the two will be considered
The total marks obtained in the Periodic test will be calculated for 15 marks

Question Pattern for Model Examination **Duration: 2 ½ Hours**

Section	Q.No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 5	Internal Choice - Either … or Type	5	5	6	30
B	6 - 8	Internal Choice – Either… or Type	3	3	10	30
	Total					**60***

*The total marks obtained in the Model Examination will be calculated for 30 marks

B.2.5 PART IV- Internship/ Field Project

Internship / Field Project is compulsory for II year UG Science Students

- **Internship:** A designated activity that carries one credit involving not less than 15 days of working in an organization under the guidance of an identified mentor
- **Field Project:** Students comprising of maximum 5 members in a team need to undertake project that involve conducting surveys inside/outside the college premises and collection of data from designated communities or natural places.
- Assessment by Internal Examiner only

Mode of Evaluation		Marks
Onsite Learning/Survey	:	50
Report	:	25
Viva-Voce	:	25
Total		**100**

B.2.6 SELF STUDY COURSE

B.2.6 .1 PART III - Core & Elective Courses Quiz – Online

- Assessment by Internal Examiner only
- Question Bank is prepared by the Faculty Members of the Departments for all the Core and Elective Courses offered in all the Semesters.
- No. of Questions to be taken 700.
- Multiple Choice Question pattern is followed.
- Online Test will be conducted in VI Semester for 100 Marks.
- Model Examination is conducted after two periodic tests.

Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	25
Model Examination	:	75
Total	**:**	**100**

Two Periodic Tests - Better of the two will be considered

B.2.6 .2 PART IV - Practice for Competitive Examinations – Online

Assessment by Internal Examiner only

- Question Bank prepared by the Faculty Members of the respective Departments will be followed.
- Multiple Choice Question pattern is followed.
- Online Test will be conducted in V Semester for 100 Marks.
- Model Examination is conducted after two periodic tests.

Subject wise Allotment of Marks

Subject		Marks
Tamil	:	10
English	:	10
History	:	10
Mathematics	:	10
Current affairs	:	10
Commerce, Law & Economics	:	10
Physical Sciences	:	10
Life Sciences	:	15
Computer Science	:	5
Food and Nutrition	:	5
Sports and Games	:	5
Total	**:**	**100**

Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	25
Model Examination	:	75
Total	**:**	**100**

Two Periodic Tests - Better of the two will be considered

B.2.7. Part V – Extension Activities

INTERNAL ASSESSMENT ONLY

Distribution of Marks

Mode of Evaluation		Marks
Attendance	:	5
Performance	:	10
Report/Assignment/Project/Camp/Practical	:	10
Total	**:**	**25***

*The marks obtained will be calculated for 100 marks

B.2.8 EXTRA CREDIT COURSES (OPTIONAL)

2.8.1 Extra Credit Course offered by the Department.

Assessment by Internal Examiner Only (To be conducted along with the III Periodic Test)

Distribution of Marks

Mode of Evaluation		Marks
Quiz (Multiple Choice Questions)	:	25
Model Examination	:	75
Total	**:**	**100**

Question Pattern for Model Examination

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q.No.(1-5)	Internal Choice-Either or Type	5	5	7	35
B Q.No.(6-9)	Internal Choice-Either or Type	4	4	10	40
				Total	**75**

2.8.2 Extra credit Course offered by MOOC (Massive Open Online Course)

- The Courses shall be completed within the first V Semesters of the Programme.
- The allotment of credits is as follows **(Maximum of 10 credits)**

4weeks Course	- 1 credit
8 weeks Course	- 2 credits
12 weeks Course	- 3 credits

ELIGIBILITY FOR THE DEGREE

- The candidate will not be eligible for the Degree without completing the prescribed Courses of study, lab work, *etc.*, and a minimum Pass marks in all the Courses.
  - No Pass minimum for Internal Assessment.
  - Pass minimum for External Examination is 27 marks out of 75 marks for Core Courses, Elective Courses (Generic Elective, DSEC Courses)
  - Pass minimum for External Examination is 18 marks out of 50 marks for Skill Enhancement Courses and Non Major Elective Courses (NMEC).
  - The aggregate minimum pass percentage is 40.
  - Pass minimum for External Practical Examination is 21 marks out of 60 marks.
  - Pass minimum for Ability Enhancement Compulsory Courses is 40 marks.
  - Pass minimum for Self Study Courses is 40 marks.
- Attendance

- For UG, PG Programmes,

a) The students who have attended the classes for 76 days (85%) and above are permitted to appear for the Summative Examinations without any condition.

b) The students who have only 60-75 days (66% - 84%) of attendance are permitted to appear for the Summative Examinations after paying the required fine amount and fulfilling other conditions according to the respective cases.

c) The students who have attended the classes for 59 days and less – upto 45 days (50% - 65%) can appear for the Summative Examinations only after getting special permission from the Principal.

d) The students who have attended the classes for 44 days or less (<50%) cannot appear for the Summative Examinations and have to repeat the whole semester.

  - For Part V in UG Programmes, the students require 75 % of attendance to get a credit.

- For Certificate, Diploma, Advanced Diploma and Post Graduate Diploma Programmes, the students require 75% of attendance to appear for the Theory/Practical Examinations.

These rules come into effect from 2023-2024 onwards.

B.3 ASSESSMENT MANAGEMENT PLAN

An Assessment Management Plan that details the assessment strategy both at the Programme and the Course levels is prepared. The continuous assessment is implemented using an assessment rubric to interpret and grade students.

B.3.1 Assessment Process for CO Attainment

Assessment is one or more processes carried out by the institution that identify, collect and prepare data to evaluate the achievement of Course Outcomes and Programme Outcomes. Course Outcome is evaluated based on the performance of students in the Continuous Internal Assessments and in End Semester Examination of a Course. Target levels of attainment shall be fixed by the Course teacher and Heads of the respective departments.

Direct Assessment (Rubric based) - Conventional assessment tools such as Term Test, Assignment, Quiz and End Semester Summative Examination are used.

Indirect Assessment – Done through Course Exit Survey.

CO Assessment Rubrics

For the evaluation and assessment of COs and POs, rubrics are used. Internal assessment contributes 40% and End Semester assessment contributes 60% to the total attainment of a CO for the theory Courses. For the practical Courses, internal assessment contributes 50% and Semester assessment contributes 50% to the total attainment of a CO. Once the Course Outcome is measured, the PO can be measured using a CO-PO matrix.

CO Attainment

Direct CO Attainment

Course Outcomes of all Courses are assessed and the CO – wise marks obtained by all the students are recorded for all the assessment tools. The respective CO attainment level is evaluated based on set attainment rubrics.

Target Setting for Assessment Method

For setting up the target of internal assessment tools, 55% of the maximum mark is fixed as target. For setting up the target of End Semester Examination, the average mark of the class shall be set as target.

Formula for Attainment for each CO

Attainment = Percentage of students who have scored more than the target marks

$$\text{Percentage of Attainment} = \frac{\text{Number of Students who scored more than the Target}}{\text{Total Number of Students}} \times 100$$

Attainment Levels of COs

Assessment Methods	**Attainment Levels**	
Internal Assessment	Level 1	50% of students scoring more than set target marks in Internal Assessment tools
	Level 2	55% of students scoring more than set target marks in Internal Assessment tools
	Level 3	60% of students scoring more than set target marks in internal Assessment tools
End Semester Summative Examination	Level 1	50% of students scoring more than average marks in End Semester Summative Examination
	Level 2	55% of students scoring more than average marks in End Semester Summative Examination
	Level 3	60% of students scoring more than average marks in End Semester Summative Examination

Indirect CO Attainment

At the end of each Course, an exit survey is conducted to collect the opinion of the students on attainment of Course Outcomes. A questionnaire is designed to reflect the views of the students about the Course Outcomes.

Overall CO Attainment= 75% of Direct CO Attainment + 25 % of Indirect CO Attainment

In each course, the level of attainment of each CO is compared with the predefined targets. If the target is not reached, the Course teacher takes necessary steps for the improvement to reach the target.

For continuous improvement, if the target is reached, the Course teacher can set the target as a value greater than the CO attainment of the previous year.

B.3.2 Assessment Process for Overall PO Attainment

With the help of CO -PO mapping, the PO attainment is calculated. PO assessment is done by giving 75% weightage to direct assessment and 25% weightage to indirect assessment. Direct assessment is based on CO attainment, where 75% weightage is given to attainment through End Semester examination and 25% weightage is given to attainment through internal assessments. Indirect assessment is done through Graduate Exit Survey and participation of students in Co-curricular/ Extra-curricular activities.

PO Assessment Tools

Mode of Assessment	Assessment Tool	Description
Direct Attainment (Weightage -75%)	CO Assessment	This is computed from the calculated CO Attainment value for each Course
Indirect Attainment (Weightage - 25%)	Graduate Exit Survey 10%	At the end of the Programme, Graduate Exit Survey is collected from the graduates and it gives the opinion of the graduates on attainment of Programme Outcomes
	Co-curricular/ Extra-curricular activities 15%	For participation in Co-curricular/Extra-curricular activities during the period of their study.

Programme Articulation Matrix (PAM)

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Average Direct PO Attainment								
Direct PO Attainment in percentage								

Indirect Attainment of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Graduate Exit Survey							
Indirect PO Attainment							

Attainments of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Direct Attainment (Weightage - 75%)							
Indirect Attainment (Weightage - 25%)							
Overall PO Attainment							

Overall PO Attainment= 75% of Direct PO Attainment +
25% of Indirect PO Attainment (Graduate Exit Survey & Participation in Co- curricular and Extra curricular Activities)

Expected Level of Attainment for each of the Programme Outcomes

POs	Level of Attainment
Attainment Value ≥70%	Excellent
60% ≤ Attainment Value < 70%	Very Good
50% ≤ Attainment Value < 60%	Good
40% ≤ Attainment Value < 50%	Satisfactory
Attainment Value <40%	Not Satisfactory

Level of PO Attainment

Graduation Batch	Overall PO Attainment (in percentage)	Whether Expected Level of PO is Achieved? (Yes/No)

B.3.3 Assessment Process for PEOs

The curriculum is designed so that all the Courses contribute to the achievement of PEOs. The attainment of PEOs is measured after 5 years of completion of the Programme only through indirect methods.

Target for PEO Attainment

Assessment Criteria	Target (UG)	Target (PG)
Record of Employment	15% of the class strength	30% of the class strength
Progression to Higher Education	50% of the class strength	5% of the class strength
Record of Entrepreneurship	2% of the class strength	5% of the class strength

Attainment of PEOs

Assessment Criteria & Tool	Weightage
Record of Employment	10
Progression to Higher Education	20
Record of Entrepreneurship	10
Feedback from Alumnae	30
Feedback from Parents	10
Feedback from Employers	20
Total Attainment	**100**

$$\text{Percentage of PEO Attainment from Employment} = \frac{\text{Number of Students who have got Employment}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from Higher Education} = \frac{\text{Number of Students who pursue Higher Education}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from Entrepreneurship} = \frac{\text{Number of Students who have become Entrepreneurs}}{\text{Target}} \times 100$$

Expected Level of Attainment for each of the Programme Educational Objectives

POs	Level of Attainment
Attainment Value ≥70%	Excellent
60% ≤ Attainment Value < 70%	Very Good
50% ≤ Attainment Value < 60%	Good
40% ≤ Attainment Value < 50%	Satisfactory
Attainment Value <40%	Not Satisfactory

Level of PEO Attainment

Graduation Batch	Overall PEO Attainment (in percentage)	Whether Expected Level of PEO is Achieved? (Yes/No)

C. PROCESS OF REDEFINING THE PROGRMME EDUCATIONAL OBJECTIVES

The College has always been involving the key stakeholders in collecting information and suggestions with regard to curriculum development and curriculum revision. Based on the information collected the objectives of the Programme are defined, refined and are inscribed in the form of PEOs. The level of attainment of PEOs defined earlier will be analyzed and will identify the need for redefining PEOs. Based on identified changes in terms of curriculum, regulations and PEOs, the administrative system like Board of Studies, Academic Council and Governing Body may recommend appropriate actions. As per the Outcome Based Education Framework implemented from the Academic Year 2020 -2021, the following are the Programme Structure, the Programme Contents and the Course Contents of B.Sc. Zoology Programme

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN

(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

BACHELOR OF SCIENCE ZOOLOGY (2018)

Outcome Based Education with Choice Based Credit System
Programme Structure - Allotment of Hours and Credits
For those who join in the Academic Year 2023-2024

