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

OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM
REGULATIONS AND SYLLABUS
(With effect from Academic Year 2020 - 2021)

V.V.Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 20 UG Programmes, 14 PG Programmes, 6 M.Phil. 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 CB CS/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 and Computer Applications.

Commerce & Management	:	Commerce, Commerce (Computer Applications), Commerce (Professional Accounting), Business Administration.

PG PROGRAMMES

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

* AICTE approved Programmes

PRE-DOCTORAL PROGRAMMES (M.Phil.)

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Biochemistry
Commerce & Management	:	Commerce

OUTLINE OF CHOICE BASED CREDIT SYSTEM - PG

1. Core Courses
2. Project
3. Elective Courses
   - 3.1 Discipline Specific Elective Courses (DSEC)
   - 3.2 Non Major Elective Course (NMEC)
4. Online Course – Practice for CSIR NET – General Paper
5. Extra Credit Courses (Optional)

List of Non Major Elective Courses (NMEC) Offered

PG PROGRAMMES

Name of the Course	Semester	Department
History of Freedom Movement in India (A.D.1885 - 1947)	III	History
English for Job Aspirants	III	English
தமிழும் பிறதுறைகளும்	III	Tamil
Taxation Concepts and Assessment	III	Commerce
Entrepreneurship	III	Business Administration
Mathematics for Competitive Examinations	III	Mathematics
Digital Electronics	III	Physics
Chemistry for Competitive Examinations	III	Chemistry
Apiculture	III	Zoology
Nutrition and Health	III	Home Science - Nutrition andDietetics
Clinical Biochemistry	III	Biochemistry

Web Programming	III	Computer Science
Fundamentals of Information Technology	III	Information Technology
Web Technology	III	Computer Applications

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 channelise their teaching methodologies and evaluation strategies to attain the Programme Educational Objectives (PEOs) and fulfill the Vision and Mission of the InstitutionVision 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 eachProgramme 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 Biology for the betterment of Society.

Mission of the Department of Zoology

- 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 skill for the improvement of society.

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 M.Sc. Zoology Programme
The students will be able to

- To prioritize the competence in Life sciences and scientific research in order to constitute the principal knowledge of their degree.
- To appraise knowledge and make successful career in all the aspects of Zoology
- To perceive the impact of scientific solutions in global, environmental and societal context.

Key Components of the 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 skill 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/TeamWork, 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 their in depth domain knowledge and practical skills in interdisciplinary fields for research-based endeavours, employment and entrepreneurship development.

(*Disciplinary Knowledge)*

2 communicate proficiently and confidently with the ability to present complex ideas in a concise manner to assorted groups. (*Communication Skills*)

3 identify, formulate and solve problems in a consistent and systematic way with updated skills using modern tools and techniques. (*Scientific Reasoning and Problem Solving*)

4 analyze the data, synthesise the findings and provide valid conclusions by critical evaluation of theories, policies and practices for the betterment of society. (*Critical Thinking and Analytical Reasoning*)

5 explore and evaluate globally competent research methodologies to apply appropriately in interdisciplinary research; Develop and sustain the research capabilities to meet the emerging needs for the welfare of the society. (*Research Related Skills*)

6 use ICT to mould themselves for lifelong learning activities to face career challenges in the changing environment. (*Digital Literacy, Self - Directed and Lifelong Learning*)

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

8 uphold the imbibed ethical and moral values in personal, professional and social life for a 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 PG Programme**.** Programme Specific Outcomes denote what the students would be able to do at the time of graduation. They are Programme-specific and it is mandatory that each PO should be mapped to the respective PSO.

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

PO1. Disciplinary Knowledge

PSO1.a: Illustrate the comprehensive knowledge and understanding major concepts, theoretical principles and experimental findings in Zoology and its subfields to pursue research.

PSO1.b: Extend the use of modern instrumentation techniques to enhance practical skills in various fields of Zoology.

PO2. Communication Skills

PSO2: Communicate technical knowledge in specific area of study by apply their writing and oral communicative skills to present a technical core content in a concise manner to academicians.

PO3: Scientific Reasoning and Problem Solving

PSO3.a: Utilize contextual knowledge by adopting ecological, biostatistical, bioinformatic and biotechnological tools of research for uplifting the society.

PSO3.b: Identify, analyze and secure experimental processes to trigger solutions by interpreting data in various fields of Biology.

PO4. Critical thinking and Analytical Reasoning

PSO4: Predict various day to day problems (such as understanding environmental issues, conservation processes, pollution control, biodiversity and protection of endangered species) faced by the society, identify the causes and come out with appropriate solutions.

PO5. Research related skills

PSO5: Improve the use of technical skills in the field of life science research to meet out the emerging needs for the welfare of the society.

PO6. Digital Literacy, Self - directed and Lifelong learning

PSO6: Make use of ICT and Construct various application oriented twigs of Zoology to become an entrepreneur by fulfilling the economic needs of their life.

PO7. Cooperation/Teamwork and Multi-Cultural Competence

PSO7: Adapt to work in groups efficiently in diverse areas like research laboratories, industries and academic based institutions.

PO8. Moral and Ethical awareness

PSO8: Compile and follow the ethical strategies of environmental management and conservation for sustainable life on earth.

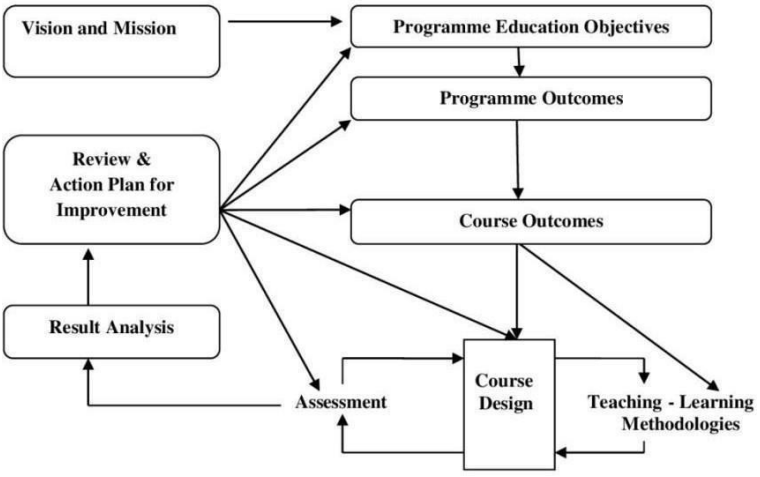
PO-PEO Mapping Matrix

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	✓	✓	✔
PO2/PSO2	✓	✓	✔
PO3/PSO3	✓	✓	-
PO4/PSO4	-	✓	✓
PO5/PSO5	-	✓	✓
PO6/PSO6	✔	✓	-
PO7/PSO7	✓	✓	✓
PO8/PSO8	-	-	✓

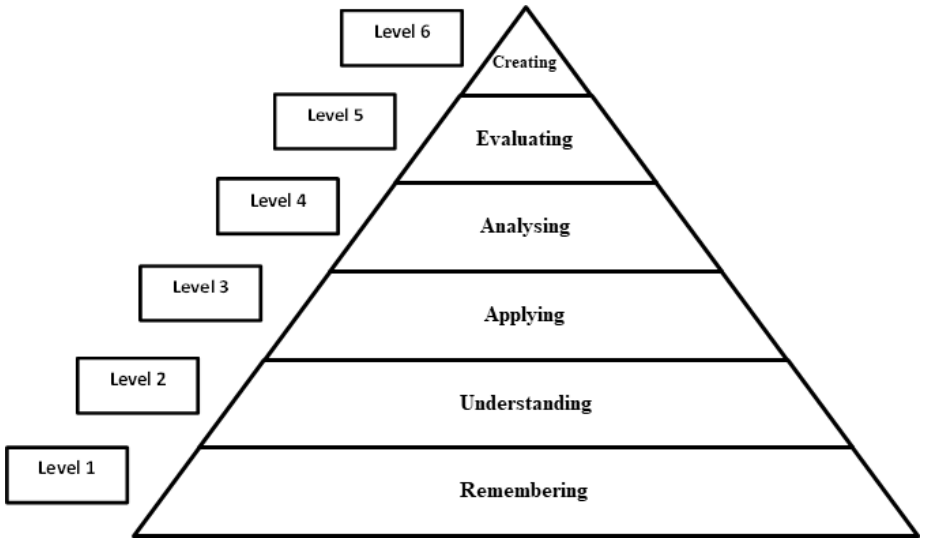
Course Outcomes (COs)

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 an adequatenumberofCos



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, 2 and 1 respectively.

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

PO / PSOs	PO1/ PSO1	PO2/ PSO2	PO3/ PSO3	PO4/ PSO4	PO5/ PSO5	PO6/ PSO6	PO7/ PSO7	PO8/ PSO8
CO1								
CO2								
CO3								
CO4								
CO5								

ELIGIBILITY FOR ADMISSION

The candidate should have passed in B.Sc. (Zoology and Life sciences)Degree from any recognized University

DURATION OF THE PROGRAMME

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

MEDIUM OF INSTRUCTION

English

B.2EVALUATIONSCHEME

Components	InternalAssessment Marks	ExternalExamination Marks	Total Marks
Theory/practical	40	60	**100**
Project	60	40	**100**

B.2.1 Core Courses, Discipline Specific Elective Courses & Non Major Elective Course

INTERNAL ASSESSMENT
Distribution of Marks
Theory

Mode of Evaluation			Marks
Periodic Test		:	25
Assignment	K5 Level	:	5
Seminar		:	10
Total		**:**	**40**

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

Practical

Modeof Evaluation		Marks
Test	:	15
Model Examination		15
Performance	:	10
Total	**:**	**40**

Test - Average of the two will be considered
Model Examination - Better of two will be considered
Performance - Attendance and Record

Question Pattern for Periodic Test **Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Max. Marks
A Q.No.(1 - 5)	MCQ	5	5	1	5
B Q.No.(6-10)	Internal Choice - Either Or Type	5	5	5	25
C Q.No.(11&12)	Internal Choice- Either Or Type	2	2	10	20
				Total	**50***

*The total marks obtained in the Periodic Test will be calculated for 25 marks

EXTERNAL EXAMINATION

Question Pattern **Duration: 3 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)	MCQ	5	5	1	5
B Q.No.(6-10)	Internal Choice- Either Or Type	5	5	5	25
C Q.No.(11-13)	Internal Choice- Either Or Type	3	3	10	30
			Total		**60**

B.2.2 Project

Project is compulsory for II PG Students in IV Semester.

Distribution of Marks

Mode of Evaluation		Marks
Internal Assessment	:	60
External Examination	:	40
Total	:	**100**

Evaluation Pattern (100 marks)					
Internal Assessment (60marks)				External Assessment (40 marks)	
One Periodic Test (20)	Project Report (20)	Pre-Submission Presentation (10)	One Open online Course related to the Project (10)	Project Presentation (30)	Viva Voce (10)

B.2.3 Online Course

Practice for CSIR NET - General Paper Internal

Examination only

- Online Test with Multiple Choice Questions will be conducted in III Semester.
- Model Examination will be conducted after two periodic tests.

Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	40
Model Examination	:	60
Total	**:**	**100**

Two Periodic Tests - Better of the two will be considered

B.2.4 Extra Credit Courses

- Extra credits are allotted for the completion of Open Online Courses offered by MOOC to the maximum of 15 credits.
  - The Courses shall be completed within the first III Semesters of the Programme.
  - The allotment of credits is as follows

    4 weeks 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 and a minimum of 50% Pass marks in all the Courses.

- No Pass minimum for Internal Assessment for other Courses.
- Pass minimum for External Examination is 27 marks out of 60 marks for Core Courses, Discipline Specific Elective Courses and Non Major Elective Course.
- Pass minimum for Practice for SET/NET - General Paper is 50 Marks.

ATTENDANCE

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

- 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.
  - These rules are applicable to UG, PG and M.Phil. Programmes and come into effect from 2020-2021 onwards.
  - For Certificate, Diploma, Advanced Diploma and Post Graduate Diploma Programmes, the students require 75% of attendance to appear for the Theory/Practical Examinations.

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.

Attainment Levels of COs

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

Target Setting for Assessment Method

For setting up the target of internal assessment tools, 55% of the maximum mark is fixedas 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

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

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 attainment of 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 against 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/Extracurricular 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 curricularactivities during the period of their study.

Programme Articulation Matrix (PAM)

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Average Direct PO Attainment									
Direct PO Attainment in percentage									

Indirect Attainment of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Graduate Exit Survey								
Indirect PO Attainment								

Attainments of POs for all Courses

Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
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 Extracurricular Activities)]

Expected Level of Attainment for each of the Programme Outcomes

POs			Level of Attainment
Value	>=	70%	Excellent
Value	> =	60 % and Value < 70%	Very Good
Value	> =	50 % and Value < 60%	Good
Value	> =	40% and Value < 50%	Satisfactory
Value	<	40%	Not Satisfactory

Level of PO Attainment

Graduation Batch	Overall PO Attainment (in percentage)	Whether Expected Level of PO is Achieved?

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 3 years of completion of the Programme only through indirect methods.

Target for PEO Attainment

Assessment Criteria	Target (UG)	Target (PG)
Record of Employment	25 % of the class strength	30 % of the class strength
Progression to Higher Education	40 % 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
Value >= 70%	Excellent
Value > = 60 % and Value < 70%	Very Good
Value > = 50 % and Value < 60%	Good
Value > = 40% and Value < 50%	Satisfactory
Value < 40%	Not Satisfactory

Level of PEO Attainment

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

B. PROCESS OF REDEFINING THE PROGRAMME 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 analysed 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 M.Sc. Zoology Programme.

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

MASTER OF ZOOLOGY (7020)

Programme Structure - Allotment of Hours and Credits

For those who join in the Academic Year 2020-2021

Components	Semester				Total Number of Hours (Credits)
	I	II	III	IV	
Core Course	6 (4)	6 (4)	6 (6)	6 (6)	24 (20)
Core Course	6 (4)	6 (4)	6 (6)	6 (5)	24 (19)
Core Course	6 (4)	6 (4)	6 (6)	6 (6)	24 (20)
Core Course	-	-	-	6 (5)	6 (5)
Core Course Practical	6 (3)	6 (3)	6 (3)	-	18 (9)
Project	-	-	-	6 (4)	6(4)
Discipline Specific Elective Course	6 (4)	6 (4)	-	-	12 (8)
Non Major Elective Course	-	-	5 (4)	-	5 (4)
Online Course	-	-	1 (1)	-	1 (1)
Total	**30 (19)**	**30 (19)**	**30 (26)**	**30 (26)**	**120 (90)**
Extra Credit Course(Optional) - MOOC	-	-	-	-	Limited to a maximum of 15 credits

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

MASTER OF ZOOLOGY

Programme Code – 7020

SEMESTER I

PROGRAMME CONTENT

S.No	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course-1	Cell Biology	20PZYC11	6	4	3	40	60	100
2	Core Course-2	Biochemistry and Biophysics	20PZYC12	6	4	3	40	60	100
3	Core Course-3	Developmental Biology	20PZYC13	6	4	3	40	60	100
4	Core Practical-1	Lab in Cell Biology, Biochemistry, Biophysics and Developmental Biology	20PZYC11P	6	3	3	40	60	100
5	DSEC-1	DSEC- Fish culture/ Vermitechnology/ Applied Biotechnology	20PZYE11 20PZYE12 20PZYE13	6	4	3	40	60	100
Total				**30**	**19**				**500**

M.Sc. Zoology - SEMESTER II

S.No	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course-4	Animal Physiology	20PZYC21	6	4	3	40	60	100
2	Core Course-5	Immunology	20PZYC22	6	4	3	40	60	100
3	Core Course-6	Entomology	20PZYC23	6	4	3	40	60	100
4	Core Practical-2	Lab in Animal Physiology, Immunology and Applied Entomology	20PZYC21P	6	3	3	40	60	100
5	DSEC-2	DSEC-Environmental Biotechnology/ Poultry Farming/ MS Office	20PZYE21/ 20PZYE22 20PZYE23	6	4	3	40	60	100
Total				**30**	**19**				**500**

M.Sc. Zoology - SEMESTER III

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours.	Marks		
							Int.	Ext.	Total
1	Core Course-7	Genetics	20PZYC31	6	6	3	40	60	100
2	Core Course-8	Biodiversity and Conservation	20PZYC32	6	6	3	40	60	100
3	Core Course-9	Biostatistics and Bioinformatics	20PZYC33	6	6	3	40	60	100
4	Core Practical-3	Lab in Genetics, Biodiversity and Conservation, Biostatistics and Bioinformatics	20PZYC31 P	6	3	3	40	60	100
5	NMEC	NMEC-Apiculture	20PZYN31	5	4	3	40	60	100
6	Online Course	Practice for CSIR NET – General Paper	20PGOL32	1	1	-	100	-	100
Total				**30**	**26**				**600**

M.Sc. Zoology - SEMESTER IV

S.No	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam Hours	Marks		
							Int.	Ext.	Total
1	Core Course-10	Evolution	20PZYC41	6	6	3	40	60	100
2	Core Course-11	Microbiology	20PZYC42	6	5	3	40	60	100
3	Core Course-12	MolecularBiology	20PZYC43	6	6	3	40	60	100
4	Core Course-13	Sericulture	20PZYC44	6	5	3	40	60	100
5	Core Course-14	Project	20PZYC41PR	6	4	3	40	60	100
			Total	**30**	**26**				**500**

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

MASTER OF ZOOLOGY
REVISED PROGRAMME CONTENT
Programme Code – 7020
SEMESTER I

S.No	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course-1	Cell Biology	20PZYC11	6	4	3	40	60	100
2	Core Course-2	Biochemistry and Biophysics	20PZYC12	6	4	3	40	60	100
3	Core Course-3	Developmental Biology	20PZYC13	6	4	3	40	60	100
4	Core Practical-1	Lab in Cell Biology, Biochemistry, Biophysics and Developmental Biology	20PZYC11P	6	3	3	40	60	100
5	DSEC-1	DSEC- Fish culture/ Vermitechnology/ Applied Biotechnology	20PZYE11 20PZYE12 20PZYE13	6	4	3	40	60	100
				30	**19**				**500**

M.Sc. Zoology - SEMESTER II

S.No	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course-4	Animal Physiology	20PZYC21N	6	4	3	40	60	100
2	Core Course-5	Immunology	20PZYC22N	6	4	3	40	60	100
3	Core Course-6	Entomology	20PZYC23N	6	4	3	40	60	100
4	Core Practical-2	Lab in Animal Physiology, Immunology and Entomology	20PZYC21P	6	3	3	40	60	100
5	DSEC-2	DSEC-Environmental Biotechnology/ Poultry Farming/ MS Office	20PZYE21/ 20PZYE22N 20PZYE23	6	4	3	40	60	100
Total				**30**	**19**				**500**

M.Sc. Zoology - SEMESTER III

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course-7	Genetics	20PZYC31	6	6	3	40	60	100
2	Core Course-8	Biodiversity and Conservation	20PZYC32	6	6	3	40	60	100
3	Core Course-9	Biostatistics and Bioinformatics	20PZYC33	6	6	3	40	60	100
4	Core Practical-3	Lab in Genetics, Biodiversity and Conservation, Biostatistics and Bioinformatics	20PZYC31P	6	3	3	40	60	100
5	NMEC	NMEC-Apiculture	20PZYN31	5	4	3	40	60	100
6	Online Course	Practice for CSIR NET – General Paper	20POLA31	1	1	-	100	-	100
Total				**30**	**26**				**600**

M.Sc. Zoology - SEMESTER IV

S.No	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam Hours	Marks		
							Int.	**Ext.**	**Total**
1	Core Course-10	Evolution	20PZYC41N	6	6	3	40	60	100
2	Core Course-11	Microbiology	20PZYC42N	6	5	3	40	60	100
3	Core Course-12	Molecular Biology	20PZYC43	6	6	3	40	60	100
4	Core Course-13	Sericulture	20PZYC44N	6	5	3	40	60	100
5	Core Course-14	Project - Research Methodology & Ethics	22PZYC41PR	6	4	3	40	60	100
			Total	**30**	**26**				**500**

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

M.Sc. ZOOLOGY

(2020 -2021 onwards)

Semester I	**CELL BIOLOGY**	Hours/Week: 6	
Core course-1		Credits: 4	
Course Code **20PZYC11**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand the structures and functions of basic components of cells.[K2]

CO2: apply the knowledge to know working mechanisms at cellular level.[K3]

CO3: identify the different kinds of cellular organelles that make up organisms related to Cell function. [K3]

CO4: analyze the characteristics and behaviour of a cell to know the changes occurring in it. [K4]

CO5: assess the merits of cellular events in vital processes and mechanisms behind pathways. [K5]

UNIT I

Cell theories-Types of cells and tissues.Cell membrane- Fluid Mosaic Model- Role of lipid molecule, unsaturated fats and cholesterol in maintaining fluidity of membrane.Membrane asymmetry in the distribution of phospholipids and proteins. Functions of membrane proteins- passive transport- Osmosis, simple diffusion, facilitated diffusion- Eg: calcium- Ion channel, Active transport- Eg: proton pump, uniport, symport and antiport. Bulk transport- exocytosis, endocytosis. (20 Hours)

UNIT II

Mitochondria- ultrastructure, chemical nature and organisation of electron carriers- NAD^+ and $NADP^+$, flavoproteins, functions- electron transport system, protein transport into mitochondria. Cell respiration- four phases- glycolysis, oxidation of pyruvic acid, KrebsCycle, oxidative phosphorylation, mitochondrial DNA- General properties, Human mitochondrial DNA. **(**20 Hours)

UNIT III

Nucleus- structure of nuclear membrane, Nucleolus, chromatin. Functions of nuclear pore complex- signal for transport across the pore, Import of nuclear proteins, Export of RNA from nucleus, Export and re import of RNA. Functions of nucleolus- biogenesis of ribosomes, SnoRNAprocessing. (18 Hours)

UNIT IV

Cell to cell signalling - signalling mechanism, signal molecules, signal receptors, forms of intercellular signalling, signal transduction pathway using cAmp bacterial cell signalling – quorum sensing in *Vibrio fischeri*. (16 Hours)

UNIT V

Cell cycle- stages of cell cycle- G, S, G2, M. Cell division – mitosis, meiosis, mitotic apparatus (Spindle fibres and centrioles). Cancer- characteristic features, types, causes and treatment. Aging and senescence- causes of aging, genetic programming. (16 Hours)

TEXT BOOKS

1. Powar, C.B. (1993). *Cell Biology*, Himalaya Publishing House, Bombay.
2. Ajoy Paul.(2016).*Text book of Cell and Molecular Biology*. Kolkata: Books and Allied (P) LTD.

REFERENCE BOOKS

1. Gupta M. L. and M.L. Jangir. (2004). *Cell Biology* (Fundamentals and Applications). UpdeshPurohit for Agrobios (India), Jodhpur.
2. Verma P.S and V.K. Agarwal. (2006). *Cytology*, New Delhi:S. Chand and Company Ltd.
3. De Robertis, E.D.P. and E.M.F. De Robertis. (2010). *Cell and Molecular Biology*. SaundersElsevier.