Components	Semester						Total Number of Hours (Credits)
	I	II	III	IV	V	VI	
Part I : Tamil /Hindi	6 (3)	6 (3)	6 (3)	6 (3)	-	-	24 (12)
Part II : English	6 (3)	6(3)	6 (3)	6 (3)	-	-	24 (12)
Part III : Core Courses, Elective Courses & Self Study Course							
Core Course	5 (5)	5 (5)	5 (5)	4 (4)	6 (5)	6 (5)	31 (29)
Core Course	-	-	-	-	5 (4)	6(5)	11 (9)
Core Course	-	-	-	-	5 (4)	5(5)	10(9)
Core Course Practical	3(2)	3 (2)	3 (2)	3 (2)	3 (2)	3 (2)	18(12)
Core Course Project	-	-	-	-	1 (3)	-	1 (3)
Elective Course (DSEC)	-	-	-	-	5(4)	5 (5)	10 (9)
Elective Course (DSEC Practical)	-	-	-	-	3(2)	3(2)	6(4)
Elective Course I (Allied)	4 (3)	4 (3)	-	-	-	-	8(6)
Elective Course I Practical I(Allied)	2(1)	2(1)	-	-	-	-	4(2)
Elective Course II(Allied)	-	-	4 (3)	4 (3)	-	-	8(6)
Elective Course II Practical II(Allied)	-	-	2 (1)	2 (1)	-	-	4 (2)
Self Study Course	-	-	-	-	-	0 (1)	0 (1)
Part IV : Skill Enhancement Courses, Elective Courses, Environmental Studies, Value Education, Self Study Course &Internship/ Field Project							
SEC	2 (2)	-	1 (1)	2 (2)	-	-	5(5)
SEC	-	2 (2)	2 (2)	2 (2)	-	2 (2)	8 (8)
Elective Course(NME)	2 (2)	2 (2)	-	-	-	-	4 (4)
Value Education	-	-	-	-	2 (2)	-	2 (2)
Environmental Studies	-	-	1 (0)	1 (2)	-	-	2 (2)
Self Study Course	-	-	-	-	0 (1)	-	0 (1)
Internship/ Field Project	-	-	-	-	0 (1)	-	0 (1)
Part V : Extension Activities	-	-	-	-	-	0 (1)	0 (1)
Total	**30 (21)**	**30 (21)**	**30 (20)**	**30 (22)**	**30 (28)**	**30 (28)**	**180 (140)**
Extra Credit Course (Self Study Course)	-	-	-	-	0(2)	-	0(2)

DSEC: Discipline Specific Elective Course SEC: Skill Enhancement Course
NMEC: Non Major Elective Course

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

BACHELOR OF ZOOLOGY -2018

PROGRAMME CONTENT

SEMESTER I

2023-2024 onwards

S.No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	**Part I**		Tamil/Hindi	23UTAG11/ 23UHDG11	6	3	3	25	75	100
2.	**Part II**		English	23UENG11	6	3	3	25	75	100
3.	**Part III**	Core Course -1	Invertebrata	23UZYC11	5	5	3	25	75	100
4.		Core Course -2 Practical I	Invertebrata Practical	23UZYC11P	3	2	3	40	60	100
5.		Elective Course –I	Plant Diversity and Cell Biology	23UBTA11	4	3	3	25	75	100
6		Elective Course – I Practical I	Plant Diversity and Cell Biology Practical	23UBTA11P	2	1	3	40	60	100
7.	**Part IV**	NME-1	Ornamental fish farming and Management	23UZYN11	2	2	3	25	75	100
8		SEC – 1 Foundation Course	Fundamentals of Zoology	23UZYF11	2	2	3	25	75	100
				Total	**30**	**21**				**800**

BACHELOR OF SCIENCE ZOOLOGY

PROGRAMME CONTENT

SEMESTER II

S. No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	**Part I**		Tamil/Hindi	23UTAG21/ 23UHDG21	6	3	3	25	75	100
2.	**Part II**		English	23UENG21	6	3	3	25	75	100
3.	**Part III**	Core Course –3	Chordata	23UZYC21	5	5	3	25	75	100
4.		Core Course – 4 Practical II	Chordata Practical	23UZYC21P	3	2	3	40	60	100
5.		Elective Course –I	Taxonomy of Angiosperms and Plant Physiology	23UBTA21	4	3	3	25	75	100
6		Elective Course –I Practical -II	Taxonomy of Angiosperms and Plant Physiology Practical	23UBTA21P	2	1	3	40	60	100
7.	**Part IV**	NME-2	Biocomposting for Entrepreneurship	23UZYN21	2	2	3	25	75	100
8		SEC-2	Wildlife Conservation and Management	23UZYS21	2	2	3	25	75	100
				Total	**30**	**21**				**800**

BACHELOR OF ZOOLOGY -2018

PROGRAMME CONTENT

SEMESTER III

(for those who join in 2023-2024)

S.No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	**Part I**		Tamil/ Hindi	23UTAG31/ 23UHDG31	6	3	3	25	75	100
2.	**Part II**		English	23UENG31	6	3	3	25	75	100
3.	**Part III**	Core Course –5	Cell Biology and Genetics	23UZYC31	5	5	3	25	75	100
4.		Core Course 6 Practical-III	Cytogenetics Practical	23UZYC31P	3	2	3	40	60	100
5		Elective Course - II	Organic Inorganic and Physical Chemistry-I	23UCHA31	4	3	3	25	75	100
6		Elective Course - II Practical -II	Volumetric Analysis	23UCHA31P	2	1	3	25	75	100
7.	**Part IV**	SEC-3	Aquarium Keeping	23UZYS31	1	1	2	100	-	100
8.		SEC-4	Agricultural Entomology	23UZYS32	2	2	2	25	75	100
9.			Environmental Studies	23UGES31	1	-	-	-	-	-
				Total	**30**	**20**				**800**

BACHELOR OF ZOOLOGY -2018

PROGRAMME CONTENT

SEMESTER IV

S.No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	**Part I**		Tamil/ Hindi	23UTAG41/ 23UHDG41	6	3	3	25	75	100
2.	**Part II**		English	23UENG41	6	3	3	25	75	100
3.	**Part III**	Core Course –7	Developmental Biology	23UZYC41	4	4	3	25	75	100
4.		Core Course -8 Practical-IV	Developmental Biology Practical	23UZYC41P	3	2	3	40	60	100
5		Elective Course –II	Organic, Inorganic And Physical Chemistry-II	23UCHA41	4	3	3	25	75	100
6		Elective Course –II Practical -II	Analysis of Organic Compounds Practical	23UCHA41P	2	1	3	40	60	100
7.	**Part IV**	SEC-5	Food, Nutrition and Health	23UZYS41	2	2	2	25	75	100
8.		SEC-6	Economic Zoology	23UZYS42	2	2	2	25	75	100
9.			Environmental Studies	23UGES41	1	2	2	100	-	100
				Total	**30**	**22**				**900**

BACHELOR OF ZOOLOGY -2018

PROGRAMME CONTENT

SEMESTER V

S.No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1	**Part III**	Core Course -9	Evolutionary Biology	23UZYC51	6	5	3	25	75	100
2		Core Course -10	Animal Physiology	23UZYC52	5	4	3	25	75	100
3		Core Course -11	Environmental Biology	23UZYC53	5	4	3	25	75	100
4		Core Course -12 Practical	Eco- Physiology and Environmental Toxicology	23UZYC51P	3	2	3	40	60	100
5		Core Course Project	Project	23UZYC54PR	1	3	-	100	-	100
6		DSEC-I	Bioinstrumentation	23UZYE51	5	4	3	25	75	100
7		DSEC Practical -I	Bioinstrumentation Practical	23UZYE51P	3	2	3	40	60	100
8	**Part IV**		Value Education	23UUGVE51	2	2	2	100	-	100
9		Self-study	Practice for Competitive Examinations Online	23UGCE51	-	1	-	100	-	100
10		Internship/ Field Project	Internship/Field Project	23UZYI51G	-	1	-	100	-	100
				Total	**30**	**28**				**1000**

11.	Extra Credit Course - Self-Study Course)	Dietetics for Women	23UZYO51	**-**	**2**	**3**	**100**	**-**	**100**

BACHELOR OF ZOOLOGY -2018

PROGRAMME CONTENT

SEMESTER VI

S.No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1	**Part III**	Core Course -13	Animal Biotechnology	23UZYC61	6	5	3	25	75	100
2		Core Course -14	Microbiology	23UZYC62	6	5	3	25	75	100
3		Core Course -15	Immunology	23UZYC63	5	5	3	25	75	100
4		Core Course -16 Practical	Biotechnology, Microbiology and Immunology Practical	23UZYC61P	3	2	3	40	60	100
5		DSEC-II	Medical Laboratory Techniques	23UZYE61	5	5	3	25	75	100
6		DSEC –II Practical	Medical Laboratory Techniques Practical	23UZYE61P	3	2	3	40	60	100
7		Self-study	Core Courses Quiz Online	23UZYQ61	-	1	-	100	-	100
8	**Part IV**	SEC-7	Nano biology	23UZYS61	2	2	2	25	75	100
9	**Part V**		Extension Activities		-	1	-	100	-	100
Total					**30**	**28**				**900**

10.	Extra Credit Course - Self-Study Course)	Life Style Diseases	23UZYO61	**-**	**2**	**3**	**-**	**-**	**100**

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN

(Belonging to Virudhunagar Hindu Nadars)

An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai

Re-accredited with 'A' Grade (3rd Cycle) by NAAC

VIRUDHUNAGAR - 626 001

B.Sc. Zoology

(2023-2024 onwards)

Semester I	**INVERTEBRATA**	Hours/Week: 5	
Core Course - 1		Credits: 5	
Course Code **23UZYC11**		Internal 25	External 75

Course Outcomes:

The students will be able to

CO1: recall the taxonomic position of animals [K1]

CO2: explain the structure and functions of organs and organ systems of invertebrates. [K2]

CO3: differentiate various groups of invertebrates. [K2]

CO4: to apply their knowledge to identify an invertebrate l animal.[K3]

CO5: to identify the economic importance of invertebrate animals. [K3]

UNIT I

Protozoa: Introduction to Classification, taxonomy and nomenclature. General characters and classification of Phylum Protozoa up to classes. Type study – *Paramecium*. Parasitic protozoan (*Entamoeba and Plasmodium*). Nutrition, Locomotion and Economic importance of Protozoans. **Porifera:** General characters and classification up to Classes. Type study - Ascon. Skeleton in sponges, Canal system and Reproduction in sponges. Economic importance of sponges. (15 Hours)

UNIT II

Coelenterata : General characters and classification upto classes – Type study – *Obelia* colony. Polymorphism in Hydrozoa. Corals and coral reefs, Economic importance of corals and coral reefs. **Platyhelminthes:** General characters and classification of upto classes. Type study – *Fasciola hepatica*. Nematode Parasites and diseases – *Wuchereria bancrofti*, Aschelminthes: General characters and classification of upto classes. *Ascaris lumbricoides*- Sexual dimorphism and Life history. (15 Hours)

UNIT III

Annelida: General characters and classification upto Classes. Type study – *Hirudinaria granulosa*. Metamerism. Reproduction in polychaetes. **Arthropoda:** General characters and classification of Phylum Arthropoda upto Classes. Detailed study: *Penaeus indicus*. Affinities of *Peripatus*, Larval forms in Crustacea. Insect pollinators - predators – parasites. (15 Hours)

UNIT IV

Mollusca: General characters and classification of Phylum Mollusca upto Classes. Detailed study: *Pila globosa*. Foot and torsion in Mollusca, Economic importance of Molluscs – Cephalopoda as the most advanced invertebrate. **Echinodermata:** General characters and classification of Phylum Echinodermata upto Classes. Detailed study: *Asterias.* Water vascular system in Echinodermata – Larval forms of Echinoderms. (15 Hours)

UNIT V

Insect pests and management: Pest of rice: Rice stem borer (*Scirpophaga incertulas*) – Pest of Sugarcane: The shoot borer (*Chilo infuscatellus*) – Pest of coconut: The rhinoceros beetle (*Oryctes rhinoceros*) Pest of cotton: The spotted bollworm (*Earias insulana*) – Pests of vegetables: Brinjal-The shoot and fruit borer (*Leucinodes orbonalis*) – Cauliflower: The diamond black moth (*Plutella xylostella*) Pests of fruits: Citrus butterfly (*Papilio demoleus*) – Pest of stored products: The rice weevil (*Sitophilus oryzae*). Insects associated with human diseases: Mosquitoes, housefly, bed bug, human head louse (Brief account only). Insects associated with household materials: Ants, Termites, Silver fish. Principles of Integrated Pest Management. (15 Hours)

TEXT BOOK

1. Ekambaranatha Iyer (2000). A Manual of Zoology, 10th edition, Viswanathan, S., Printers & Publishers Pvt Ltd.
2. Jordan, E.L. and Verma P.S. (1995).Invertebrate Zoology, 12th edn. S. Chand & Co.
3. Kotpal, R.L. (1992). Protozoa, Porifera, Coelenterata, Annelida, Arthropoda.