Course Code 20PZYC11	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	-	H	L	L	-	H	H	L	M
CO2	M	L	H	M	M	-	M	-	L	M
CO3	H	L	H	M	M	-	-	M	L	L
CO4	H	-	H	H	H	-	H	L	M	-
CO5	H	-	H	H	H	M	M	H	-	-

Dr.J.Rani
Head of the Department

Mrs.S.Jeyaruby
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

M.Sc. ZOOLOGY
(2020 -2021 onwards)

Semester I	**BIOCHEMISTRY AND BIOPHYSICS**	Hours/Week: 6	
Core course-2		Credits: 4	
Course Code **20PZYC12**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: explain the biological significance of biomolecules in living things. [K2]

CO2: apply knowledge on working mechanisms of biomolecules, enzymes and hormones. [K3]

CO3: apply the knowledge on biochemical components of several Biomolecules which in turn helps to find novel drugs. [K3]

CO4: compare the merits of various biological pathways and their applications in macromolecules. [K4]

CO5: assess the significance of the cellular metabolic pathways in our body. [K5]

UNIT I

Chemical constituents of life- Biomolecules- Carbohydrates, proteins, amino acids, lipids,nucleic acids, nucleotides, enzymes and vitamins. (18Hours)

UNIT II

Metabolism of carbohydrate – glycolysis, citric acid cycle and hexose monophosphate shunt.Metabolism of amino acids – Transamination – Deamination- Ornithine cycle.Metabolism of lipids – Biosynthesis and oxidation of fatty acid, ketone bodies, Metabolism of Nucleic acid. Metabolic disorders- Inborn errors of metabolism- Glycogen storage disease. Biochemical changes in disease- PCO. (20Hours)

UNIT III

Enzymes- Mechanism of enzyme action- Michaelis-Menton hypothesis only. Enzyme activators, inhibitors and Coenzymes. Water and fat soluble vitamins – Biochemical aspects (structure, chemistry and functions for each vitamin).Hormones-Biochemical functions.

(20 Hours)

UNIT IV

Structure of atoms, molecules and chemical bonds, (Review). Thermodynamic laws I and II, concepts of free energy, enthalpy and entropy, exergonic and endergonic reactions. Bioenergetics in mitochondria, ATP as the currency of free energy in the biological system.

(16 Hours)

UNIT V

Biophysics of membrane- Salient features, chemical composition, Membrane receptor, Transport of substances across epithelia, factors governing the passage of materials across cell membranes.Biophysical principles- Diffusion-facilitated diffusion, physico-chemical criteria for diffusion across membranes, Active transport, Endocytosis- Phagocytosis and pinocytosis. (16 Hours)

TEXT BOOKS

1. Palanisamy.S. and Shanmugavelu.M. (1991). *Principles of Biophysics*. Palani paramount Publication.
2. AmbikaShanmugam. (2012). *Fundamentals of Biochemistry for Medical Students*. Lippincott Williams & Wilkins.
3. Jain J.L, Jain S and N.Jain . (2013). *Fundamentals of Biochemistry*. New Delhi: S. Chand and Company Pvt. Ltd.

REFERENCE BOOKS

1. Sathiyanarayanan, U. and U.Chakrapani . (2013). *Biochemistry*, 4thedn. Elsevier, Reed Elsevier India Pvt Ltd.
2. Pattabhi, V.N. and N. Goutham. (2002). *Biophysics*. Springer Science and Business media.
3. Lehninger. (2005). *Principles of Biochemistry*. Macmillan Publishers.
4. Voet Donald and Voet Judith G. (2005). *Biochemistry*. 3rd Ed. John, Publisher: Wiley & sons, New York.
5. Chauhan. B.S. (2008). *Principles of Biochemistry and Biophysics*. Firewall Media.

Course Code 20PZYC12	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	H	H	L	-	H	H	L	M	M
CO2	H	H	H	M	M	M	L	H	L	M
CO3	H	H	M	M	H	H	H	M	L	L
CO4	H	H	M	H	M	H	M	M	M	L
CO5	H	H	M	H	H	H	M	H	-	L

Dr.J.Rani
Head of the Department

Mrs.SinthiaGanesan
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

M.Sc. ZOOLOGY
(2020 -2021 onwards)

Semester I	**DEVELOPMENTAL BIOLOGY**	Hours/Week: 6	
Core course-3		Credits: 4	
Course Code		Internal	External
20PZYC13		40	60

COURSE OUTCOMES

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

CO1: explain the key concepts in Developmental Biology. [K2]

CO2: apply knowledge on the essential features in Embryology. [K3]

CO3: make use of the concepts on basic cellular events and processes during embryonic development. [K3]

CO4: analyse the importance of embryological processes during pre and post embryonic development. [K4]

CO5: evaluate all aspects that occur during development of an organism. [K5]

UNIT I

Gametogenesis in Humans- Spermatogenesis, Oogenesis, Comparison of spermatogenesis and oogenesis.Fertilization - Mechanism and Significance.Egg sperm interaction- Acrosome interaction, activation of egg. (20 Hours)

UNIT II

Cleavage -Characteristics, patterns and significance.Frog- Gastrulation- Morphogenetic movement, fate map – Construction (Natural, artificial and vital staining marking).

(18 Hours)

UNIT III

Embryogenesis of Chick - Cleavage, blastulation and gastrulation. Neurulation and tubulation.Development of extra embryonic membranes.Organogenesis in frog – formation of organ rudiments- neural induction, development of eye. (16Hours)

UNIT IV

Cellular Differentiation-Differentiation, dedifferentiation, redifferentiation,totipotency. Organiser - Inductive tissue interaction. Organizer concept– Gradients, Experimental evidence. Nuclear transplantation, Parthenogenesis, Regeneration (amphibians).Metamorphosis- Metamorphosis in Frog- Morphological, chemical changes and hormonal control.Insect metamorphosis- Neuroendocrine control. (20 Hours)

UNIT V

Human Embryology: Teratology, In-vitro fertilization - Test tube baby, Biochemical tests for pregnancy,Prenatal diagnosis of disease-. Amniocentesis, chorionic villi sampling, stem cell therapy and umbilical cord preservation **(**16 Hours)

TEXT BOOKS

1. Verma. P.S. and V.K.Agarwal. (2003). *Chordate Embryology*, S. Chand and Company Ltd, New Delhi.
2. Rastogi, V.B and M.S. Jayaraj. (2005). *Developmental Biology*. KedarNath Ram Nath, Meerut, New Delhi.

REFERENCE BOOKS

1. Twyman, R. M. (2001). *Developmental Biology*, Publisher - Bios Scientific Publishers.
2. Werner A. Muller. (2005). *Developmental Biology*.Springer (India) Private Ltd, New Delhi.
3. Gilbert, S.F. (2006). *Developmental Biology*, 8th edition, Publisher Sinauer Associates Inc.
4. Lewis Wolpert. (2007). *Principles of Development*, 3rd edition, Publisher: Oxford University Press.
5. Balinsky B.I.(2008). *Introduction to Embryology*. Saunders, Philadelphia.

Course Code 20PZYC13	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	-	H	L	-	L	L	L	M	L
CO2	H	M	H	M	M	M	H	-	M	L
CO3	H	M	H	M	H	M	M	L	M	L
CO4	H	-	H	H	M	M	M	-	M	H
CO5	H	H	H	H	H	H	M	H	M	H

Dr.J.Rani
Head of the Department

Dr.V.Amsha Devi
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

M.Sc. ZOOLOGY
(2020 -2021 onwards)

Semester: I	**LAB IN CELL BIOLOGY, BIOCHEMISTRY, BIOPHYSICS AND DEVELOPMENTAL BIOLOGY**	Hours/Week: 6	
Core Practical-1		Credits: 3	
Course Code **20PZYC11P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: apply the theoretical concepts in biological, biochemical, biophysical and developmental aspects. [K3]

CO2: write theprocedure/flow charts/description/diagrams/tabular column / graph / formulae / mapto explain the required parameters. [K3]

CO3: analyze the given parameters with observation/calculations/results/Inference and comments on the spotter. [K3]

CO4: examine the obtained results with proper illustrations and completion of record work. [K4]

CO5: justify and validate the concepts learnt in Cell Biology/ Biochemistry/ Biophysics and Developmental biology. [K5]

1. Observation of different types of cells by using slides.
2. Observation of mitotic stages in onion root tip.
3. Quantitative estimation of Protein- Lowry's method.
4. Quantitative estimation of Carbohydrate- Anthrone method.
5. Quantitative estimation of cholesterol - Zak's method.
6. Separation and identification of amino acids by paper chromatography.
7. Observation of various developmental stages of the chick embryo.
8. Mounting of chick blastoderm.
9. Spotters:
    - Scintillation counter
    - GM counter

- Blastula and Gastrula in frog.
- Structure of human ovum and sperm

Course Code 20PZYC11P	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	H	H	H	H	M	H	H	H	-
CO2	H	H	H	H	H	M	M	H	H	-
CO3	H	H	H	H	H	H	H	H	H	L
CO4	H	H	H	H	H	H	H	H	H	-
CO5	H	M	H	H	H	H	M	H	H	-

Dr.J.Rani
Head of the Department

Ms.N.Subashini
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

M.Sc. ZOOLOGY
(2020 -2021 onwards)

Semester I	**FISH CULTURE**	Hours/Week: 6	
DSEC-1		Credits: 4	
Course Code **20PZYE11**		Internal 40	External 60

COURSE OUTCOMES

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

CO1:explain the culture techniques and scope of fish farming. [K2]

CO2: apply the knowledge on fish culture to promote self employment.[K3]

CO3: make use of skills to maintain a successful fish culture unit. [K3]

CO4:analyze the fish culture practices for good productivity. [K4]

CO5: recommend the sustainable management of fish farms to promote Entrepreneurship. [K5]

UNIT I

Aquaculture potential of India – Inland fishery resources- Riverine, Lake and brackish water aquaculture – kinds of aquaculture practices – monosex culture, polyculture and sewage – fed fish culture.Ornamental fishes-types. (20 Hours)

UNIT II

Culture of important aquatic organisms – Culture of Indian major carp, common carp, trout,catfish culture; culture of fish feed organisms- *Daphnia* culture, *Artemia Culture*. Integrated Fish culture- Agriculture cum fish culture (Paddy), Animal husbandry cum fish culture (Duck). (18 Hours)

UNIT III

Pond construction- site selection, soil structure, water source, bunds, berm, inlet and outlet, Hatching pond, nursery pond, rearing pond and stocking pond. Maintenance of pond- water quality management- pond fertilization- predator and weed control, fish health management.

(20Hours)

UNIT IV

Fish feed – Introduction-nutritional requirements of fin fish, varieties of fish feeds-plant feeds, animal feeds, qualities of good feed. Feed formulation – square method-diet processing- management of feeding-nutritional deficiency. (16 Hours)

UNIT V

Disease management – Bacterial (Dropsy, gill rot), Fungal (Dermatomycoses, Branchiomycosis), Protozoa (Costiasis, Ich) and Viral disease (VHS,EUS), Fish health management. (16 Hours)

TEXT BOOKS

1. Santhanakumar. G.A and A.M. Selvaraj. (2002). *Concept of aquaculture*, Nagercoil: Meenam Publications.
2. Gupta, S.K., and P.C. Gupta. (2006).*General and Applied Ichthyology.* New Delhi: S.Chand& Company ltd.

REFERENCE BOOKS

1. Pandey, K. and J.P. Shukla, (2005). *Fish and Fisheries*. Rastogi Publications, Shivaji Road, Meerut, India.
2. Arnold C. Long, (2008). *Fish Processing Technology*, Cyber Tech publication, New Delhi-110002.
3. Singh, V. (2012). *Fish diseases*, Sonali publication, New Delhi-110002.
4. Mukhopadhyay. P.K. (2013). *Fish Processing Technolog*y, Swastik publication, New Delhi-110002.
5. Aminul Islam.(2016).*Economic Zoology*,1st Edition. IK International publishing House pvt.ltd.NewDelhi

Course Code 20PZYE11	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	H	H	L	L	H	M	H	M	H
CO2	H	-	H	M	-	H	M	H	M	L
CO3	H	-	H	M	-	L	H	H	M	-
CO4	H	-	H	H	-	L	M	-	M	M
CO5	H	-	H	H	L	L	M	H	M	M

Dr.J.Rani
Head of the Department

Dr.V.Amsha Devi
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

M.Sc. ZOOLOGY
(2020 -2021 onwards)

Semester I	**VERMITECHNOLOGY**	Hours/Week: 6	
DSEC-1		Credits: 4	
Course Code **20PZYE12**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: describe the basic concepts of vermiculture along with its importance. [K2]

CO2: make use of the ideas about cultivable species to set up a culture Unit. [K3]

CO3: apply the knowledge on vermicomposting to develop their practical skills which promotes self-employment opportunities. [K3]

CO4: analyse the role of Vermiculture in organic farming for better agricultural practices in an eco-friendly manner. [K4]

CO5: recommend the better management practices by evaluating the profit outputs. [K5]

UNIT I

Introduction to vermitechnology-scope and importance.Biology of Earthworm, Habitat of earthworms-epigeic,endogeic and anecic. Cultivable earthworms-*Eiseniafetida*, *Eudriluseugenia*, *Perionyxexcavatus*and *Amynthasgracilis*. Life cycle of Earthworm – *Eiseniafetida*, Economic importance of earthworms.Earthworm as a bioreactor.