REFERENCE BOOKS

1. Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.
2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The

Invertebrates: A New Synthesis, III Edition, Blackwell Science.

3. Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson.
4. Hyman L.H (1955). The invertebrates - Vol. I to Vol. VII – McGraw Hill Book Co.
5. Parker, J. and Haswell. (1978). A text book of Zoology Vol.I - Williams and Williams.

WEBSITE REFERENCES

1. https://www.nationalgeographic.com/animals/invertebrates/
2. https://greatbarrierreef.org/

Mapping Table:

Course Code	PO1		PO2	PO3		PO4		PO5	PO6	PO7
23UZYC11	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	3	3	3	2	3	3	3	-	2	2
CO2	3	2	3	2	3	3	3	1	2	3
CO3	3	2	2	2	3	3	1	2	2	2
CO4	3	2	3	3	3	3	2	2	2	3
CO5	3	3	3	3	3	3	1	3	2	3

Strong (3) Medium (2) Low (1)

Dr, J. Rani
Head of the Department

Dr, J. Rani
Dr. M. Tamilselvi
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

B.Sc. Zoology

(2023-2024 onwards)

Semester I	**INVERTEBRATA PRACTICAL**	Hours/Week: 3	
Core Course – 2 Practical I		Credits: 2	
Course Code **23UZYC11P**		Internal 40	External 60

Course Outcomes:

On completion of this course, students will be able to

CO1: identify the different groups of invertebrate animals based on external features .[K2]

CO2: explain the various systems in invertebrates.. [K2]

CO3: dissect and display the economically important invertebrate [K3]

CO4: compare and distinguish the dissected internal organs of lower animals.[K3]

CO5: differentiate and compare the structure, function and mode of life of various groups of animals. [K3]

Major Dissection: Cockroach - Digestive system, Nervous system, Reproductive system. Earthworm: Nervous System. Prawn - Appendages.(cephalic,thoracic and abdominal)

Minor Dissection: Earthworm: Body and Penial setae.

Mounting: Mouth parts – Cockroach, Honeybee and House fly.

Spotters :(i). Protozoa: *Amoeba, Paramoecium, Paramoecium* -Binary fission and Conjugation, *Euglena*, *Plasmodium vivax.* **(ii). Porifera:** Sycon, Euplectella, Cliona, Spicules and Gemmule in sponges. **(iii). Coelenterata:** Obelia Colony and Medusa, Fungia and Aurelia, **(iv). Platyhelminthes:** *Planaria, Fasciola hepatica* and *Taenia solium.* **(v). Aschelminthes:** *Ascaris* (Male & Female) and *Wuchereria* **(vi). Annelida:** Nereis, Hirudinaria and Trochophore larva **(vii). Arthropoda:** Penaeus, Scolopendra, Sacculina, Spider and Peripatus, **(viii). Mollusca:** Pila, Sepia, Dentalium, Nautilus **(ix). Echinodermata:** Asterias, Brittle star, Sea Urchin, Sea cucumber and Sea lily.

TEXT BOOKS

1. EkambaranathaIyyar and T. N. Ananthakrishnan (1995) A manual of Zoology Vol.I (Part 1, 2) S. Viswanathan, Chennai
1. Ganguly, Sinha an d A dhikari . (2 0 11) . Biology of Animals: Volume I, New Central Book Agency; 3rd revised edition. 1008 pp.
2. Sinha, Chatterjee and Chattopadhyay. (2 0 1 4). Advanced Practical Zoology, Books & Allied Ltd; 3rd Revised edition, 1 07 0 pp.
3. Lal ,S. S (2016). Practical Zoology Invertebrate, Rastogi Publications.
4. Verma, P. S. (2010). A Manual of Practical Zoology: Invertebates, S Chand, 4 97pp.

REFERENCE BOOKS

1. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002).*The Invertebrates: A New Synthesis*, III Edition, Blackwell Science.
2. Barnes, R.D. (1982). *Invertebrate Zoology*, V Edition. Holt Saunders International Edition.
3. Barrington, E.J.W. (1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson
4. Boradale, L.A. and Potts, E.A. (1961).*Invertebrates: A Manual for the use of Students*. Asia Publishing Home.
5. Lal, S.S. (2005). A text Book of Practical Zoology: Invertebrate, Rastogi, Meerut

WEBSITE REFERENCES

1. https://www.nationalgeographic.com/animals/invertebrates/

Mapping Table

Course Code 23UZYC21P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	3	3	2	3	3	3	3	1	3	3
CO2	3	3	2	2	3	3	2	1	3	3
CO3	3	2	2	2	3	3	3	1	3	3
CO4	3	3	2	2	3	3	3	1	3	3
CO5	3	3	2	1	3	3	3	3	2	3

Strong (3) Medium (2) Low (1)

Dr. J. Rani
Head of the Department

Dr. J. Rani
Dr. M. Tamilselvi
Course Designers

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

B.Sc. Zoology
(2023-2024 onwards)

Semester I	**PLANT DIVERSITY AND CELL BIOLOGY**	Hours/Week: 4	
Elective Course - I		Credits: 3	
Allied Code **23UBTA11**		Internal 25	External 75

Course Outcomes:
on successful completion of the course, the learners should be able to

CO1: Increase the awareness and appreciation of human friendly algae and their economic Importance. [K1]

CO2: Develop an understanding of microbes and fungi and appreciate their adaptive Strategies [K2]

CO3: Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms. [K2]

CO4: Identify the importance of cell as a basic unit of life [K3]

CO5: Interpret the structure and function of cells and explain the development of cells [K3]

UNIT I : Algae: General characters of algae - Structure, reproduction and life cycle of *Sargassum* and economic importance of algae. (11 Hours)

UNIT II: Fungi: General characters of fungi, structure, reproduction and life cycle of *Agaricus* and economic importance of fungi. (11 Hours)

UNIT III : Bryophytes, Pteridophytes and Gymnosperms:
General characters of Bryophytes, Structure and life cycle of *Funaria*. General characters of Pteridophytes, Structure and life cycle of *Lycopodium*. General characters of Gymnosperms, Structure and life cycle of *Cycas*. (14 Hours)

UNIT IV: Cell Biology:

Prokaryotic and Eukaryotic cell- structure /organization. Cell organelles - ultra structure and function of chloroplast, mitochondria and nucleus. Cell division – mitosis. (12 Hours)

UNIT V : **Cell Biology:**

Membrane systems in Eukaryotes - Endoplasmic Reticulum, Golgi complex and Ribosomes – Origin, structure and functions. (12 Hours)

TEXT BOOKS

1. Singh, V., Pande, P.C and Jain, D.K. 2021. A Text Book of Botany. Rastogi Publications,Meerut.
2. Bhatnagar, S.P and Alok Moitra. 2020. Gymnosperms, New Age International (P) Ltd., Publishers, Bengaluru.
3. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd. Delhi.
4. Lee, R.E. 2008. Phycology, IV Edition, Cambridge University Press, New Delhi.
5. Rao, K., Krishnamurthy, K.V and Rao, G.S. 1979. Ancillary Botany,S. Viswanathan Pvt. Ltd., Madras.
6. Verma, P.S. & Agarwal, V.K. (2006). *Cell Biology,* New Delhi: S. Chand & Company Ltd.,

REFERENCE BOOKS

1. Parihar, N.S. 2012. An introduction to Embryophyta –Pteridophytes - Surjeet Publications, Delhi.
2. Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd.
3. Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand & Company Ltd, Delhi.
4. Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surjeet Publications, Delhi.
5. Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand & Company Ltd, Delhi.
6. Parihar, N.S. 2013. An introduction to Embryophyta –Bryophytes -, Surjeet Publications, Delhi.
7. Pandey B.P. 1986, Text Book of Botany (College Botany) Vol I &II, S.Chand and Co. New Delhi.

Course Code **23UBTA11**	PO1	PO2	PO 3	PO4	PO 5	PO 6	PO 7
CO1	3	3	3	3	2	2	2
CO2	3	3	3	3	2	2	2
CO3	3	3	3	3	2	2	2
CO4	3	3	3	3	2	2	2
CO5	3	3	3	3	2	2	2

Strong (3) Medium (2) Low (1)

Dr. B. Karunai Selvi
Head of the Department

Dr. B. Karunai Selvi
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

B.Sc. Zoology

2023-2024 onwards

Semester II	**PLANT DIVERSITY AND CELL BIOLOGY PRACTICAL**	Hours/Week: 2	
Elective Course – I Practical I		Credits: 1	
Allied Code **23UBTA11P**		Internal 40	External 60

Course Outcomes:
on successful completion of the course, the learners should be able to

CO1: Explain the internal organization of algae and fungi. [K2]

CO2: Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms. [K2]

CO3: Sketch the diagrams of Plant Diversity and Cell Biology. [K3]

CO4: Interpret the structure and functions of the cell organelles [K3]

CO5: Identify the different stages of mitosis [K3]

EXPERIMENTS

1. Make suitable micro preparation of the types prescribed in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.
2. Study of cell organelles - Chloroplast, Mitochondria, Endoplasmic reticulum and Golgi complex
3. Spotters - Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Cell biology
4. Cell division - Mitosis

TEXT BOOKS

1. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd, New Delhi.
2. Sharma, O.P. 2012. Pteridophyta, Tata McGraw-Hills Ltd, New Delhi.
3. De Robertis, P, Nowinski, E.D and Saez, A, (2001 reprint), *Cell Biology*, WB Saunders Co, Philadelphia.

REFERENCE BOOKS

1. Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India.
2. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.
3. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing.

Course Code **23UBTA11P**	PO1	PO2	PO 3	PO4	PO 5	PO 6	PO 7
CO1	3	3	3	3	2	3	3
CO2	3	3	3	3	2	3	3
CO3	3	3	3	3	2	3	3
CO4	3	3	3	3	2	3	3
CO5	3	3	3	3	2	3	3

Strong (3) Medium (2) Low (1)

Dr. B. Karunai Selvi
Head of the Department

Dr.R.Sreebha
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

B.Sc. Zoology

(2023-2024 onwards)

Semester I	**ORNAMENTAL FISH FARMING& MANAGEMENT**	Hours/Week: 2	
NME- I		Credits: 2	
Course Code **23UZYN11**		Internal 25	External 75

Course Outcome:

The students will be able to

CO1: recall the names of commercially important ornamental fishes. [K1]

CO2: understand the culture methods of ornamental fishes. [K2]

CO3: select the advanced techniques used in aquaculture and fisheries to increase the rate of production. [K2]

CO4: develop the ability to guide layman individual in his/her difficulties during the construction as well as to run a fish farm successfully. [K3]

CO5: make use of their skills to promote self employment. [K3]

Unit I:

Introduction to ornamental fish keeping. Scope and importance of ornamental fish culture. Domestic and global scenario of ornamental fish trade and export potential. Commercially important ornamental fishes –Gold fish, Siamese fighter fish, Black molly and angel fish .

(6 hours)

Unit II:

Food and feeding in ornamental fishes. Fish feed – Brief account on Artemia and its culture. Artificial feed - Composition.) Breeding, hatchery and nursery management of egg layers (eg. Goldfish) and live bearers (eg Black molly). (6 hours)

Unit III:

Aquarium design and construction; Accessories - aerators, filters and lighting. Aquarium plants and their propagation. Maintenance of aquarium and water quality management. Ornamental fish diseases- white spot disease and Gill rot disease- prevention, control and treatment methods. (6 hours)

Unit IV

Conditioning, packing, transport and quarantine methods. Economics, trade regulations, domestic and export marketing strategies. (6 hours)

Unit- V

1) Identification of locally available ornamental fishes - Egg layers and live bearers.