(20 Hours)

UNIT II

Vermiculture – Methods-monoculture and polyculture, collection and preservation of earthworms. Suitable conditions required for culture of earthworms, factors influencing culture of earthworms. (16 Hours)

UNIT III

Vermicomposting – methods –Continuous flow system - Bin method; Batch system-Windrow method, Harvesting and Advantages. Economic importance of vermicompost.

(16 Hours)

UNIT IV

Vermicast- formation, shapes, composition and importance.Vermiwash - Preparation, composition and applications.Role of earthworms in soil fertility.

(18 Hours)

UNIT V

Pests of Earthworm: Fruit fly, soldier fly. Parasites - Centipedes and Mites. Enemies: birds and moles.Financial agencies to support Vermiculture – BERI (Bhawalkar Ecological Research Institute) and BAIF (Bhatia Agro Industries Foundation), KVG (Karnataka VikasGrameen Bank)

(20 Hours)

TEXT BOOKS

1. Raveendran and Seethalakshmi. (1983). *Vermiculture,*Saras Publications, Nagercoil.
2. Mary Violet Christy.(2008). *A.Vermitechnology,* MJP Publishers, Chennai.

REFERENCE BOOKS

1. Renganthan LS.(2006). *Vermitechnology from soil health to human health,* first edition, Agrobios, India.
2. PrakashMalhotra.(2008).*Economic Zoology,* First edition, Adhyayan Publications and Distributors,NewDelhi.

Course Code 20PZYE12	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	-	H	L	-	H	M	H	M	M
CO2	H	-	H	M	-	M	M	H	M	M
CO3	H	M	H	M	-	H	-	H	-	L
CO4	H	-	H	H	-	H	-	H	M	-
CO5	H	L	H	H	-	L	M	H	-	L

Dr.J.Rani
Head of the Department

Ms.N.Subashini
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

M.Sc. ZOOLOGY
(2020 -2021 onwards)

Semester I	**APPLIED BIOTECHNOLOGY**	Hours/Week: 6	
DSEC-1		Credits: 4	
Course Code **20PZYE13**		Internal 40	External 60

COURSE OUTCOMES

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

CO1:explain the concepts of Biotechnology in various fields of biology. [K2]

CO2:make use of biotechnological techniques to improve the health of mankind and the quality of the environment.[K3]

CO3:apply the skills for the sustainable maintenance of the environment. [K3]

CO4: analyze the advantages of various novel applications in the field of Biotechnology. [K4]

CO5:assess the merits of conventional and recent techniques. [K5]

UNIT I

Genetic engineering: Gene cloning -the basic steps, types of restriction enzymes, ligases - linkers and adaptors, cDNA, selection of recombinants. Hybridization techniques, chemical synthesis of oligonucleotides, PCR and DNA sequencing techniques. (18 Hours)

UNIT II

Marine Biotechnology: Bioremediation - Types- *In-situ* and *Ex-situ* Bioremediation - methods and application. Degradation of chlorinated hydrocarbons – Biofouling organisms - Problems due to biofouling. (18 Hours)

UNIT III

Animal Biotechnology: Cell culture: Organ culture, whole embryo culture, embryo transfer - in-vitro fertilization (IVF) technology. Dolly- in-vitro fertilization and embryo transfer in humans. Transgenic animals.Human gene therapy.Cryobiology. (18 Hours)

UNIT IV

Microbial Biotechnology: Bioreactor.-Microbial products- primary and secondary metabolites. Protein engineering.Bioremediation of hydrocarbons, industrial wastes and heavy metals.Single cell protein, biopolymers, biopesticides and biofertilizers.

(18 Hours)

UNIT V

Nano Biotechnology: Drug development: Synthesis of Nanoparticles - Bottom up and Top Down approaches. Synthesis of Nanoparticles using Biological Sources- Microorganism, Bacteria, Fungi, Algae, Plants.Anticancer and antioxidant activities of Nanoparticles.Nanomaterials in drug delivery and therapy.Nanomedicine. (18 Hours)

TEXT BOOKS

1. Satyanarayana, U.(2007). *Biotechnology*. Uppala author-publisher interlinks,Vijayawada, Andhra Pradesh, India. Old, R.W and Primrose, S.B.1993.Principles of Gene manipulation:

REFERENCE BOOKS

1. Ignacimuthu, S.(2008).*An introduction to Genetic Engineering*,Blackwell Science Publication.. Biotechnology: An introduction, Narosa Publishing house, New Delhi.
2. Purohit, S.S.(2008). *Biotechnology*. Student Edition, Jodhpur. Lee and Savage, L.M. Biological Molecules in Nanotechnology.

E-Resources:

1. https://www.sciencedirect.com/topics/neuroscience/bioreactors
2. https://www.khanacademy.org/science/ap-biology/gene-expression-and-regulation/biotechnology/a/overview-dna-cloning
3. https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/single-cell-protein

Course Code 20PZYE13	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	L	H	L	-	H	H	L	-	M
CO2	H	-	H	M	-	H	H	-	-	L
CO3	H	H	H	M	-	H	M	-	L	H
CO4	H	L	H	H	-	H	H	H	L	-
CO5	H	M	H	H	-	H	H	H	L	H

Dr.J.Rani
Head of the Department

Mrs.S.Jeyaruby
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

M.Sc. ZOOLOGY
(2020 -2021 onwards)

Semester II	**ANIMAL PHYSIOLOGY**	Hours/Week: 6	
Core Course-4		Credits: 4	
Course Code 20PZYC21		Internal 40	External 60

COURSE OUTCOMES

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

CO1: explain the basic fundamental concepts of Physiology. [K2]

CO2: make use of knowledge on theanatomical and physiological functions of various Organisms.[K3]

CO3: apply the ideas to know the key features of physiology and its systematic regulations. [K3]

CO4: Analyse the regulatory mechanisms behind the normal functioning of body.[K4]

CO5: assess the efficacy of organs and various systems to lead a healthy life. [K5]

UNIT I

Nutrients- Types of nutrients, essential and non-essential vitamins and minerals– Digestion and absorption of carbohydrates, proteins, and lipids.Role of gastrointestinal hormones in digestion.Balanced Diet- BMR and Malnutrition,Obesity. (16 Hours)

UNIT II

Respiration- Types, physiology of respiration in man- Transport of O_2 and Co_2.Respiratory pigments-types, Respiratory Quotient. Circulation – Types of heart – physiology of cardiac muscle in man , heart beat and its regulation, blood coagulation and theories. (18 Hours)

UNIT III

Excretion- types of excretory products- ammonia, uric acid, urea, and other nitrogenous constituents, physiology of excretion in man. Osmoregulation – Osmoregulation in freshwater and marine water fishes and crustaceans. Thermoregulation – Poikilotherms and Homeotherms- Hibernation, Aestivation and diapause. (20 Hours)

UNIT IV

Neurons- types and ultrastructure, transmission of nerve impulse and reflex action. Muscles – ultra structure and mechanism- energetic of muscle contraction- Receptor organs and their functions – Eye, ear, tongue. (20 Hours)

UNIT V

Reproduction- structure of male and female reproductive system in man. Endocrine physiology in man- Pituitary, thyroid, parathyroid and adrenal, photoperiodism and biological clock. (16 Hours)

TEXT BOOKS

1. Verma P.S., Agarwal V.K, and B. S. Tyagi. (1995). *Animal Physiology*, S. Chand & Co Ltd, New Delhi.
2. Rastogi S.C. (1988).*Essentials of Animal Physiology*, 2nd ed., Wiley Eastern Ltd.

REFERENCE BOOKS

1. Eckert and Randall.(2000). *Animal Physiology Mechanism and Adaptations*.Second Edition, CBS Publishers and Distributors, New Delhi.
2. Nagabhushanam R. M., Kodarkar S and Sarojini R.(2002). *Text book of Animal physiology*.Second Edition, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
3. DevyaniKhamka. (2003). *Animal Physiology*, 1stedn., Dominant publishers & Distributors, NewDelhi.

Course Code 20PZYC21	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	L	H	L	H	M	M	H	M	M
CO2	H	L	H	M	M	M	M	M	M	M
CO3	H	L	H	M	M	L	-	L	L	L
CO4	H	-	H	H	H	M	-	-	M	-
CO5	H	L	H	H	M	L	M	H	M	L

Dr.J.Rani
Head of the Department

Ms.N.Subashini
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

M.Sc. ZOOLOGY
(2022 -2023 onwards)

Semester II	**ANIMAL PHYSIOLOGY**	Hours/Week: 6	
Core Course-4		Credits: 4	
Course Code 20PZYC21N		Internal 40	External 60

COURSE OUTCOMES

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

CO1: explain the basic fundamental concepts of Physiology. [K2]

CO2: make use of knowledge on the anatomical and physiological functions of various organisms. (K3]

CO3: apply the ideas to know the key features of physiology and its systematic regulations. [K3]

CO4: Analyse the regulatory mechanisms behind the normal functioning of body.[K4]

CO5: assess the efficacy of organs and various systems to lead a healthy life [K5].

UNIT I

Nutrients- Types of nutrients, essential and non-essential vitamins and minerals– Digestion and absorption of carbohydrates, proteins, and lipids.Role of gastrointestinal hormones in digestion.Balanced Diet- BMR and Malnutrition,Obesity. Neuro-endocrinal control of digestion. (18 Hours)

UNIT II

Respiration- Types, physiology of respiration in man- Transport of O_2 and Co_2.Respiratory pigments-types, Respiratory Quotient. Circulation – Types of heart – physiology of cardiac muscle in man , heart beat and its regulation, Lymph, Hemodynamics, Blood coagulation and theories. (18 Hours)

UNIT III

Excretion- types of excretory products- ammonia, uric acid, urea, and other nitrogenous constituents, physiology of excretion in man. Process of waste elimination and micturition. Osmoregulation – Osmoregulation in freshwater and marine water fishes and crustaceans. Thermoregulation – Poikilotherms and Homeotherms- Hibernation, Aestivation and diapause.

(18 Hours)

UNIT IV

Neurons- types and ultrastructure, Chemical composition of muscle fiber and physiology of muscle contraction.Myoneural Junction-transmission of nerve impulse and reflex action. Muscles – ultra structure and mechanism- energetic of muscle contraction- Receptor organs and their functions – Eye, ear and tongue. (18 Hours)

UNIT V

Reproduction- structure of male and female reproductive system in man. Endocrinephysiology in man- Pituitary, thyroid, parathyroid and adrenal, photoperiodism and biological clock. Neuro-Endocrine functions in regulation of photoperiods in mammals. (18 Hours)

TEXT BOOKS

1.. Verma P.S., Agarwal V.K, and B. S. Tyagi. (1995). *Animal Physiology*, S. Chand & Co Ltd, New Delhi.

2.. Rastogi S.C. (1988).*Essentials of Animal Physiology*, 2nd ed., Wiley Eastern Ltd.

REFERENCE BOOKS

1. Eckert and Randall.(2000). *Animal Physiology Mechanism and Adaptations*.Second Edition, CBS Publishers and Distributors, New Delhi.
2. Nagabhushanam R. M., Kodarkar S and Sarojini R.(2002). *Text book of Animal physiology*.Second Edition, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
3. DevyaniKhamka. (2003). *Animal Physiology*, 1stedn., Dominant publishers & Distributors, New Delhi.