2) Identification of locally available live feed. (6 hours)

REFERENCE BOOKS

1. Swain SK., Sarangi N. and Ayyappan S. 2010. Ornamental fish farming. ICAR, New Delhi.

2. Living Jewels – A handbook on freshwater ornamental fish, MPEDA, Kochi.

3. Dey V.K.A. 1997. A handbook on aquafarming ornamental fishes. MPEDA, Kochi.

4. Ahilan, B., Felix N. and Santhanam R. 2008. Text book of aquariculture.Daya Publishing House, New Delhi.

WEBSITE REFERENCES

1. **http://ecoursesonline.iasri.res.in/course/view.php?id=297**
2. **https://www.ofish.org/**
3. **https://krishijagran.com/agripedia/income-generation-by-ornamental-fish-culture/**

4**.** https://99businessideas.com/ornamental-fish-farming/

Mapping Table

CO/PO Course Code 23UZYN11	PO1		PO2	PO3		PO4		PO5	PO6	PO7
CO 1	3	3	2	3	2	2	3	2	3	3
CO 2	3	3	2	2	2	3	3	.	3	3
CO 3	3	2	2	2	2	1	2	-	2	3
CO 4	3	2	1	1	3	-	2	1	2	3
CO 5	2	3	1	3	3	2	2	1	3	2

Strong (3) Medium (2) Low (1)

Dr. J. Rani
Head of the Department

Dr. P. Vijaya
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

B.Sc. Zoology

(2023-2024 onwards)

Semester I	**FUNDAMENTALS OF ZOOLOGY**	Hours/Week: 2	
SEC-1 Foundation Course		Credits: 2	
Course Code **23UZYF11**		Internal 25	External 75

Course Outcomes:

The students will be able to

CO1: recall the importance of of Zoology. [K1]

CO2: describe the techniques used in laboratory instruments. [K1]

CO3: understand the basic concepts of various branches of zoology.[K2]

CO4: discuss the preservation methods of animals. [K2]

CO5: explain and transmit their knowledge about the significance of animals to the society. [K2]

UNIT-I

Introduction - History and Scope of Zoology, Branches of Zoology, Applications and importance of Zoology, Career opportunities in Zoology. Contributions of Zoologists- Schleiden and Schwann, Anton van Leeuwenhoek, Carl Linnaeus, Gregor Johann Mendel, Watson and Crick, Karl Landsteiner, Charles Robert Darwin *and* Lamarck. (6 Hours)

UNIT-II

Basic concepts in Zoology-Terminologies in Animal Diversity and Cytogenetics - - Invertebrata, Chordata, Herbivore, Carnivore, Omnivore, Ectoparasite, Endoparasite, Oviparous, Viviparous, Ovoviviparous, Hermaphrodite, Sedentary Animal, Agnatha, Acrania, Apoda and Tetrapoda. Prokaryotic Cell, Eukaryotic Cell, Nucleoid, Amitosis, Mitosis, Meiosis, Osmosis, Diffusion, Plasma Membrane, Protoplasm, Karyokinesis, Cytokinesis, Allele, Gene, Genotype, Phenotype, Inheritance, Pedigree Analysis, Euthenics, Eugenics. Genome and Proteome. (6 Hours)

UNIT-III

Terminologies in Developmental biology, Animal Physiology, Ecology and Evolution-. Digestion,respiration,excretion, reproduction, circulation, enzymes, hormones, metabolism, anabolism and catabolism. Ovum, sperm, gametes, gametogenesis, fertilization, Zygote, Cleavage, Blastula, Gastrula, Metamorphosis and Retrogressive Metamorphosis. Ecosystem, Biotic factors, Abiotic Factors, Producers, Consumers,Decomposers, Habitat, Population, Community, Xerophyte and Hydrophyte. Fossil, Extinct Species, Endangered Species, Palaeontology, Connecting Link, Homologous Structures, Analogous Structures, Vestigial Structures and Atavism. (6 Hours)

UNIT-IV

Laboratory Instruments and Uses: Microscope - Compound and Dissection, Haemocytometer, Haemoglobinometer, Stethoscope, Sphygmomanometer, Incubator, Laminar Air Flow Chamber and Deep Freezer. (6 Hours)

UNIT-V

Animal Collection and Preservation techniques: Collection - Beat collection, Gill net, Seine net, Trap net, Sweep net and Hand Collection. Preservation - Wet and Dry methods-Chemical and Physical method. (6 Hours)

REFERENCES

1. A Dictionary of Zoology Michael Allaby, 2020
2. A Dictionary of Zoology- A.W.Leftwich,2004
3. Modern text book of Zoology-Kotpal, R.L.2009

Web References

1. https://eduinput.com/introduction-to-zoology/
2. https://www.scribd.com/presentation/430924605/Scope-of-Zoology#
3. http://importanceofstuff.com/zoology
4. https://ucmp.berkeley.edu/glossary/gloss7metazoa.html
5. https://dpmiindia.com/blog/2022/10/04/museum-technique/:

Mapping Table

Course Code 23UZYF11	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	3	3	3	2	3	3	3	3	3	3
CO2	3	2	2	2	3	1	3	3	3	3
CO3	3	2	1	1	2	1	2	2	1	2
CO4	2	2	1	1	2	2	2	1	2	2
CO5	3	3	3	3	2	1	1	2	3	1

Strong (3) Medium (2) Low (1)

Dr. J. Rani
Head of the Department

Dr. R. Radhalakshmi
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

B.Sc. Zoology

(2023-2024 onwards)

Semester II	**CHORDATA**	Hours/Week: 5	
Core Course - 3		Credits: 5	
Course Code **23UZYC21**		Internal 25	External 75

Course Outcomes:

On completion of this course, students will able to

CO1: recall the name and distinct features of different classes of phylum Chordata.[K1]

CO2: explain, the morphology and anatomical structure of vertebrates. [K2]

CO3: to apply their knowledge to identify economically important animals K2]

CO4: discuss the various modes of life in vertebrates. [K3]

CO5: to correlate the morphological and ecological adaptations in vertebrates .[K3]

UNIT I

Prochordates and Chordates: General characters, Affinities and Systematic position of Hemichordata (*Balanoglossus*), Urochordata (*Ascidia*), Cephalochordata (*Amphioxus*).Origin of Chordata, Differences between non-chordates and chordates, (15 Hours)

UNIT II

Agnatha Characteristics of subphylum vertebrata, Classification of Vertebrata upto Class level. Agnatha (Detailed study of *Petromyzon*)

Pisces General characters and classification, Origin of fishes, Type study--*Scoliodon sorrakowah* Affinities of Dipnoi - Types of scales and fins - Accessory respiratory organs - Air bladder - Parental care - Migration - Economic importance. (15 Hours)

UNIT III

Amphibia : General characters and classification - Origin of Amphibia - Type study – *Rana hexadactyla* - Adaptive features of Anura, Urodela and Apoda - Neoteny in Urodela - Parental care in Amphibia. (15 Hours)

UNIT IV

Reptilia : General characters and classification - Origin of reptiles- Type study – (*Calotes versicolor (endoskeleton of Varanus*) - Effects of terrestrialisation, Extinct reptiles. Snakes of India.-Poisonous (*Naja naja* and Viper) and Non poisonous (Ptyas and Dryophis) Poison apparatus and biting mechanism of poisonous snakes - Skull in reptiles as basis of classification. (15 Hours)

UNIT V

Aves and Mammalia : Aves: General characters and classification – Type study - *Columba livia* - Origin of birds, Flight adaptations, Migration. Mammalia: General characters and classification - Type study - Rabbit - Adaptive radiation in mammals - Egg laying mammals, Marsupials, Flying mammals, Aquatic mammals, Dentition in mammals. (15 Hours)

TEXT BOOKS

1. Ayyar, E.K. and T.N. Ananthakrishnan, (1992).Manual of Zoology Vol. II (Chordata), S. Viswanathan (Printers and Publishers) Pvt Ltd., Madras, 891p.
2. Jordan, E.K. and P.S. Verma, (1995). Chordate Zoology and Elements of Animal Physiology, 10th edition, S. Chand & Co Ltd., Ram Nagar, New Delhi, 1151 pp.
3. Nigam, H.C., (1983). Zoology of Chordates, Vishal Publications, Jalandhar - 144008, pp.942.
4. Ganguly, Sinha,.BharatiGoswami and Adhikari, (2004).Biology of animals Vol.II - New central book Agency (p) Ltd.
5. Kotpal.R.L.A, (2009) Modern text book of Zoology Vertebrates- Rastogi publications.
6.

REFERENCE BOOKS

1. Darlington P.J. (2008) The Geographical Distribution of Animals, R.E. Krieger Pub.Co.
2. Hall B.K. and Hallgrimsson B. (2008).Strickberger'sEvolution.IVEdition.Jones and Bartlett Publishers Inc.
3. Hickman, C.P. Jr., F.M.Hickman and L.S. Roberts. (1984). Integrated Principles of Zoology, 7th Edition, Times Merror/Mosby College Publication. St. Louis. 1065 pp.
4. Newman, H.H., (1981). The Phylum Chordata, Satish Book Enterprise, Agra .477 pp.
5. Parker and Haswell. (1964). Text Book of Zoology, Vol II (Chordata), A.Z.T,B.S. Publishers and Distributors, New Delhi - 110 051, 952 pp.
6. Pough H. Vertebrate life, VIII Edition, Pearson International.

7. Waterman, Allyn J. et al., (1971). Chordate Structure and Function, Mac Millan&Co., New York, 587 pp.
8. Young, J. Z. (2004). The Life of Vertebrates.IIIEdition.Oxforduniversity press.

WEBSITE REFERENCES

1. http://tolweb.org/Chordata/2499
2. https://biologyeducare.com/aves/
3. https://www.vedantu.com/biology/mammalia

Mapping Table

Course Code	PO1		PO2	PO3		PO4		PO5	PO6	PO7
20UZYC21	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	3	3	3	2	3	3	3	-	2	2
CO2	3	2	3	2	3	3	3	1	2	3
CO3	3	2	2	2	3	3	1	2	2	2
CO4	3	2	3	3	3	3	2	2	2	3
CO5	3	3	3	3	3	3	1	3	2	3

Strong (3) Medium (2) Low (1)

Dr. R. Radhlakshmi

Dr. J. Rani — Dr. P. Veeramuthumari

Head of the Department — Course Designers

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

B.Sc. Zoology

(2023-2024 onwards)

Semester II	**CHORDATA PRACTICAL**	Hours/Week: 3	
Core Course – 4 Practical II		Credits: 2	
Course Code **23UZYC21P**		Internal 40	External 60

Course Outcomes:

On completion of this course, students will able to

CO1: identify the animals based on distinct external features of Chordates.. [K2]

CO2: find out the structural organization of various organs and systems in different classes of vertebrates..[K2]

CO3: differentiate the morphological features and developmental stages of chordates.[K3]

CO4: dissect and examine various organs and internal systems in different vertebrates and correlate its function. [K3]

CO5: compare the morphology and ecological adaptations in vertebrates and list out the economic importance. [K3]

Dissections: Fish External features, Digestive system, Male and Female Urinogenital system.

Mounting: Fish: Placoid and Ctenoid scales. Fish - Brain (Demo).

Osteology: Frog: Skull and lower jaw, Vertebral column, Pectoral girdle, Pelvic girdle, Fore limb, Hind limb. Chelonia – Anapsid skull. Pigeon – Skull and lower jaw and Synsacrum.

Specimen and Slides: **(i) Hemichordata:** Balanoglossus, Tornaria larva **(ii). Protochordata:** UroChordata- Ascidian. Cephalochordata- Amphioxus. l**(iii). Cyclostomata:** Petromyzon, Ammocoetus larva **(iv). Pisces:** Shark, Torpedo, Hippocampus, Exocoetus, Echeneis and Protopterus. **(v). Amphibia:** Ichthyophis, Bufo, Rana, Axolotal larva **(vi). Reptilia :** Draco, Chameleon, Naja, Bungarus, Enhydrina and Typhlops. **(vii) Aves:** Archaeopteryx and Columba. **Collection and study of different types of feathers:** Quill, Contour, Filoplume and Down **(viii). Mammalia:** Ornithorhynchus, Pteropus, Manis and Loris.

TEXT BOOK

1. Lal S S (2009). Practical Zoology Vertebrate, Rajpal and Sons Publishing, 484pp.
2. VermaP.S (2000). AManualofPracticalZoology:Chordates,S.ChandLimited, 627pp.