	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
Course Code **20PZYC21N**	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	L	H	M	H	M	L	-	H	-
CO 2	H	L	H	-	M	-	L	-	H	M
CO 3	H	L	H	-	M	M	-	-	H	-
CO 4	H	-	H	M	H	-	-	M	H	-
CO 5	H	L	H	L	M	L	-	M	H	H

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
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

M.Sc. ZOOLOGY)
(2020 -2021 onwards)

Semester II	**IMMUNOLOGY**	Hours/Week: 6	
Core Course-5		Credits: 4	
Course Code **20PZYC22**		Internal 40	External 60

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

CO1: explain the fundamental concepts of immunology. [K2]

CO2: make use of the knowledge on the various immunological reactions in our body. [K3]

CO3: apply the knowledge on important mechanisms and recent concepts in the field of Immunology.[K3]

CO4: compare the cells, molecules and diseases related to immunology. [K4]

CO5: assess the merits of immunological response and immunological techniques. [K5]

UNIT I

Historical perspectives of immunology- Primary and secondary lymphoid organs.Haematopoiesis, lymphopoiesis and myelopoiesis, cells involved in immune response-stem cells, lymphoid cells, NK cells, mononuclear phagocytes and granulocytic cells.

(16 Hours)

UNIT II

Immune response- Primary and secondary immune response-CMI and HMI, Antigens- types and properties, adjuvants and haptens.HLA antigen-HLA typing. Antibodies-structure of Ig, classes and functions of Igs. Antigen- Antibody interactions- precipitation, agglutination, cytolysis and flocculation. (18 Hours)

UNIT III

Hybridoma and monoclonal antibody production- monoclonal antibody production in mice, applications of MAb. Complement – Complement activation and biological functions. MHC-Classes of MHC, Class I and Class II molecules in mice, functions of MHC proteins.

(20 Hours)

UNIT IV

Hypersensitivity- Types; Autoimmune disorders- Systemic autoimmune disease - Rheumatoid arthritis; Organ specific autoimmune disease -Myasthenia gravis.Transplantation Immunology- Bone marrow, immunological basis for graft rejection – prevention.Immunodeficiency disease-Primary immunodeficiencies- Digeorge's syndrome. Secondary immunodeficiencies- AIDS. Immunization – passive and active immunization, Immunization Schedule. Vaccines- classification, whole organisms' vaccine and synthetic vaccine. (20 Hours)

UNIT V

Techniques- Immunoelectrophoresis, Single and Double immune diffusion, Western blotting, Widal test, VDRL slide test, ELISA test. ABO blood typing, Rh blood typing and immune fluorescence.

(16 Hours)

TEXT BOOKS

1.IvanM.Roit. (Ed.6)-(1988). *Essential Immunology* - Blackwell Scientific Publications.

2.Rao C.V. (2008). *Immunology -A Textbook*.Narosa Publishing House, New Delhi.
SeemiFarhat

3.Basir. (2009). *Text Book of Immunology.*PHI Learning Private Limited, New Delhi.

REFERENCE BOOKS

1. Richard A. Goldsby and T.J.Kind.(2000). *Kuby Immunology*. W. H Freeman and Company, New York.
2. Haleem Khan, A.A, Rajendrasagar.C. and A.D. Sadguna.(2011). *Immunology.*Ane Books Pvt. LTD.
3. Ajoy Paul. (2016). *Text Book of Immunology,* Books and Allied (P) Ltd. Kolkata.

Course Code 20PZYC22	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	L	H	L	H	L	L	-	M	-
CO2	H	L	H	M	M	-	-	L	M	-
CO3	H	H	H	M	H	-	L	M	L	L
CO4	H	M	H	H	M	L	L	L	M	H
CO5	H	H	H	H	M	-	L	H	L	L

Dr.J.Rani
Head of the Department

Mrs.SinthiaGanesan
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

M.Sc. ZOOLOGY
(2022 -2023 onwards)

Semester II	**IMMUNOLOGY**	Hours/Week: 6	
Core Course-5		Credits: 4	
Course Code 20PZYC22N		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : explain the fundamental concepts of immunology (K2).

CO2 : make use of the knowledge on the various immunological reactions in our body (K3).

CO3 : apply the knowledge on important mechanisms and recent concepts in the field of Immunology (K3)

CO4 : compare the cells, molecules and diseases related to immunology (K4)

CO5 : assess the merits of immunological response and immunological techniques (K5).

UNIT I

Historical perspectives of immunology- Primary lymphoid organs – Thymus and Bone marrow. Secondary lymphoid organs- Spleen and Tonsils. Haematopoiesis, lymphopoiesis and myelopoiesis, cells involved in immune response- stem cells, lymphoid cells, NK cells, mononuclear phagocytes and granulocytic cells. (18 Hours)

UNIT II

Immune response- Primary and secondary immune response-CMI and HMI, Antigens- types and properties, adjuvants and haptens.HLA antigen-HLA typing. Antibodies- structure of Ig, classes and functions of Igs. Antigen- Antibody interactions- precipitation, agglutination, cytolysis and flocculation.

(18 Hours)

UNIT III

Hybridoma and monoclonal antibody production- monoclonal antibody production in mice, applications of MAb. Complement – Complement activation and biological functions. MHC-Classes of MHC, Class I and Class II molecules in mice, functions of MHC proteins.Immuno-globulin domains;Immunogloubulin fold; variable region domains; complementarity determining regions (CDRS), CDRS and antigen binding, hinge region. Engineered Monoclonal antibodies, antibody engineering and their clinical applications.

(18 Hours)

UNIT IV

Hypersensitivity- Types; Autoimmune disorders- Systemic autoimmune disease - Rheumatoid arthritis. Organ specific autoimmune disease -Myasthenia gravis.Transplantation Immunology- Bone marrow, immunological basis for graft rejection – prevention.
Immunodeficiency disease- Digeorge's syndrome and AIDS. Immunization – passive and active immunization, Immunization Schedule. Vaccines- classification, whole organisms' vaccine and synthetic vaccine..Vaccines against AIDS and Tropical Infectious Diseases – Leprosy,Malaria and TB. Vaccines for control of fertility, Anti – HCG Vaccines

(18Hours)

UNIT V

Techniques- Principle, procedure, applications and advantages: Immunoelectrophoresis, Single and Double immunodiffusion, Western blotting, Widal test, VDRL slide test, ELISA test. ABO blood typing, Rh blood typing and immunofluorescence. Importance of immunological techniques in the field of medicine and research. (18 Hours)

TEXT BOOKS

1.IvanM.Roit. (Ed.6)-(1988). *Essential Immunology* - Blackwell Scientific Publications.

2.Rao C.V. (2008). *Immunology -A Textbook*.Narosa Publishing House, New Delhi.

3.Basir. (2009). *Text Book of Immunology*.PHI Learning Private Limited, New Delhi.

REFERENCE BOOKS

1. Richard A. Goldsby and T.J.Kind.(2000). *Kuby Immunology*. W. H Freeman and Company, New York.

2. Haleem Khan, A.A, Rajendrasagar.C. and A.D. Sadguna.(2011). *Immunology*.Ane Books Pvt. LTD.

3. Ajoy Paul. (2016). *Text Book of Immunology,* Books and Allied (P) Ltd. Kolkata.

	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
Course Code **20PZYC22N**	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	L	H	M	H	M	-	H	M	-
CO 2	M	L	H	H	M	M	L	M	H	L
CO 3	H	H	M	H	H	M	H	M	L	-
CO 4	H	M	H	M	M	L	M	H	M	H
CO 5	M	H	M	H	M	M	H	H	L	M

Dr.J.Rani
Head of the Department

Mrs.SinthiaGanesan
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

M.Sc. ZOOLOGY
(2020 -2021 onwards)

Semester II	**ENTOMOLOGY**	Hours/Week: 6	
Core Course-6		Credits: 4	
Course Code **20PZYC23**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: explain the classification and Biology of insects. [K2]

CO2: apply theoretical knowledge to know the key features and significance of insect Bionomic.[K3]

CO3: make use of the impact of insects in an ecosystem to lead a healthy lifestyle. [K3]

CO4: compare the role of various species of insects in agriculture, human health and environment.[K4]

CO5:analyze the physiology of insects and its role in various fields of Biology. [K5]

UNIT I

Outline Classification of insects- Economically important Orders in class Insecta - Lepidoptera, Coleoptera, Hemiptera and Thysanoptera. General organisation and structure of a typical insect- mouth parts, sense organs, appendages and wings. Endocrine system of an insect–Corpora cardiaca, corpora allata and neuro secretory cells.Moulting and metamorphosis: Hormones involved in moulting and metamorphosis - ecdysone, neuropeptides, prothoracicotropic hormone and juvenile hormone. (20 Hours)

UNIT II

Economic Entomology: Productive insects- Bionomics, life cycle and economic importance of silkworm, honey bee and lac insect. Helpful insects- Predators, parasites, weed killers, soil builders and scavengers. Insects with aesthetic and scientific values. (18 Hours

UNIT III

Medical Entomology**:** Bionomics, life cycle, control and the medical importance of mosquitoes, house fly, fleas, lice, ticks and mites. (16 Hours)

UNIT IV

Agriculture Entomology: Biology, pest status and control measures- *Nephotettixvirescens*in rice; *Pyrillaperpusilla*in sugarcane; *Leucinodesorbonalis in* Brinjal; fruit fly in mango; Aphids in groundnut; *Oryctes rhinoceros* in coconut, pests of stored products- *Trogoderma*and *Tripolium*. (16 Hours)

UNIT V

Insect Pest Control and Management: Natural control, cultural control, applied control and legal control. Biological control of insect pests - merits and demerits; Chemical control- classification of insecticides; ill effects of insecticides. Integrated Pest Management (IPM) and its importance. **(**20 Hours)

TEXT BOOKS

1. Ravindranathan. K.R. (2003).*Economic Zoology*. Dominant Publishers and Distributors. New Delhi.
2. Verma. P.S. and Agarwal V.K.(2003). *Chordate Embryology,* S. Chand and Company Ltd, New Delhi.
3. NalinaSundari,M.S. and R. Santhi.(2008).*Entomology*.MJP publishers.
4. Aminul Islam.(2016).*Economic Zoology*,1st Edition.IK International publishing House pvt.ltd.New Delhi

REFERENCE BOOKS

1.VasanthaRaj David, B and T. Kumaraswami.(1982). *Elements of economic entomolog*y.
2.Donald J. Borror, Charles A. Triplehorn, andNorman F. Johnson.(1989). *An Introduction to the Study of Insects*.Saunders College Pub.
3.David, B andT. Ananthakrishnan.(2004). *General and Applied Entomology*, 2 edition.McGraw Hill Education (India) Private Limited.

Course Code 20PZYC23	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PS O 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	-	H	H	H	H	H	M	H	M
CO2	H	-	H	H	H	H	H	L	H	H
CO3	H	-	H	H	L	M	H	H	H	H
CO4	H	-	H	H	H	H	H	M	H	H
CO5	H	-	H	M	H	H	H	H	H	H

Dr.J.Rani
Head of the Department

Dr.V.Amsha Devi
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

M.Sc. ZOOLOGY
(2022 -2023 onwards)

Semester II	**ENTOMOLOGY**	Hours/Week: 6	
Core Course-6		Credits: 4	
Course Code **20PZYC23N**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: explain the classification and Biology of insects [K2].

CO2: apply theoretical knowledge to know the key features and significance of insect bionomics. [K3].

CO3: make use of the impact of insects in an ecosystem to lead a healthy lifestyle.[K3].