REFERENCE BOOKS

1. Robert William Hegner (2015). Practical Zoology, BiblioLife, 522pp.

Website References

1. https://www.youtube.com/watch?v=b04hc_kOY10
2. http://tolweb.org/Chordata/2499
3. https://www.nhm.ac.uk/

Mapping Table

Course Code	PO1		PO2	PO3		PO4		PO5	PO6	PO7
23UZYC21P	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	3	3	2	3	3	3	3	1	3	3
CO2	3	3	2	2	3	3	2	1	3	3
CO3	3	2	2	2	3	3	3	1	3	3
CO4	3	3	2	2	3	3	3	1	3	3
CO5	3	3	2	1	3	3	3	3	2	3

Strong (3) Medium (2) Low (1)

Dr. M. Tamilselvi
Dr. J. Rani Dr. R. Radhalakshmi
Head of the Department Course Designers

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

B.Sc. Zoology

(2023-2024 onwards)

Semester II	**Taxonomy of Angiosperms and Plant Physiology**	Hours/Week: 4	
Elective Course - I		Credits: 3	
Allied Code **23UBTA21**		Internal 25	External 75

Course Outcomes:

On completion of this course, students will able to

CO1: Understand the fundamental concepts of plant taxonomy and physiology. [K1]

CO2: Recognize the different parts of flower and plant metabolism.[K2]

CO3: Explain the water relation of plants with respect to various physiological processes.[K2]

CO4: Demonstration of an aerobic and anaerobic respiration. [K3]

CO5: Interpret the plant systematics and recognize the importance of herbarium and virtual herbarium. [K3]

TAXONOMY OF ANGIOSPERMS

UNIT I

Morphology of flowering plants: Plant and its parts, Structure and function of root and stem, Leaf and its parts, Leaf types - simple and compound, Phyllotaxy and types, Inflorescence - Racemose, Cymose and Special types, Herbarium preparation techniques. (12 Hours)

UNIT II

Taxonomy: Study of the range of characters and plants of economic importance in the following families: Annonaceae, Rutaceae, Caesalpinioideae and Myrtaceae. (12 Hours)

UNIT III:

Taxonomy: Study of the range of characters and plants of economic importance in the following families: Asclepiadaceae, Euphorbiaceae and Cannaceae. (12 Hours)

PLANT PHYSIOLOGY

UNIT III

Plant water relation - Absorption of water - mechanism of active and passive absorption of water. Ascent of sap – path and mechanism - Dixon's cohesion theory. Photosynthesis – photosynthetic apparatus, pigments and units. Mechanism of photosynthesis – Light reaction: cyclic and non- cyclic photo phospharylation and dark reaction: Calvin Cycle. (12 Hours)

UNIT V

Respiration – Aerobic and anaerobic respiration, respiratory substrates, respiratory apparatus, mechanism of respiration - glycolysis, Kreb's cycle and electron transport chain, factors affecting respiration. Physiological role of natural growth hormones in plants: auxins, gibberellins and cytokinins and their applications. (12Hours)

TEXT BOOKS

1. Sharma, O.P. 2017. Plant Taxonomy. (II Edition).The McGraw Hill Companies.
2. Jain, VK. 2006. Fundamentals of Plant Physiology, S. Chand and Company Ltd.
3. Ting, I.P. 1982. Plant Physiology. Addison Wesley Pb. Philippines.

REFERENCE BOOKS

1. Lawrence.G.H.M. 1985. An Introduction to Plant Taxonomy, Central Book Depot, Allahabad.
2. Salisbury, F. B.C.W. Ross.1991. Plant Physiology. Wassworth Pub. Co. Belmont.
3. Rajni Gupta. 2012. Plant Taxonomy: Past, Present and Future. Vedams (P) Ltd. New Delhi.
4. Jain, V.K. 2006. Fundamentals of Plant Physiology, S.Chand and Company Ltd., New Delhi.
5. Verma, S.K. 2006. A Textbook of Plant Physiology, S.K.Chand & Co., New Delhi.

Course code 23UBTA21	PO1	PO2	PO 3	PO4	PO 5	PO 6	PO 7
CO1	3	3	3	3	2	2	2
CO2	3	3	3	3	2	2	2
CO3	3	3	3	3	2	2	2
CO4	3	3	3	3	2	2	2
CO5	3	3	3	3	2	2	2

Strong (3) Medium (2) Low (1)

Dr. B. Karunaiselvi
Head of the Department

Dr. B. Karunaiselvi
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

B.Sc. Zoology

(2023-2024 onwards)

Semester II	**TAXONOMY OF ANGIOSPERMS AND PLANT PHYSIOLOGY PRACTICAL**	Hours/Week: 2	
Elective Course – I Practical II		Credits: 1	
Allied Code 23UBTA21P		Internal 40	External 60

Course Outcomes:

On completion of this course, students will able to

CO1: Explain the internal organization of algae and fungi. [K2]

CO2: Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms. [K2]

CO3: Solve the classical taxonomy with reference to different parameters. [K3]

CO4: Sketch the fundamental concepts of plant anatomy and embryology. [K3]

CO5: Demonstrate the effect of various physical factors on photosynthesis. [K3]

EXPERIMENTS

1. To describe in technical terms, plants belonging to any of the family prescribes and to identify the family
2. To dissect a flower, construct floral diagram and write floral formula.
3. Demonstration experiments
   - Mohl's half leaf experiment,
   - Ganong's Light screen
   - Ganong's respiroscope

4. Spotters – Leaf types - simple and compound, Phyllotaxy and types, Inflorescence - Racemose, Cymose and Special types, Chloroplast and Mitochondria,

TEXT BOOKS

1. Subramaniam, N.S. 1996. Laboratory Manual of Plant Taxonomy. Vikas Publishing House Pvt. Ltd., New Delhi.
2. Noggle G.R and G.J. Fritz. 2002. Introductory Plant Physiology. Prentice Hall of India, New Delhi.

REFERENCE BOOKS

1. Steward, F.C. 2012. Plant Physiology Academic Press, US
2. Gamble, J.S. 1921. Flora of the Presidency of Madras, Volumes I, II and

III. Adlard and Son Ltd. London.

3. Warrier, P.K., V.P. K. Nambiar and C. Ramankutty. 1994. Indian Medicinal Plants – a compendium of 500 species. Vaidyaratnam P.S. Varier's Arya Vaidya Sala, Kottakkal, Orient Longman Publications, Chennai.

Course code 23UBTA21P	PO1	PO2	PO 3	PO4	PO 5	PO 6	PO 7
CO1	3	3	3	3	2	3	3
CO2	3	3	3	3	2	3	3
CO3	3	3	3	3	2	3	3
CO4	3	3	3	3	2	3	3
CO5	3	3	3	3	2	3	3

Strong (3) Medium (2) Low (1)

Dr. B. Karunaiselvi
Head of the Department

Dr.R.Sreebha
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

B.Sc. Zoology

(2023-2024 onwards)

Semester II	**BIOCOMPOSTING FOR ENTREPRENEURSHIP**	Hours/Week: 2	
NME-2		Credits: 2	
Course Code **23UZYN21**		Internal 25	External 75

Course outcomes:

The students will able to

CO1: define the process of Biocomposting and its importance. [K1]

CO2: outline the various applications of Biocomposting. [K1]

CO3: describe about the Biocompost units. [K2]

CO4: explain the methods and requirements to construct a Biocomposting unit. [K2]

CO5: apply their skills in making "clean and green" and sustainable environment.[K3]

Unit I

Biocomposting – Definition, types and ecological importance. (6 Hours)

Unit II

Types of Biocomposting technology – Field pits/ground heaps/ tank/large-scale/batch and continuous methods. (6 Hours)

Unit III

Preparation of Biocompost pit and bed using different amendments. (6 Hours)

Unit IV

Applications of Biocompost in soil fertility maintenance, promotion of plant growth, value added products, waste reduction, etc. (6 Hours)

Unit V

Economics of establishment of a small biocompost unit – project report proposal for Self Help Group (Income and employment generation). (6 Hours)

Practical

- Preparation procedures for Biocompost pit.
- Selection of Biocompost material, separation of Compostable and Non-compostable materials.
- Packing and marketing of Biocompost.
- Field visit to Biocomposting unit.
-

REFERENCES

1. Bikas R. Pati&Santi M. Mandal. (2016). Recent trends in composting technology.
2. Van der Wurff, A.W.G., Fuchs, J.G., Raviv, M., Termorshuizen, A.J. (Editors) (2016). Handbook for Composting and Compost Use in Organic Horticulture. Bio Greenhouse COST Action FA 1105, www.biogreenhouse.org.

Mapping Table

CO/PO Course Code 23UZYN21	PO1		PO2	PO3		PO4		PO5	PO6	PO7
CO 1	3	2	3	3	2	3	3	3	2	3
CO 2	3	2	2	1	2	3	3	2	1	3
CO 3	3	3	2	1	2	2	1	2	1	2
CO 4	2	3	2	2	1	1	2	1	2	2
CO 5	3	2	1	2	3	3	3	2	2	1

Strong (3) Medium (2) Low (1)

Dr. J. Rani
Head of the Department

Dr. P. Veeramuthumari
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

B.Sc. Zoology

(2023-2024 onwards)

Semester II	**WILDLIFE CONSERVATION AND MANAGEMENT**	Hours/Week: 2	
SEC-2		Credits: 2	
Course Code **23UZYS21**		Internal 25	External 75

Course outcomes

On completion of the course, the students will be able to

CO1: define the fundamental concepts of wild life biology. (K1)

CO2: describe the general principles of wildlife conservation to improve the status of Wildlife. (K1)

CO3: explain the problems related to wildlife conservation and management. (K2)

CO4: discuss the value of wild life species in maintaining healthy ecosystem. (K2)

CO5: identify the importance of wildlife and the conservation methods for the future. (K3)

Unit I

Biodiversity Extinction and Conservation Approaches : Perspectives and Expressions. Identification and prioritization of Ecologically sensitive area (ESA). Coarse filter and fine filter approaches. Regional and National approaches for biodiversity conservation. (6 Hours)

Unit II

Theory and Analysis of Conservation of Populations: Stochastic perturbations - Environmental, Demographic, spatial and genetic stochasticity.Population viability analysis-conceptual foundation, uses of PVA models. Management Decisions for small populations using PVA models. Minimum viable populations & recovery strategies for threatened species. (6 Hours)

Unit III

National and International Efforts for Conservation : International agreements for conserving marine life, Convention on wetlands of International Importance (Ramsar convention), Conservation of Natural Resources.Overview of conservation of Forest &Grassland resources. CITES, IUCN, CBD National Forest Policy, 1988, National Wildlife Action Plan 2017-2031, Wildlife Protection Act 1972, National and State Biodiversity Action Plans and other Forests and Environmental Acts. (6 Hours)

Unit IV

Wildlife in India : Wildlife wealth of India & threatened wildlife, Reasons for wildlife depletion in India, Wildlife conservation approaches and limitations. Wild life Habitat: Characteristic, Fauna and Adaptation with special reference to Tropical forest. Protected Area concept: National Parks, Sanctuaries and Biosphere Reserves, cores and Buffers, Nodes and corridors.Community Reserve and conservation Reserves. (6 Hours)

Unit V

Management of Wildlife : Distribution, status. Habitat utilization pattern, threats to survival of Slender Loris, Musk deer, Great Indian Bustard, Olive Ridley turtle. Wild life Trade & legislation, Assessment, documentation, Prevention of trade, Wild life laws and ethics.

(6 Hours)

TEXT BOOKS

1. Robinson W L and Eric G Bolen, 1984. Wildlife Ecology and Management, Maxmillan Publishing Company, New York, p 478.
2. Aaron, N.M.1973 Wildlife ecology, W.H. Freeman Co. San Francisco, U.S.A.
3. Dasmann R F, 1964. Wildlife Biology, John Wiley & Sons, New York, p 231.
4. Justice Kuldip Singh 1998. Handbook of Environment, Forest and Wildlife Protection Laws in India, Natraj Publishers, Dehradun.
5. Hosetti, B.B. 1997 Concepts in Wildlife Management, Daya Publishing House, Delhi.
6. Sutherland, W.J 2000. The conservation handbook: Research, Management and Policy. Blackwell Science.
7. Caughley.G and Sinclaire, A.R.E 1994 Wildlife ecology and management. Blackwell Science.
8. Woodroffe R, Thirgood, S. and Rabinowitz A. 2005.People and Wildlife, Conflict or Co exsistence? Cambridge University.