CO4: compare the role of various species of insects in agriculture, human health and environment. [K4]

CO5: analyze the physiology of insects and its role in various fields of Biology. [K5]

UNIT I

Outline Classification of insects- Economically important Orders in class Insecta - Lepidoptera, Coleoptera, Hemiptera and Thysanoptera. General organisation and structure of a typical insect- mouth parts, sense organs, appendages and wings. Endocrine system of an insect–Corpora cardiaca, corpora allata and neuro secretory cells. Moulting and metamorphosis: Hormones involved in moulting and metamorphosis - ecdysone, neuropeptides, prothoracicotropic hormone and juvenile hormone. (18 Hours)

UNIT II

Economic Entomology: Productive insects- Bionomics, life cycle and economic importance of silkworm, honey bee and lac insect. Helpful insects- Predators, parasites, weed killers, soil builders and scavengers. Insects with aesthetic and scientific values. Insect as food – Insects as food for humans and examples. (18 Hours)

UNIT III

Medical Entomology**:** Bionomics, life cycle, control and the medical importance of mosquitoes, house fly, fleas, lice, ticks and mites. Forensic Entomology - Definition, Principles, Scope and Application of Forensic entomology and Forensic Laboratories in India.

(18 Hours)

UNIT IV

Agriculture Entomology: Biology, pest status and control measures- *Nephotettix virescens*in rice; *Pyrilla perpusilla*in sugarcane; *Leucinodes orbonalis in* Brinjal; fruit fly in mango; Aphids in groundnut; *Oryctes rhinoceros* in coconut, pests of stored products- *Trogoderma* and *Tripolium*. (18 Hours)

UNIT V

Insect Pest Control and Management: Natural control, cultural control, applied control and legal control. Biological control of insect pests - merits and demerits; Chemical control-classification of insecticides; ill effects of insecticides. Integrated Pest Management (IPM) and its importance. (18 Hours)

TEXT BOOKS

1. Ravindranathan. K.R. (2003).*Economic Zoology*. Dominant Publishers and Distributors. New Delhi.
2. Verma. P.S. and Agarwal V.K.(2003). *Chordate Embryology,* S. Chand and Company Ltd, NewDelhi.
3. NalinaSundari,M.S. and R. Santhi.(2008).*Entomology*.MJP publishers.
4.Aminul Islam.(2016).*Economic Zoology*,1st Edition.IK International publishing House pvt.ltd. New Delhi

REFERENCE BOOKS

1.VasanthaRaj David, B and T. Kumaraswami.(1982). *Elements of economic entomology.*
2.Donald J. Borror, Charles A. Triplehorn, and Norman F. Johnson.(1989). *An Introduction to the Study of Insects*. Saunders College Pub.
3.David, B and T. Ananthakrishnan.(2004). *General and Applied Entomology*, 2 edition. McGraw Hill Education (India) Private Limited.

	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
Course Code 20PZYC23N	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PS O 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	-	H	H	H	H	M	H	H	M
CO 2	H	-	H	H	H	H	L	H	H	H
CO 3	H	-	H	H	L	M	H	H	H	H
CO 4	H	-	H	H	H	H	M	H	H	H
CO 5	H	-	H	M	H	H	H	H	H	H

Dr.J.Rani
Head of the Department

Mrs. S. Jayadurkga
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

M.Sc. ZOOLOGY
(2020 -2021 onwards)

Semester II	LAB IN ANIMAL PHYSIOLOGY, IMMUNOLOGY AND ENTOMOLOGY	Hours/Week: 6	
Core Practical-2		Credits: 3	
Course Code **20PZYC21P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: apply the theoretical knowledge in the field of Animal Physiology, Immunology and Entomology. [K3]

CO2: write the procedure / flow charts / description / diagrams / tabular Column / graph / formulae / map to explain the required parameters. [K3]

CO3 : analyze the given parameters with observation/calculations/results/Inference and comments on the spotter. [K3]

CO4: examine the obtained results with proper illustrations and completion of record work. [K4]

CO5: justify and evaluate the concepts learnt in Animal physiology, Immunology and Entomology. [K5]

1. Effect of temperature on salivary amylase activity.

2.2.Effect of pH on salivary amylase activity.

3.Rate of oxygen consumption by fish.

4.Qualitative test for ammonia, urea and uric acid.

5.Estimation of haemoglobin.

6.Observation of Polymorphic structure of WBC in human blood.

7.Blood grouping- ABO and Rh blood group.

8.Observation of haemin crystals in human blood.

9.Observation and identification of insects.

10. spotters :

·Sphygmomanometer

· ECG

·SRID and DRID

·Immunoglobulin

·Primary and secondary lymphoid organs

11. Life cycle of beneficial insects – Silkworm and honeybee.

12. Newton's bee hive, smoker, honey extractor.

13.Pests of plants – *Tryporyzaincertulas*in rice

*Idiocerusatkinsoni*in mango

Course Code	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
20PZYC21P	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	H	H	H	H	H	H	H	H	-
CO2	H	H	H	H	H	M	M	H	H	-
CO3	H	H	H	H	H	H	M	H	H	L
CO4	H	H	H	H	H	H	H	H	H	-
CO5	H	H	H	H	H	H	M	H	H	-

Dr.J.Rani
Head of the Department

Ms.N.Subashini
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

M.Sc. ZOOLOGY
(2020 -2021 onwards)

Semester II	**ENVIRONMENTAL BIOTECHNOLOGY**	Hours/Week: 6	
DSEC-2		Credits: 4	
Course Code		Internal	External
20PZYE21		40	60

COURSE OUTCOMES

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

CO1: explain the basic concepts of ecosystem and Environmental pollution. [K2]

CO2: apply the knowledge to control Environmental pollution. [K3]

CO3: apply the skills for maintaining a healthy Environment.[K3]

CO4: analyze biotechnological processes and methods to protect environmental quality. [K4]

CO5: assess all the biotechnological aspects for making a sustainable pollution free environment. [K5]

UNIT I

Environment – Basic concept-Atmosphere, hydrosphere, lithosphere and Biosphere (a brief account only). Environmental pollution- sources and nature, Pollution monitoring and measurements, biotechnological methods for management of pollution– Criteria for Biomonitoring – visual, genotoxicity and metabolic rating, pollution indicators.

(20 Hours)

UNIT II

Environmental pollution – Air – sources, classifications and its effects, Control devices for air pollutants – Gaseous, VOCs and particulates. Water – pollutants – organic, inorganic, micro biological and radioactive. Measurements of water pollution – BOD, COD-Wastewater treatment- primary, secondary, tertiary. (20 Hours)

UNIT III

Bioremediation- Biodegradation of hydrocarbons.*Pseudomonas*– the predominant microorganism for bioremediation. Types- *In-situ* and *Ex-situ* bioremediation.Bioremediation of hydrocarbon and dyes.Genetically engineered microorganisms.

(18 Hours)

UNIT IV

Protection of Environmental health – biopesticides, biofertilizers, bioenergy and biofuel - biogas as energy source – Biocomposting and bioleaching, Biodegradable plastics- Waste reduction, reuse and recycling. (16 Hours)

UNIT V

Environmental management-Concepts, scope and trends. Current environmental issues-Deforestation and ocean acidification. Environmental management plan – solid waste management. Environment Impact Assessment. (16 Hours)

TEXT BOOKS

1. Kumaresan N. (2005). *Biotechnology*, Saras Publications.
2. Satyanarayana, U. (2010). *Biotechnology*, Books and Allied Private Ltd. Kolkata – 700010.

REFERENCE BOOKS

1. Dubey, R.C. (2006). *A Textbook of Biotechnology*, S.Chand& Company Ltd, New Delhi-110055.
2. Yadav Rajiv Tyagi, P. R. (2006). *Environmental Biotechnology*, Discovery Publishing house, New Delhi-110002.
3. Sadhana Singh, (2012). Applied Biotechnology, RBSA Publishers, Jaipur – 302003

Course Code 20PZYE21	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	-	H	L	M	H	M	H	M	H
CO2	H	M	H	M	M	H	H	-	M	H
CO3	H	H	H	M	M	H	H	M	M	H
CO4	H	M	H	H	H	H	M	M	M	H
CO5	H	M	H	H	H	H	H	H	M	H

Dr.J.Rani
Head of the Department

Mrs.SinthiaGanesan
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

M.Sc. ZOOLOGY
(2020 -2021 onwards)

Semester II	**POULTRY FARMING**	Hours/Week: 6	
DSEC-2		Credits: 4	
Course Code **20PZYE22**		Internal 40	External 60

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

CO1:explain the basic concepts and scope of the Poultry industry. [K2]

CO2:apply the theoretical knowledge construct a poultry house and plan for self employment opportunity.[K3]

CO3:apply the skills to set up a poultry unit among rural folk to uplift their economic status as entrepreneurs. [K3]

CO4: compare the conventional and recent methods in poultry management. [K4]

CO5: recommend the effective farming practices to obtain more profit. [K5]

UNIT I

Scope of poultry industry in India, Choosing commercial layers and Broilers, Poultry housing, deep litter system, laying cages, meat and eggs-nutritive values.poultry manure.

(18 Hours)

UNIT II

Chick Management – Management of Chicks, growers, layers and broilers,forcedmoulting, important strategies to increase profit margin in layer operation. (18 Hours)

UNIT III

Seasonal management of Chick rearing- Lighting, summer management, winter management, Debeaking. (18 Hours)

UNIT IV

Poultry Nutrition: Non- nutritive feed additives, Feedstuff for Poultry- energy sources, vegetable protein sources, animal protein sources and mineral sources, feed formulation.

(18 Hours)

UNIT V

Poultry diseases: viral disease- ranikhet disease, bacterial disease – salmonellosis, fungal disease- aspergillosis, parasitic disease - coccidiosis, Vaccination programme-Vaccination methods. (18 Hours)

TEXT BOOKS

1.Gnanamani.M.R.2003.Modern aspects of commercial Poultry Keeping: Ninth Edition, Giri Publication, Alwarnagar, Nagamalai.Madurai-19, Tamil Nadu.

REFERENCE BOOKS

1. Jagdish Prasad.(2015). *Poultry Production and Management*. Kalyani publishers
2. Aminul Islam.(2016).*Economic Zoology*,1st Edition.IK International publishing House pvt.ltd. NewDelhi

Course Code 20PZYE22	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	M	H	L	H	L	L	H	M	M
CO2	H	H	H	M	M	L	H	H	M	M
CO3	H	M	H	M	M	H	H	H	M	L
CO4	H	H	H	H	H	M	H	H	M	M
CO5	H	H	H	H	M	H	M	H	M	L

Dr.J.Rani
Head of the Department

Ms.N.Subashini
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

M.Sc. ZOOLOGY
(2022 -2023 onwards)

Semester II	**POULTRY FARMING**	Hours/Week: 6	
DSEC-2		Credits: 4	
Course Code **20PZYE22N**		Internal 40	External 60

COURSE OUTCOMES

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

CO1:explain the basic concepts and scope of the Poultry industry [K2].

CO2:apply the theoretical knowledge construct a poultry house and promoteself-employment opportunity[K3].

CO3:apply the skills to set up a poultry unit among rural folk to uplift their economic status as entrepreneurs [K3].

CO4: compare the conventional and recent methods in poultry management [K4].

CO5: recommend the effective farming practices to obtain more profit. [K5]

UNIT I

Scope of poultry industry in India, Choosing commercial layers and Broilers, Poultry housing, deep litter system, laying cages, meat and Eggs-nutritive values. Poultry manure.By-products of poultry. (18 Hours)

UNIT II

Fowl house – Location. Kinds of Poultry house – Hatchery – Brooder house – Broiler house – Layer house. Equipments – Feeders – Catching equipment – Nests – Hatchery equipments Chick Management – Management of Chicks, growers, layers and broilers, forced moulting, important strategies to increase profit margin in layer operation. (18 Hours)

UNIT III

Culling of non – layer and poor layers. Management of broilers – Broiler industry.Seasonal management of Chick rearing- Lighting, Summer management, Winter management, Debeaking. Management of incubators during incubation. Management of chicks in the brooder. (18 Hours)

UNIT IV

Poultry Nutrition: Non- nutritive feed additives, Feedstuff for Poultry- energy sources, vegetable protein sources, animal protein sources and mineral sources, feed formulation. Poultry meat – production and Processing – Preservation of raw meat - Composition and nutritional value.Inspection and grading.Meat products. (18 Hours)

UNIT V

Poultry diseases: viral disease- Ranikhet disease and Fowl Pox. Bacterial disease– Salmonellosis and Chronic respiratory disease (CRD). Fungal disease- Aspergillosis. Parasitic disease – External and Internal parasites. Vaccination programme-Vaccination methods.