9. Sinha, P.C. 1998. Wildlife and Forest Conservation, Anmol Publishing Pvt. Ltd., New Delhi.
10. Singh, S.K, 2005. Text Book of Wildlife Management. IBDC, Lucknow

Suggested Readings

1. Gilas R H Jr.(ed.), 1984. Wildlife Management Techniques, 3rd ed. The Wildlife Society, Washington D.C., Nataraj Publishers, Dehra Dun, p 547.
2. Rodgers W A, 1991. Techniques for Wildlife Census in India - A Field Manual: Technical Manual - T M - 2. WII.
3. Saharia V B, 1982. Wildlife of India, Natraj Publishers, Dehra Dun.
4. Goutam Kumar Saha and SubhenduMazumdar, 2017. Wildlife Biology: An Indian Prospective, PHI Publisher, Delhi.
5. Katwal/Banerjee, 2002. Biodiversity conservation in managed and protected areas, Agrobios, India.
6. Gopal, Rajesh,1992. Fundamentals of Wildlife Management, Justice Home, Allahabad, India.
7. Sharma, B.D, 1999. Indian Wildlife Resources Ecology and Development, Daya Publishing House, Delhi.
8. Stephen, H.B. and V.B. Saharia,1995. Wildlife research and management. Asian and American Approaches, Oxford University Press, Delhi.
9. Negi, S.S. 1993. Biodiversity and its conservation in India, Indus Publishing Co., New Delhi.
10. Moulton, M. P. & J. Sanderson, 1997. Wildlife Issues in a Changing World. St. Lucie Press.

WEB RESOURCES

1. https://www.vedantu.com/biology/conservation-of-biodiversity
2. https://www.embibe.com/exams/conservation-of-biodiversity/

Mapping Table

Course Code	PO1		PO2	PO3		PO4		PO5	PO6	PO7
23UZYS21	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	3	2	3	3	3	2	3	2	2	3
CO2	3	2	3	2	3	1	3	2	1	3
CO3	3	3	2	1	2	1	2	2	1	3
CO4	2	2	2	1	2	1	2	3	2	2
CO5	3	2	2	2	2	2	1	2	2	2

Strong (3) Medium (2) Low (1)

Dr. J. Rani
Head of the Department

Dr. P. Vijaya
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. Zoology

(for those who join in 2023-2024)

Semester III	**CELL BIOLOGY AND GENETICS**	Hours/Week: 5	
Core Course - III		Credits: 5	
Course Code **23UZYC31**		Internal 25	External 75

Course Outcomes:

On completion of this course, students will able to

CO1: describe the basic concepts of Cell biology and Genetics. [K1]

CO2: discuss the significant role of cells and genes. [K2]

CO3: apply their knowledge to find out the effects of variations in cells and genes. [K2]

CO4: identify the causes of disorders in cellular and genetic levels. [K3]

CO5: review the case reports in the field of cytogenetics. [K3]

Unit I

Cell types – Prokaryotic and Eukaryotic cells. **Cellular components** - Plasma Membrane Ultra Structure - Different Models - Functions - Ultrastructure, Composition and Function of Endoplasmic reticulum, Ribosomes, Golgi Complex, Lysosomes, Centrioles, Mitochondria and Microsomes. **(15 Hours)**

Unit II

Nucleus - Ultrastructure, Composition and Functions- Nucleus, Nuclear Membrane, Nucleoplasm, Chromosomes - Heterochromatin and Euchromatin. Nucleolus, Nucleolus Cycle, DNA and RNAs. Protein Synthesis- Transcription and Translation and Post Translation processing. **(15 Hours)**

Unit III

Cell Divisions and Cell Cycle - Amitosis, Mitosis and Meiosis and their significance. Cancer Biology – Characteristics of cancer cells, types, theories on Carcinogenesis, Ageing of Cells – Apoptosis. Stem cell- types, features and importance. **(14 Hours)**

Unit IV

Basic concepts of Genetics: Laws of Mendel, Monohybrid, Dihybrid, back and test cross; Polygenic inheritance- skin colour; multiple alleles- ABO blood groups and coat colour in rabbit; sex linked inheritance – eye colour in Drosophila, colour blindness and haemophilia in man. **Linkage and Crossing Over**: Linkage: Linked genes, complete and incomplete linkage. Crossing over: molecular mechanisms of crossing over, kinds of crossing over. **Gene mutation:** types, molecular basis of mutation, mutational hot spots, reversion; radiation and chemical agents as mutagens. **(16 Hours)**

Unit V

Human and Microbial Genetics: Human genetics: Karyotype and ideogram; sex determination - Barr body technique, chromosomal abnormalities in humans, Pedigree analysis; diagnosis of genetic abnormalities; Eugenics, Euphenics and Euthenics. Population genetics and evolution: gene pool, gene frequency and genotype frequency; Hardy-Weinberg law of equilibrium. Bacterial genetics: Conjugation, transformation, transduction and chromosome mapping. **(15 Hours)**

Text Books:

1. Arumugam N (2019). Cell and Molecular Biology. Saras Publications, Nagercoil.
2. Meyyan, R.P., (2019). Genetics. Saras Publications. Nagarcoil.

References

1. Verma P.S. and Agarwal V.K. (2021). Cell Biology (Cytology, Biomolecules, Molecular Biology), Paperback, S. Chand and Company Ltd.
2. Rastogi SC. (2015). Cell Biology. New Age International Pvt., New Delhi.
3. Aminul Islam. (2018). Essential of Cell Biology. Arunabha Sen Book and Allied Pvt.Ltd. Kolkata.
4. De Robertis, E. D. P and E.M.F Robertis(2017). Cell and Molecular Biology 8th Edition, LWW.
5. Verma P.S and Agarwal V.K., (2006). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, S. Chand & Company Ltd.
6. Arora, M.P., & Sandhu, G.S., (2000). Genetics. Mumbai: Himalaya Publishing House.

Website References

- http://www.microscopemaster.com/organelles.html
- https://rsscience.com/cell-organelles-and-their-functions/

- .https://www.genome.gov/genetics-glossary/Sex-Linked
- https://www.vedantu.com/biology/mutagens

Course Code	PO1		PO2	PO3		PO4		PO5	PO6	PO7
23UZYC31	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	3	3	1	1	1	1	2	-	1	1
CO2	3	2	3	3	2	2	-	-	1	-
CO3	3	2	3	2	1	3	2	2	2	3
CO4	3	3	2	3	2	1	3	1	2	3
CO5	3	3	2	3	3	1	3	2	2	1

Strong (3) Medium (2) Low (1)

Dr. J. Rani

Head of the Department

Dr, J. Rani

Dr. R. Radhalakshmi

Course Designers

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. Zoology

(for those who join in 2023-2024)

Semester III	**CYTOGENETICS PRACTICAL**	Hours/Week: 3	
Core Course Lab- III		Credits: 2	
Course Code **23UZYC31P**		Internal 40	External 60

COURSE OUTCOMES

On completion of the course, the students will be able to

CO1: explain the types of cells based on their structure. [K2]

CO2: describe the different stages during cell division. [K2]

CO3: apply the knowledge in identifying the nature of genetic traits. [K3]

CO4: find out the factors involved in genetic variations in a population. [K3]

CO5: identify the prevalence of genetic disorders to create awareness among the people. [K3]

Practicals

1. Preparation and Identification of Mitotic cell divisions in onion root tips.
2. Demonstration and Identification of different stages of Meiosis in the testis of Grasshopper.
3. Buccal epithelium (Barr body) preparation.
4. Karyotyping (with the help of photographs) – normal male and female karyotypes and study of karyotypes of different genetic syndromes.
5. Verification of the Mendelian laws of inheritance using coloured beads.
6. Observation on genetic traits.
7. Principle and methods of staining - Histological stains: Haematoxylin and Eosin.
8. Blood Typing.
9. Genetic Problems on Linkage and Crossing over.
10. Polytene chromosomes in salivary glands of chironomous larva.

11. Study of at least five types of Drosophila- Morphology and Sexual dimorphism: Body colour mutant- Ebony body and Yellow body. Wing mutant- Curly wing and Vestigial wing. Eye colour mutant- Bar eye, White eye, Sepia eye.
12. Coat colour of Mice.

Course Code	PO1		PO2	PO3		PO4		PO5	PO6	PO7
23UZYC31P	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	3	2	2	1	1	3	3	1	3	2
CO2	3	3	2	1	2	3	3	2	3	2
CO3	3	2	2	2	2	3	3	2	3	2
CO4	2	2	2	2	2	2	2	2	3	2
CO5	3	3	2	3	1	2	3	3	3	2

Strong (3) Medium (2) Low (1)

Dr. J. Rani

Head of the Department

Dr, J. Rani

Dr. R. Radhalakshmi

Course Designers

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. Zoology

(for those who join in 2023-2024)

Semester III	**ORGANIC,INORGANIC AND PHYSICAL CHEMISTRY-I**	Hours/Week: 4	
Elective Course-II		Credits: 3	
Course Code **23UCHA31**		Internal 25	External 75

On completion of the course, the students will be able to

CO1 : know the theories of Chemical bonding, Fuel gases, hybridisation, antibiotics and principles of volumetric analysis. [K1]

CO2 : recognize the bonding and antibonding orbitals, Silicones, Polar effect, structure of drugs and uses. [K2]

CO3 : explain the nuclear reactions, manufacture of fuel gas, hyperconjugation, artificial sweeteners, distillation and crystallisation. [K2]

CO4 : understand the nuclear fission and fusion reactions, fertilizers, geometry of the molecules, and chromatography. [K3]

CO5 : identify the applications of radioactive isotopes, NPK fertilizers, types of reactions, organic halogen compounds, and the types of chromatography. [K3]

UNIT I

Chemical Bonding and Nuclear Chemistry

Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. M. O diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties. Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and nuclear reactions- group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes – carbon dating, rock dating and medicinal applications. **(12 Hours)**

Unit II

Industrial Chemistry

Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required).

Silicones: Synthesis, properties and uses of silicones.

Fertilizers: Urea, ammonium sulphate, potassium nitrate NPK fertilizer, superphosphate, triple superphosphate. **(12 Hours)**

UNIT III

Fundamental Concepts in Organic Chemistry

Hybridization: Orbital overlap hybridization and geometry of CH_4, C_2H_4, C_2H_2 and C_6H_6. Polar effects: Inductive effect and consequences on Ka and K_b of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric-examples and explanation. Reaction mechanisms: Types of reactions- aromaticity-aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.

(12 Hours)

UNIT IV

Drugs and Speciality Chemicals

Definition, structure and uses: Antibiotics viz., Penicillin, Chloramphenicol and Streptomycin; Anaesthetics viz., Chloroform and ether; Antipyretics viz., aspirin, paracetamol and ibuprofen; Artificial Sweeteners viz., saccharin, Aspartame and cyclamate; Organic Halogen compounds viz., Freon, Teflon. **(12 Hours)**

UNIT V:

Analytical Chemistry

Introduction qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques: extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer chromatography. **(12 Hours)**

RecommendedText

1. V.Veeraiyan, (2009), Textbook of Ancillary Chemistry; High mountpublishing house, Chennai, first edition.
2. S.Vaithyanathan, (2006), Text book of Ancillary Chemistry; PriyaPublications, Karu.
3. ArunBahl, B.S.Bahl,(2012), Advanced Organic Chemistry; S.Chandand Company, New Delhi, twenty third edition.
4. P.L.Soni, H.M.Chawla,(2007), Text Book of Inorganic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition.

Reference Books

1. P.L.Soni, Mohan Katyal, (2007), Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition.
2. B.K,Sharma, (2014), Industrial Chemistry; GOEL publishing house,Meerut, sixteenth edition.
3. Jayashree gosh, (2 0 0 6) , Fundamental Concepts of Applied Chemistry; Sultan & Chand, Edition.

Course Code 23UCHA31	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	1	2	3	2	2	2
CO2	2	2	2	2	2	1	1
CO3	2	1	2	2	1	2	1
CO4	2	1	2	1	1	2	2
CO5	2	1	2	2	2	2	1

Strong (3) Medium (2) Low (1)

Dr.M.Dhanalakshmi
Head of the Department

Mrs.R.Nagasathya
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. Zoology

(for those who join in 2023-2024)

Semester III	**VOLUMETRIC ANALYSIS PRACTICAL**	Hours/Week: 2	
Elective Course-II Practical		Credits: 1	
Course Code **23UCHA31P**		Internal 40	External 60

On completion of the course, the students will be able to

CO1 : understand the use of Standard flash, pipette and burette [K2]

CO2 : carry out the reactions and find out the values in titrations. [K2]

CO3 : interpret the results of Volumetric titrations. [K3]

CO4 : apply their skill in the analysis of hardness using EDTA [K3]

CO5 : identify the Chemical constituents in allied chemical products. [K3]

VOLUMETRIC ANALYSIS

1. Estimation of sodium hydroxide using standard sodiumcarbonate.
2. Estimation of hydrochloric acid using standard oxalic acid.
3. Estimation of ferrous sulphate using standard Mohr's salt.
4. Estimation of oxalic acid using standard ferrous sulphate.
5. Estimation of potassium permanganate using standardsodium hydroxide.
6. Estimation of magnesium using EDTA. (Demonstration only) **(30 Hours)**

Reference Books

V.Venkateswaran, R.Veerasamy, A.R.Kulandaivelu, (1997), Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition.