(18 Hours)

TEXT BOOKS

1.Gnanamani.M.R.2003.Modern aspects of commercial Poultry Keeping: Ninth Edition, Giri Publication, Alwarnagar, Nagamalai.Madurai-19, Tamil Nadu.

REFERENCE BOOKS

1. Jagdish Prasad.(2015). *Poultry Production and Management*. Kalyani publishers.
2. Aminul Islam.(2016).*Economic Zoology*,1st Edition.IK International publishing House pvt.ltd. NewDelhi

	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
Course Code 20PZYE22N	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	M	H	H	H	M	H	L	H	M
CO 2	H	H	H	M	M	M	H	H	H	-
CO 3	H	M	H	H	M	H	H	H	H	-
CO 4	H	H	H	M	H	H	H	H	H	-
CO5	H	H	H	H	M	M	M	L	H	-

Dr.J.Rani
Head of the Department

Mrs. S. Jeyaruby
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

M.Sc. ZOOLOGY
(2020 -2021 onwards)

Semester II	**MS OFFICE**	Hours/Week: 6	
DSEC-2		Credits: 4	
Course Code **20PZYE23**		Internal 40	External 60

COURSE OUTCOMES

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

CO1:describe the essential concepts of MS office and its applications. [K2]

CO2: make use of the MS Office program to create academic documents. [K3]

CO3: apply practical skills to promote self employability. [K3]

CO4: examine new innovative methods of learning and teaching. [K4]

CO5: choose the suitable tools to create presentations for academic proposals. [K5]

UNIT I

Introduction to computers

Definition - Characteristics, Generation, history, Concept of Computing, Data and Information.Components of computer- Central Processing Unit (CPU), Input Devices- Punch Cards, Keyboard, Mouse , Light Pen, JoyStick, Track Ball, Scanner Output Devices- Printers, Plotter, Video Display Terminals ,and Applications of Computer. (18Hours)

UNIT II

Windows

New to Windows 7- Windows Desktop – resizing and moving windows – Taskbar Start menu- Files and folders security features - manage passwords and privacy levels – shutdown computer. (16Hours)

UNIT III

Microsoft word

Word Basis - Create new document – designing document – typing text – selecting text – Formatting text – Auto format – formatting paragraph – line spacing - copying and moving – Saving document – quit – restarting word. (18 Hours)

UNIT IV

Microsoft Excel

Managing Worksheets-Introduction- Create a new blank worksheet, selecting cells, rearranging worksheet – moving cells – copying cells – inserting rows and columns - Open an existing worksheet, Saving and Sharing Worksheets – Chart Features – Insert – resizing – moving – delete. (20 Hours)

UNIT V

Microsoft powerpoint

Create presentation – Insert new slide - save presentation - insert object – adding chart – working with image-inserting shape-word art - Working with tables – create table – format table. (18 Hours)

TEXT BOOK

1.Vikas Gupta.(2017). *Comdex – Computer course kit windows 7 with office 2010. SRKGraphics*,Delhi.

REFERENCE BOOKS

1.Ron Mansfield. (1997). *Working in Microsoft Office*. Tata McGraw- Hill publishing company limited, New Delhi.

V. Rajaraman .(2000).*Fundamentals of computers*. Prentice Hall of India Private limited, New Delhi.

E- RESOURCES

1. https://www.wcupa.edu/infoservices/training/documents/courses/Windows/IntroWin d ows7.pdf **(Unit - II)**
2. https://www. sarstec.com/book_argment/com_fun.pdf**(Unit – I)**

Course Code 20PZYE23	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	-	H	L	L	L	H	H	M	L
CO2	H	L	H	M	M	M	H	H	M	L
CO3	H	H	H	M	M	M	H	H	M	L
CO4	H	M	H	H	M	L	H	--	M	-
CO5	H	-	H	H	L	L	M	H	M	-

Dr.J.Rani
Head of the Department

Ms.N.Subashini
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

M.Sc. ZOOLOGY

(2020-21 onwards)

Semester III	**GENETICS**	Hours/Week: 6	
Core course-7		Credits: 6	
Course Code **20PZYC31**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: to understand the basic principles of inheritance biology. [K2]

CO2: apply the knowledge to know the mechanism of inheritance. [K3]

CO3:comparing and contrasting different molecular aspects inheritance to detect the genetic defects. [K4]

CO4:assess the role of genetics to lead a healthy life by choosing proper diagnostic tools.[K5]

CO5:justify the mode of inheritance of genes and its impacts on organisms. [K5]

UNIT I

Basic principles: Mendelism-Mendelian principle: Law of dominance, segregation, independent assortment. Dominance- Phenomenon of dominance, codominance, incomplete dominance.Epistasis-Types of epistatic interactions (Dominant and recessive). Multiple alleles: ABO blood group in Man**.** (18 Hours)

UNIT II

Sex linked inheritance - Sex determination in drosophila and Man. Sex linked inheritance: Characteristics, sex linked lethal, sex linked influenced gene, sex limited gene, Haemophilia –color blindness.Congenital disorders-Sickle cell anaemia,Thalassemia**.** (18 Hours)

UNIT III

Mechanism of inheritance: Linkage, crossing over, Molecular mapping methods-RFLP, Chromosome walking and chromosome jumping - Chromosome and ploidy - Cytoplasmic inheritance: inheritance of Kappa particles – plastid inheritance.

(18 Hours)

UNIT IV

Human genetics: Down syndrome, Klinefelter syndrome, Turner's syndrome. Human karyotype- applications of karyotyping. Principles and methods of pedigree analysis.Human genome project – methodology, preparation of DNA for study, application of genome project.

(18 Hours)

UNIT V

Microbial Genetics: Introduction-DNA as genetic material - Michelson Stahl experiment and Erwin Chargoff experiment. Recombination of bacteria-transformation-conjugation-sexduction and transduction.Bacterial Genetics and its applications.

(18 ours)

TEXT BOOKS

1.Verma, P. S. and Dr. V. K. Agarwal. (2005).*Cell Biology, Evolution and Ecology*, New Delhi: S.CHAND & Company LTD.

REFERENCE BOOKS

1. Arora, M.P. and G.S. Sandhu. (2000). *Genetics*, New Delhi: Himalaya Publishing House.
2. Gardner, E.J., Peter Simmons, M.J. and D. P. Snustad. (2006). *Principles of Genetics*, New York: John Wiley and Sons.
3. Peter J. Russell. (2006). *Genetics- A Molecular Approach*, Pearson Inc. Publishing as Bejnamin Cummings.
4. William S.Klug. and Michael R. Cummings. (2008). *Concepts of Genetics*, New York: Edn. IX. Prentice Hall Internatl, Inc.
5. Sambamurty,A.V.S.S.(2009).Genetics.2nd Edition.Narosa Publishing House.New Delhi.

Course Code 20PZYC31	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	-	H	L	-	M	H	L	L	H
CO2	H	-	H	M	-	M	M	L	L	H
CO3	H	-	H	M	-	M	-	-	L	H
CO4	M	-	H	H	-	H	H	L	M	M
CO5	M	-	H	H	-	H	M	-	L	M

Dr.J.Rani — Head of the Department

Mrs.S.Jeyaruby — 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

M.Sc. ZOOLOGY

(2020-21 onwards)

Semester III	**BIODIVERSITY AND CONSERVATION**	Hours/Week: 6	
Core course-8		Credits: 6	
Course Code **20PZYC32**		Internal 40	External 60

COURSE OUTCOMES

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

CO1:explain the diversity of living organisms and its importance. [K2]

CO2:apply the conservation methods of fauna and its sustainable maintenance.[K3]

CO3:assess the better conservation methods to enrich productivity. [K4]

CO4:evaluate the values of Biodiversity and Conservation for the betterment of the environment. [K5]

CO5: develop novel strategies to preserve biological diversity. [K5]

UNIT I

Biodiversity: Definition – scope of biodiversity; levels – genetic, species, ecological, evolutionary and agro biodiversity, Values of biodiversity; threats to biodiversity India as a megadiversity nation, diversity indices- calculate richness, dominance, evenness of biodiversity in any one ecosystem. Future strategy for the conservation of biological diversity. **(**18 Hours)

UNIT II

Status and conservation: Conservation –needs, India's efforts for biodiversity conservations - *In situ* – National parks, Sanctuaries and biosphere reserves. *Ex-situ* – Sacred groves and Germplasm conservation. **(**18 Hours)

UNIT III

Current environmental issues on biodiversity: Effects of ozone layer depletion, acid rain, greenhouse effect and deforestation on environment and organisms, Impact of invasive species, importance of indicator species and keystone species (brief account only) Environmental issues in India. **(**18 Hours)

UNIT IV

Natural resources: Types - Renewable resources - forest and water resources and their conservation; Non-renewable resources- solar energy and fossil fuels. Role of an individual in conservation of natural resources. **(**18 Hours)

UNIT V

Conservation and Laws: Breeding programmes with special reference to project tiger, lion, crocodile and elephant. Organizations involved in conservation- IUCN, WWF, Biological diversity act, 2002. **(**18 Hours)

TEXT BOOKS

1.Krishnamurthy.K.V.(2017). *An Advanced Textbook of Biodiversity,* New Delhi:Oxford and IBH Publishing Co. Pvt. LTD.

REFERENCE BOOKS

1. Sharma,P.D. (1995). *Ecology and Environment,* Meerut: Rastogi Publication.
2. Erach Bharucha.(2005).*Text book of Environmentalstudies,*UniversityGrants Commission, Universities Press
3. Vasudevan,N.(2006). *Essentials of Environmental studies,* Delhi: Narosa Publishing House Pvt.Ltd.
4. Kumaresan,V.(2014). *Environmental Studies,*Saras Publications, Nagercoil
5. Santra,S.C. (2016). *Environmental Science,* London: New central book agency PVT LTD.

Course Code 20PZYC32	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PS O 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	-	H	L	H	H	L	M	M	-
CO2	H	-	H	M	H	H	L	-	M	H
CO3	H	-	H	M	H	M	M	-	M	H
CO4	H	-	H	H	H	H	L	L	M	M
CO5	H	-	H	H	H	H	L	H	M	H

Dr.J.Rani
Head of the Department

Dr.V.Amsha Devi
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

M.Sc. ZOOLOGY

(2020-21 onwards)

Semester III	**BIOSTATISTICS AND BIOINFORMATICS**	Hours/Week: 6	
Core course-9		Credits: 6	
Course Code **20PZYC33**		Internal 40	External 60

COURSE OUTCOMES

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

CO1:explain the key concepts and scope of Biostatistics and Bioinformatics. [K2]

CO2: apply the tools and methods to carry out data analysis. [K3]

CO3:compare the applications for the improvement of the health of mankind. [K4]

CO4: evaluate the biological data by using software tools. [K5]

CO5: assess available biological databases to develop research oriented skills. [K5]

UNIT I

Basic principles of Statistics: Definition, scope, functions and limitations; Statistical data-sources - Primary and Secondary sources, methods of data collection. Measures of central tendency- mean, median and mode; Measures of dispersion- range, standard deviation and variance. Data representation - classification and tabulation of data, frequency distribution, Diagrammatic and Graphical representation of data– Bar diagrams, Pie Chart, Line graph, Pictogram, Histogram, Frequency polygon, Frequency curve, Ogive. (18 Hours)

UNIT II

Sampling: Introduction, methods- random - Random, stratified, systematic and cluster. Non random- purposive, convenience and quota sampling.Sampling and non samplingerror.Probability – Introduction, theorems – addition and multiplication; theories – permutation and combination, types of probability, theoretical distribution- Binomial, poisson and normal. (18 Hours)

UNIT III

Testing of hypothesis: Null hypothesis, student's t' distribution, Chi square test, goodness of fit.Correlation – types, methods, Karl Pearson's correlation coefficient, rank correlation, regression analysis – equation, estimation of unknown value from known value. ANOVA – one way and two way classification. (18 Hours)

UNIT IV

Bioinformatics: Introduction, origin, components of Bioinformatics. Biological databases-objectives, properties, classification and types – generalized and specialized, DNA, RNA and protein databases, applications of Bioinformatics. (18 Hours)

UNIT V

Sequence alignment: Criteria and needs for sequence alignment. Pairwise alignment – methods- dot matrix, dynamic, programming.Multiple sequence alignment – methods – dynamic, programming and progressive. Phylogenetic analysis- structure and construction of Phylogenetic tree – phenetic, interactive and cladistic method. (18 Hours)

TEXT BOOKS

1. Palanichamy. (2002). *Statistical Methods for Biologists,*Palani:Paramount Publications.
2. Jean Michel.C.andN.Cedric.(2010).Bioinformatics - A Beginner's Guide. 2nd edition.Wiley.India.