Course Code **23UCHA31P**	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	1	2	3	2	2	2
CO2	2	2	2	2	1	1	1
CO3	2	1	2	2	1	2	1
CO4	2	1	2	3	1	2	2
CO5	2	1	2	2	2	2	1

Strong (3) Medium (2) Low (1)

Dr.M.Dhanalakshmi
Head of the Department

Dr.J.Kavitha
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. Zoology

(for those who join in 2023-2024)

Semester III	**AQUARIUM KEEPING**	Hours/Week: 1
SEC - III		Credits: 1
Course Code **23UZYS31**		Internal 100

COURSE OUTCOMES

On completion of the course, the students will be able to

CO1: define the basic concepts and importance of aquaculture. [K1]

CO2: gain knowledge on culture of ornamental fishes. [K1]

CO3: guide layman individual in his/her difficulties during the preparation of an aquarium [K2]

CO4: understand about the scope of self-employment opportunities. [K2]

CO5: apply the skills to set up a well maintained aquarium. [K3]

UNIT I

Introduction and scope - External morphology of a typical fish- Angel and Fighter fish.

(2 Hours)

UNIT II

Set up an Aquarium- Exotic and endemic varieties of ornamental fishes- Gold fish, Guppy and Molly. Aquarium tank - Kinds of tanks, tank setting, biological filter and aeration**. (5 Hours)**

UNIT III

Water management- planting, lighting and feeds. Aquarium Fish Farm as a Cottage Industry.

(2 Hours)

Unit IV

Ornamental fish transport methods- Conditions of packing, transportation and marketing of Ornamental fish. **(3 Hours)**

Unit V: Fish Diseases-Causes, symptoms and control measures- Gill rot disease (Fungal), Dropsy (Bacterial) and Knot Disease (Parasitic). **(3 Hours)**

Test Book

1. Arumugam N. (2019). Saras Publication, Nagercoil.

Reference Books:

1. Pauly, D and Zeller, D. Comments on FAOs State of World Fisheries and Aquaculture (SOFIA 2016), Marine Policy,
2. Pandey and Shukla. (2005). Fish and Fisheries. Rastogi Publications.
3. Jhingran, V.G. (1983). Fish and Fisheries of India, Hindustan Publishing Corp. Delhi.

Website References

1. http://www.fao.org/fishery/aquaculture/en
2. https://www.sciencedirect.com/science/article/pii/S0308597X16305516

Course Code 23UZYS31	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	3	3	2	3	3	2	2	1	2	2
CO2	3	3	2	2	2	2	2	1	2	2
CO3	3	2	2	3	2	3	3	1	2	3
CO4	3	3	-	3	3	2	2	-	2	3
CO5	3	2	2	3	2	3	3	3	2	3

Strong (3) Medium (2) Low (1)

Dr. J. Rani — **Head of the Department**

Dr. P. Vijaya — **Course Designer**

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. Zoology

(for those who join in 2023-2024)

Semester III	**AGRICULTURAL ENTOMOLOGY**	Hours/Week: 2	
SEC - IV		Credits: 2	
Course Code **23UZYS32**		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the students will be able to

CO1: understand the basic concepts of entomology and observe the pest status of agriculture. [K1]

CO2: describe the kinds of insects and its role in the agricultural fields. [K1]

CO3: explain the systemic and functional morphology of various group of agricultural insect pests. [K2]

CO4**:** discuss the culture methods and outcomes of Integrated Pest Management. [K2]

CO5: analyze the economic importance of agricultural insect species. [K3]

Unit I

Outline classification of insects. Importance of insects. Insect Pests- Methods of collection, mounting and preservation. **(5 Hours)**

Unit II

Agriculture Pests and Control measures- Biology, Pathology and Control measure: Cotton pest – *Earias fabia*; Sugarcane pest- *Pyrilla perpusilla*; Paddy pest- *Leptocorisa varicornis*. Locust and its control. Insect pollinators and scavenger (Brief account). Insect pests of stored grains their preventive and curative methods (Brief account). **(7 Hours)**

Unit III

Apiculture: Introduction, types of honey bees, hive, apiary, selection of bees for apiary, Newton's bee hive, enemies and diseases of honey bees- Mites- Ectoparasitic mite-Varroa mite and Endoparasitic mite-Acarine mite and Bacterial Disease- American Foul Brood disease.

(6 Hours)

Unit IV

Sericulture: Introduction, types of silk worms, life history of mulberry silk worm, Economic importance of sericulture. Mulberry cultivation methods. Pest of Silkworm – Uzifly. Diseases of silk worm- Protozoan disease – Pebrine. **(6 Hours)**

Unit V

IPM- Introduction- physical, mechanical, chemical and biological control methods, Pesticide application equipment. Pheromones, antifeedents, repellents and biopesticide.

(6 Hours)

Reference Books

1. Ganga, G. and Sulochana Chetty, J. (2006). An Introduction to sericulture. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.
2. Tamilselvi,M., and Abdul Jaffar Ali, H., (2016). A Textbook on Apiculture. Vijay Nicole Pvt.Ltd., Chennai.
3. Nalina Sundari, M. S. (2016). Entomology. Chennnai: MJP Publishers.
4. Donald, J. B. Tripplehorn, C.A. and Johnson, N.F. (1989). An Introduction to the Study of Insects. Philadelphia: Saunders College Publication.
5. Vasantha Raj Devid, B and Kumaraswami, T. (1982). Elements of Economic Entomology. Madras : Popular Book Depot.
6. Rupal H. Nagrecha. (2018). Basic Entomology. Cyber Tech Publications, New Delhi.
5. Wheeler WM. (2006). Social Insects. Discovery Publishing House, New Delhi.

Web resources

1. http://www.fao.org
2. http://www.ipm.ucdavis.edu
3. www.entsoc.org

Course Code	PO1		PO2	PO3		PO4		PO5	PO6	PO7
23UZYS32	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	3	3	2	3	3	2	2	1	2	2
CO2	3	3	2	2	2	2	2	1	2	2
CO3	3	2	2	3	2	3	3	1	2	3
CO4	3	3	-	3	3	2	2	-	2	3
CO5	3	2	2	3	2	3	3	3	2	3

Strong (3) Medium (2) Low (1)

Dr. J. Rani

Head of the Department

Dr.P. Veeramuthumari

Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. Zoology

(for those who join in 2023-2024)

Semester IV	**DEVELOPMENTAL BIOLOGY**	Hours/Week: 4	
Core Course - IV		Credits: 4	
Course Code **23UZYC41**		Internal 25	External 75

Course Outcomes:

On completion of this course, students will able to

CO1: understand the fundamental principles in developmental biology. [K1]

CO2: describe the various stages in the development of an embryo. [K2]

CO3: explain the various interactive processes involved during the development of an organism. [K2]

CO4: find out the factors responsible for important events in embryological studies. [K3]

CO5: identify the merits of advanced concepts in developmental biology. [K3]

Unit I :Gametogenesis & Fertilization

Basic concepts of developmental biology. Structure and types of Spermatozoa, Mammalian egg - Egg membranes. Types of egg - Spermatogenesis – Oogenesis. Fertilization – mechanism – Chemical and Cytological factors and significance – Parthenogenesis-Types and its Significance. **(12 Hours)**

Unit II :Blastulation & Gastrulation

Cleavage - Planes and Patterns, Factors controlling cleavage. Fate map and its construction. Blastulation –types of blastula. Morphogenetic movements - Gastrulation of frog and chick.

(12 Hours)

Unit III :Organogenesis

Development of Brain, Eye and Heart in frog. Development of Nervous system in chick. Foetal membranes in chick. Development of Pro, Meso Metanephric kidneys. Placentation in Mammals. **(12 Hours)**

Unit IV : Applied Embryology

Organizer concept –Structure – mechanism of induction and competence. Nuclear transplantation, Teratogenesis, Regeneration: types - events and factors. Embryonic stem cells and significance. **(12 Hours)**

Unit V: Human embryology

Reproductive organs, menstrual cycle and menopause, Pregnancy – trimesters development. Erythroblastosis foetalis, Twins – types. Infertility – causes, Test tube baby and Assisted Reproductive Technology – Embryo transfer and Amniocentesis. **(12 Hours)**

Text Book

1. Arumugam, N. (2008).Text Book of Embryology. Kottar, Nagarcoil: Saras Publication. 2. Verma, P.S. and Agarwal V.K. (2000). Chordate Embryolog., New Delhi: S.Chand & Co.

References

1. Subramanian MA. (2020). Developmental Biology, MJP Publishers, Chennai.
2. Balinsky. (1981). An Introduction to Embryology. Philadelphia : W.B. Saunders Company.
3. Berill, N.J.(1986). Developmental Biology. New Delhi: MC Graw Hill.
4. Saunder.J.W.(1982). Developmental Biology Patterns and Principles. New York.
5. Patten, B.M.(1958). Foundations of Embryology. NewYork: Mc Graw Hill,
6. Macmillan. Browder, L.W.Erickson, C.A. and Williams. (1992). Developmental Biology. London: R.J.Saunders College Publications.

Course Code	PO1		PO2	PO3		PO4		PO5	PO6	PO7
23UZYC41	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	3	2	1	2	-	2	2	1	2	1
CO2	3	3	1	2	1	3	3	1	2	2
CO3	3	3	1	3	1	2	2	1	2	1
CO4	3	2	1	3	2	2	2	1	2	1
CO5	3	2	2	3	3	2	3	H	2	2

Strong (3) Medium (2) Low (1)

Dr. J. Rani — **Head of the Department**

Dr.M. Tamilselvi — **Course Designer**

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. Zoology

(for those who join in 2023-2024)

Semester III	**DEVELOPMENTAL BIOLOGY PRACTICAL**	Hours/Week: 3	
Core Course Lab- IV		Credits: 2	
Course Code **23UZYC41P**		Internal 40	External 60

COURSE OUTCOMES

On completion of the course, the students will be able to

CO1: explain the basic structure and functions of gametes. [K2]

CO2: describe the developmental stages during embryogenesis. [K2]

CO3: apply the knowledge and practical skills in completing their projects. [K3]

CO4: identify the functional status of different types of cells. [K3]

CO5: find out the factors responsible for development of the organisms. [K3]

Practicals

1. Slides on the Observation of mammalian egg and sperm.
2. Placenta of Sheep and man.
3. Early developmental stages of frog – Cleavage, Blastula and Gastrula.
4. Mounting of different stages of chick blastoderm (24 hrs, 48hrs, 72 hrs and 96 hrs).
5. Collection of eggs of different birds (any2)
6. Observation of Regeneration in Lizard (Virtual Video)
7. Observation of metamorphosis in frog (Virtual Video).
8. T.S.of mammalian testis and ovary showing maturation Stages.
9. Types of eggs (Pictures)

a) Microlecithal egg - eg: Amphioxus b) Megalecithal egg - eg: Hen c) Centrolecithal egg - eg: Cockroach d) Cleidoic egg - eg: Hen e) Non –Cleidoic egg - eg: Frog

Reference Books

1. Arumugam, N., (2008). Text Book of Embryology. Kottar: Saras Publication
2. Verma, P.S. and Agarwal, V.K., (2000). Chordate Embryology. New Delhi:S.Chand & Co.
3. Browder, L.W., Erickson, C.A., and Williams., (1992). Developmental Biology. London: R.J.Saunders College Publications

3. Balinsky., (1981). An Introduction to Embryology. Philadelphia: W.B. Saunders Company.
4. Berill, N.J., (1986). Developmental Biology. New Delhi: MC Graw Hill.
5. Saunder.J.W., (1982). Developmental Biology. New York: Patterns and Principles, Macmillan.
6. Patten, B.M., (1958). Foundations of Embryology. NewYork: Mc Graw Hill

Course Code	PO1		PO2	PO3		PO4		PO5	PO6	PO7
23UZYC41P	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	3	2	2	1	1	3	3	1	3	2
CO2	3	3	2	1	2	3	3	2	3	2
CO3	3	2	2	2	2	3	3	2	3	2
CO4	2	2	2	2	2	2	2	2	3	2
CO5	3	3	2	3	1	2	3	3	3	2

Strong (3) Medium (2) Low (1)

Dr. J. Rani — **Head of the Department**

Dr.M. Tamilselvi — **Course Designer**

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. Zoology

(for those who join in 2023-2024)

Semester IV	**ORGANIC, INORGANIC AND PHYSICAL CHEMISTRY-II**	Hours/Week: 4	
Elective Course-II		Credits: 3	
Course Code **23UCHA41**		Internal 25	External 75

On completion of the course, the students will be able to

CO1 **:** know the basic concepts of co-ordination chemistry, electrochemistry, biochemistry and photo chemistry [K1]

CO2 **:** Classify amino acids, proteins, carbohydrates and cells in electrochemistry explain the theories of co-ordination chemistry and laws governing photochemistry [K2]

CO3 **:** describe the role of haemoglobin, chlorophyll, nucleic acids, trace metals and buffer solutions in biological systems [K2]

CO4 **:** apply water technologies for purification of water, determine the structure of glucose, fructose, nucleic acids and co-ordination compounds, illustrate various photo physical, chemical and electro chemical reactions [K3]

CO5 **:** apply the electrochemistry principles in corrosion, electroplating and fuel cells, interpret the chemistry of proteins, aminoacids and carbohydrates [K3]

UNIT I

Co-ordination Chemistry and Water Technology

Co-ordination Chemistry**:** Definition of terms - IUPAC Nomenclature - Werner's theory - EAN rule - Pauling's theory – Postulates - Applications to $[Ni(CO)_4]$, $[Ni(CN)_4]^{2-}$,$[Co(CN)_6]^{3-}$ Chelation - Biological role of Hemoglobin and Chlorophyll (elementary idea) - Applications in qualitative and quantitative analysis.

Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques – BOD and COD. **(12 Hours)**

UNIT II

Carbohydrates

Classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose. Glucose-fructose interconversion. Preparation and properties of sucrose, starch and cellulose. **(12 Hours)**

UNIT III

Amino Acids and Essential elements of biosystem

Classification - preparation and properties of alanine,preparation of dipeptides using Bergmann method - Proteins- classification – structure - Colour reactions – Biological functions – nucleosides -nucleotides – RNA and DNA – structure. Essentials of trace metals in biological system-Na, Cu, K, Zn, Fe, Mg. **(12 Hours)**

UNIT IV

Electrochemistry

Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials - electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome

plating – Types of cells -fuel cells-corrosion and its prevention. **(12 Hours)**

UNIT V

Photochemistry

Grothus - Drapper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen -chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples). **(12 Hours)**

RecommendedText

1. V.Veeraiyan, (2009), Textbook of Ancillary Chemistry; High mountpublishing house, Chennai, first edition.
2. S.Vaithyanathan,(2006), Text book of Ancillary Chemistry; PriyaPublications, Karur.
3. Arun Bahl, B.S.Bahl, (2012), Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition.
4. P.L.Soni, H.M.Chawla,(2007), Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition.

Reference Books

1. Arun Bahl, B.S.Bahl, (2012), Advanced Organic Chemistry; S.Chandand Company, New Delhi, twenty third edition.
2. P.L.Soni, H.M.Chawla, (2007), Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition.
3. P.L.Soni, Mohan Katyal, (2007), Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition.
4. B.R.Puri, L.R.Sharma, M.S.Pathania, (2018), Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventhedition.
5. B.K,Sharma, (2014), Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition.

Course Code 23UCHA41	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	2	3	2	2	2
CO2	2	3	2	2	2	1	1
CO3	2	2	2	2	1	2	1
CO4	2	2	2	1	1	2	2
CO5	2	1	2	3	3	2	1

Strong (3) Medium (2) Low (1)

Dr.M.Dhanalakshmi
Head of the Department

Mrs.R.Nagasathya
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. Zoology

(for those who join in 2023-2024)

Semester III	**ANALYSIS OF ORGANIC COMPOUNDS PRACTICAL**	Hours/Week: 2	
Elective Course-II Practical		Credits: 1	
Course Code **23UCHA41P**		Internal 40	External 60

On completion of the course, the students will be able to

CO1 : remember the functional group of Organic Compounds. [K2]

CO2 : carry out the reactions and find out the elements of Organic compounds. [K2]

CO3 : determine the functional group and distinguish the aliphatic and aromatic compunds.[K3]

CO4 : apply the skill in the analysis of functional group of Organic compunds. [K3]

CO5 : identify the chemical constituents of Organic compunds. [K3]

SYSTEMATIC ANALYSIS OF ORGANIC COMPOUNDS

The analysis must be carried out as follows:

(a) Functional group tests [phenol, acids (mono & di) aromatic primary amine, amides (mono & di), ester, aldehyde and glucose].

(b) Detection of elements (N, S, Halogens).

(c) To distinguish between aliphatic and aromaticcompounds.

(d) To distinguish – Saturated and unsaturated compounds. **(30 Hours)**

Reference Book

1.V.Venkateswaran, R.Veerasamy, A.R.Kulandaivelu, (1997), Basic Principlesof Practical Chemistry; Sultan Chand & sons, Second edition.

Course Code 23UCHA41P	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	1	2	3	2	2	2
CO2	1	2	2	2	1	1	1
CO3	2	1	-	2	1	-	1
CO4	2	1	2	3	1	-	2
CO5	2	1	2	2	2	-	1

Strong (3) Medium (2) Low (1)

Dr.M.Dhanalakshmi
Head of the Department

Mrs.R.Nagasathya
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. Zoology

(for those who join in 2023-2024)

Semester IV	**FOOD, NUTRITION AND HEALTH**	Hours/Week: 2	
SEC- V		Credits: 2	
Course Code **23UZYS41**		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the students will be able to

CO1: understand the basic concepts of food, nutrition and balanced diet. [K1]

CO2: explain role of food and nutrients in health and disease. [K1]

CO3: discuss about the hygiene, food safety and disease transmission. [K2]

CO4: describe a healthy diet and food choices to prevent health problems. [K2]

CO5: identify the food system management in healthcare community. [K3]

Unit I : Nutrition and dietary nutrients:

Basic concepts of Food: Components and nutrients. Concept of balanced diet, nutrient requirements and dietary pattern for different groups viz., adults, pregnant and nursing mothers, infants, school children, adolescents and elderly people. **(6 Hours)**

Unit II: Macro nutrients and micronutrients:

Macronutrients- Carbohydrates, Lipids, Proteins- dietary source and role. Micronutrients. Vitamins- Water-soluble and Fat-soluble vitamins- their sources and importance. Important minerals -Iron, Calcium, Phosphorus, Iodine, Selenium and Zinc- their biological functions.

Unit III: Malnutrition and nutrient deficiency diseases: **(6 Hours)**

Definition and concept of health: Common nutritional deficiency diseases- Protein Malnutrition (e.g., Kwashiorkor and Marasmus), Vitamin A deficiency- Night blindness. Iron deficiency- Anaemia and Iodine deficiency disorders- Goitre- Symptoms, treatment and prevention.

(6 Hours)

Unit IV: Life style dependent diseases- hypertension, diabetes mellitus, and obesity their causes and prevention. Social health problems- smoking, alcoholism, narcotics. Acquired Immuno Deficiency Syndrome (AIDS): causes, treatment and prevention. **(6 Hours)**

Unit V: Diseases caused by microorganisms:

Food hygiene: Potable water- sources and methods of purification at domestic level. Food and Water-borne infections: Bacterial diseases: Cholera, Viral diseases: Hepatitis, Protozoan diseases: Amoebiasis, Parasitic diseases: Taeniasis - transmission, causative agent, symptoms and prevention. Causes of food spoilage and its prevention. **(6 Hours)**

References Books:

1. Mudambi SR, Rao MS and Rajagopal MV. (2007). Food Science. New Age International (P) Ltd. Publishers, New Delhi.
2. Suresh Gopalani. (2011). Fundamentals of Applied Nutrition. GS Rawat Cyber Tech Publications, New Delhi.
3. Umesh Prasad. (2011). Food Science and Nutrition. Sonali Publications, New Delhi.
4. Srilakshmi B. (2008). Food Science. New Age International (P) Ltd. Publishers, New Delhi.

Website References

https://www.slideshare.net/slideshow/potable-water-sources-and-methods-of-purification-at-domestic-level/108137242

https://byjus.com/chemistry/potable-water/

Course Code 23UZYS41	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	3	3	2	3	3	2	2	1	2	2
CO2	3	3	2	2	2	2	2	1	2	2
CO3	3	2	2	3	2	3	3	1	2	3
CO4	3	3	-	3	3	2	2	-	2	3
CO5	3	2	2	3	2	3	3	3	2	3

Strong (3) Medium (2) Low (1)

Dr. J. Rani — **Head of the Department**

Dr.P. Veeramuthumari — **Course Designer**

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. Zoology

(for those who join in 2023-2024)

Semester IV	**ECONOMIC ZOOLOGY**	Hours/Week: 2	
SEC- VI		Credits: 2	
Course Code		Internal	External
23UZYS42		25	75

COURSE OUTCOMES

On completion of the course, the students will be able to

CO1: understand the basic concepts of economically important living organisms. [K1]

CO2: explain the culturing techniques and production methods of different farm animals. [K1]

CO3: describe the life history of animals and disease control methods during culture practices. [K2]

CO4: discuss the economic and ecological importance of Vermiculture, Aquaculture, Poultry Farming, Dairy farming and Lac culture. [K2]

CO5: identify the basic culture technique skills to promote self-employment. K3]

Unit I

Vermiculture : Introduction: Types of earthworms – ecological classifications of earthworms – Physical, chemical and biological changes caused by earthworms in the soil – Natural enemies of earthworms. Vermicomposting: vermicomposting methods – factors affecting vermicomposting –Vermiculture unit. Harvesting of vermicompost – vermicast – advantages of vermicompost – vermiwash and its applications. **(6 Hours)**

Unit II

Aquaculture: Introduction- Types. Fresh water aquaculture - Carp culture. Types of ponds – preparation – maintenance – harvesting and management of fishes. Integrated / composite fish culture. Marine Aquaculture- Prawn culture and Pearl oyster culture. **(6 Hours)**

Unit III

Poultry Farming: Poultry industry in India – Poultry for sustainable food production and livelihood - Commercial poultry farming – Nutritive value of egg and meat- Broiler

management (Housing and equipment; Brooding, feeding and Record keeping). Layer management (Brooder, Grower, layer management and Culling of layers). Marketing of eggs and meat. Women in backyard poultry farming. **(6 Hours)**

Unit IV

Dairy Farming: Dairy farming, advantages of dairying. Classification of breeds of cattle – Indigenous and exotic breeds. Selection of dairy cattle. Breeding – artificial insemination. Dairy cattle management – housing, water supply, cattle nutrition feeding standards. Milk - Composition of milk, milk spoilage, pasteurization, Role of milk and milk products in human nutrition. Dairying as a source of additional income and employment. **(7 Hours)**

Unit V: Lac culture – History of Lac, Lac insect- and Biology, life cycle and host plants. Productions of Lac- Methods and steps. Lac products and its uses. Lac pests. **(5 Hours)**

Reference Books

1. Seethalakshmi, M., and Santhi, R., (2012). *Vermiculture*. Nagercoil: Saras Publication.

2. Mary Violet Christy A. (2008). *Vermitechnology*. Chennai: MJP Publishers.

3. Gnanamani, M.R. (1992). *Modern aspects of commercial poultry keeping*. Madurai:Giri Publication.

4. Arumugam N. (2019). Saras Publication, Nagecoil.

5. Ganga, G. and Sulochana Chetty, J. (2006). An Introduction to sericulture. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.

6. Tamilselvi,M., and Abdul Jaffar Ali, H., (2016). A Textbook on Apiculture. Vijay Nicole Pvt.Ltd., Chennai.

7. Banerjee GC and MAndal L. (2016) Poultry. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.

Website references

https://library.ignfa.gov.in/library-documents-2020-22/ntfp/lac-culture-29062021.pdf

https://www.rdscollege.ac.in/studymaterial/1595342253.pdf?uid=

https://cssda.cg.nic.in/Syllabus/MFP901.pdf

https://www.embibe.com/exams/lac-culture/

Course Code	PO1		PO2	PO3		PO4		PO5	PO6	PO7
23UZYS42	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 6
CO1	3	3	3	3	3	3	2	1	2	2
CO2	3	3	3	2	3	2	2	1	3	2
CO3	3	2	1	2	3	3	3	-	2	3
CO4	3	3	3	3	3	3	3	-	3	3
CO5	3	3	2	3	3	2	3	3	2	3

Strong (3) Medium (2) Low (1)

Dr. J. Rani

Head of the Department

Dr.P. Vijaya

Course Designer