REFERENCE BOOKS

1. Banerji, P. K. (2004).*Introduction to Biostatistics*, S. Chand and Company Ltd.
2. Daniel, W.W. (2009). *Biostatistics:* 9th edition, New York: John Wiley and Sons

Course Code 20PZYC33	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	H	H	H	H	-	-	-	H	-
CO2	H	H	H	H	-	H	H	-	H	-
CO3	H	-	H	M	L	-	M	-	H	-
CO4	H	M	H	H	H	-	H	-	H	M
CO5	H	M	H	H	-	M	H	H	H	-

Dr.J.Rani
Head of the Department

Ms.N.Subashini
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

M.Sc. ZOOLOGY

(2020-21 onwards)

Semester III	**LAB IN GENETICS, BIODIVERSITY AND CONSERVATION, BIOSTATISTICS AND BIOINFORMATICS**	Hours/Week: 6	
Core Practical-3		Credits: 3	
Course Code **20PZYC31P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: apply the theoretical concepts in various fields of biology. [K3]

CO2: write theprocedure/flow charts/description/diagrams/tabular column/graph/formulae/map in order to explain the required parameters. [K3]

CO3: analyze the given parameters with observation/calculations/results/Inference and comment on the spotter.[K3]

CO4: examine the obtained results with proper illustrations and completion of record work. [K4]

CO5: evaluate the concepts learnt in the field of Genetics, Biodiversity and Conservation and Bioinformatics. [K5]

1. Monohybrids cross using beads
2. Rh factor interaction
3. Endangered animals-Nilgritahr, Lion tailed macaque, Bengal tiger
4. Extinct animals-Great Auk, Woolly Mammoth, Smilodon
5. Mark the biosphere reserves using India map.
6. Measuring biodiversity by quadrat method using various indices, calculate dominance and evenness.
7. Quantitative estimation of dissolved oxygen in water samples
8. Quantitative estimation of alkalinity and salinity in freshwater

9. Identifying plankton diversity in freshwater.
10. Statistical analysis of quantitative characters- Length of *Polyalthia Leaves* (Measures of Central tendency and Dispersion).
11. Correlation analysis using quantitative characters.
12. ANOVA – Analysis of variance between the samples.
13. Pairwise sequence alignment using BLASTn and BLASTp.
14. Database search NCBI and SNP database.

Course Code 20PZYC31P	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	H	H	H	H	H	H	L	H	-
CO2	H	H	H	H	H	H	H	M	H	-
CO3	H	H	H	H	H	M	H	H	H	L
CO4	H	H	H	H	H	H	H	M	H	-
CO5	H	H	H	H	H	M	H	H	H	-

Dr.J.RANI
Head of the Department

Dr.V.Amshadevi
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

M.Sc. ZOOLOGY

(2021 -22 onwards)

Semester III	**PRACTICE FOR CSIR NET – GENERAL PAPER**	Hours/Week:1	
Course Code		Credits: 1	
20PGOL32		Internal 100	-

COURSE OUTCOMES

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

CO1 : explian various concepts related to numbers, quantitative comparison, monetary problems and logical reasoning. [K2]

CO2 : apply the analytical skills and logical reasoning in solving problems related to competitive examinations. [K3]

CO3 : solve typical problems, geometrical type problems, daily life problems in a effective manner. [K3]

CO4 : analyze the techniques used in solving complicated real life problems.[K4]

CO5 : interpret the data using logical reasoning and observational ability.[K5]

UNIT I

Typical Problems- Series formation

Numerical Ability- Numbers

UNIT II

Geometrical Type Problems

Mensuration and quantitative comparison

UNIT III

Typical Problems- Moving locomotive problem

Numerical Ability- Distance and Directions

UNIT IV

Daily Life Problems

Finding the X – Average - Monetary problems

UNIT V

Logical Reasoning
Data interpretation – Observational ability – Logical puzzles

BOOKS FOR STUDY:

Christy Varghese (2016)., *CSR – NET, General aptitude –A new outlook*, Lilly publishing house, Changanacherry, Kerala

REFERENCE BOOKS

1. Pradip Kumar Ray, General Aptitude Theory ,CSIR NET, Previous question and answer with explanation and hint to solve, Notion Press, India

2. Ram Mohan Pandey (2021)., *CSIR-UGC-NET General Aptitude Theory and Practice*, Pathfinder Publication, a unit of Pathfinder Academy Pvt. Ltd., India.

Unit	Chapter	Section/Page Number
1	4	142-162
	5	163-192
2	12	272-294
3	3	132-141
	7	206-220
4	8	221-230
	9	231-239
	10	240-249
5	13	295-309
	14	310-323
	15	324-332

Course code 20PGOL32	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	H	H	M	M	-	M	-	-
CO2	H	H	H	H	-	M	-	-
CO3	H	H	H	H	-	H	-	-
CO4	H	M	H	H	-	H	-	-
CO5	H	M	H	H	-	H	-	-

Dr.A.Uma Devi
Head of the Department

Dr.A.Uma Devi
Tmty.T.Anitha
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

M.Sc. ZOOLOGY

(2020-21 onwards)

Semester IV	**EVOLUTION**	Hours/Week: 6	
Core course -10		Credits: 6	
Course Code **20PZYC41**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: explain the fundamental principles and basic concepts of evolution.[K2]

CO2: apply their knowledge to appreciate the adaptation of animals during the evolutionary period.[K3]

CO3: analysethe merits of evolutionary concepts and its applications. [K4]

CO4: assess the role of factors that inducethe origin of life of an organism. [K5]

CO5:evaluate the value of evidences in evolutionary biology. [K5]

UNIT I

Introduction to evolutionary Biology: Importance of evolution in Biology-A brief history of life. Evidence and theories of evolution- Criticism of Evolutionary Theories. Origin of life-Theory of Biochemical origin of life, Urey-Miller experiments, evidence of evolution from Biogeography, Comparative anatomy, embryology, physiology and biochemistry, palaeontology. Theories of evolution- Darwinism, Mutation theory of De Vries and Modern mutation theory. (18 Hours)

UNIT II

Mechanism of Evolution: Variation: Sources of variation-gene mutation- Isolating mechanism-Pre zygotic and Post zygotic mechanism. Natural selection and reproduction, Genetic drift-bottleneck effect. Genetic equilibrium- Hardy Weinberg law and its significance. (18 Hours)

UNIT III

Origin of species: Species concepts-Subspecies, Sibling species and Deme. Speciation- types, mechanisms and patterns-Allopatric and sympatric speciation-Factors influencing speciation. Adaptive variation- Causes, significance. (18 Hours)

UNIT IV

Patterns of evolution- basic patterns and types of evolution.Neoteny and evolution, Molecular evolution, Patterns, Origin of higher categories, Extinction-Causes and significance. (18 Hours)

UNIT V

Origin and evolution of man and horse, Evolutionary trends and Phylogeny.

Man's place in the animal kingdom-Causes for human evolution-Trends in human evolution- Fossil records of man-Cultural and future evolution of man. Orthogenesis. (18 Hours)

TEXT BOOKS

1. Verma, P. S & V. K Agarwal. (2005). *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*, New Delhi: Chand and company LTD.

REFERENCE BOOKS

1. Edward. O. Dodson. (1960). *Evolution – Process and product*, New Delhi: East west press pvt. Ltd.
2. Veer BalaRastogi. (1985). *Organic Evolution*, Delhi: kedarnath ram nath.

Course Code 20PZYC41	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PS O 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	-	H	L	M	-	L	H	M	-
CO2	H	-	H	M	L	-	M	-	M	-
CO3	H	-	H	M	M	L	L	H	M	-
CO4	H	-	H	H	M	L	-	M	M	L
CO5	H	-	H	H	M	M	L	H	M	-

Dr.J.Rani
Head of the Department

Ms.N.Subashini
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

M.Sc. ZOOLOGY

(2022 -2023 onwards)

Semester IV	**EVOLUTION**	Hours/Week: 6	
Core course -10		Credits: 6	
Course Code 20PZYC41N		Internal 40	External 60

COURSE OUTCOMES

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

CO1: explain the fundamental principles and basic concepts of evolution. [K2]

CO2: apply their knowledge to appreciate the adaptation of animals during the evolutionary period. [K3]

CO3: make use of their knowledge to identify the merits of evolutionary concepts. [K3]

CO4: analyze the role of factors that bring out the evolutionary changes in animals. [K4]

CO5:evaluate the value of evidences in evolutionary biology. [K5]

UNIT I

Introduction to evolutionary Biology: Importance of evolution in Biology-A brief history of life. Evidence and theories of evolution-Origin of life-Theory of Biochemical origin of life, Urey-Miller experiments, evidence of evolution from Biogeography, Comparative anatomy, embryology, physiology and biochemistry, palaeontology. Theories of evolution- Darwinism, Mutation theory of De Vries and Modern mutation theory. (18 Hours)

UNIT II

Mechanism of Evolution: Variation: Sources of variation-gene mutation- Isolating mechanism-Pre zygotic and Post zygotic mechanism. Natural selection and reproduction, Genetic drift-bottleneck effect. Genetic equilibrium- Hardy Weinberg law and its significance . (18 Hours)

UNIT III

Origin of species: Species concepts-Subspecies, Sibling species and Deme. Speciation- types, mechanisms and patterns-Allopatric and sympatric speciation-Factors influencing speciation. Adaptive variation- Causes, significance. (18 Hours)

UNIT IV

Patterns of evolution- basic patterns and types of evolution.Neoteny and evolution, Phyletic gradualism, punctuated equilibrium,Anagenesis and Cladogenesis,Patterns, Origin of higher categories, Extinction-Causes and significance. (18 Hours)

UNIT V

Molecular evolution-Phylogenetic trees,construction method, Multigene families, phylogenetic classification,phenetics, cladistics . Origin and evolution of man and horse. Man's place in the animal kingdom-Causes for human evolution-Trends in human evolution- Fossil records of man-Cultural and future evolution of man. Orthogenesis. (18 Hours)

TEXT BOOKS

1. Verma, P. S & V. K Agarwal. (2005). *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology,* New Delhi: Chand and company LTD.

REFERENCE BOOKS

1. Edward. O. Dodson. (1960). *Evolution – Process and product*, New Delhi: East west press pvt. Ltd.
2. Veer BalaRastogi. (1985). *Organic Evolution,* Delhi: kedarnath ram nath.

	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
Course Code 20PZYC41N	PSO 1.a	PSO 1.b	PSO 2	PS O 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	-	H	-	M	M	-	-	H	L
CO 2	M	-	H	H	L	H	-	M	H	M
CO 3	M	-	H	M	M	L	-	L	H	M
CO 4	M	-	H	M	M	L	M	-	H	-
CO 5	H	-	H	M	M	M	-	L	H	-

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

M.Sc. ZOOLOGY

(2020-21 onwards)

Semester IV	**MICROBIOLOGY**	Hours/Week: 6	
Core course -11		Credits: 5	
Course code **20PZYC42**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: describe the basic concepts and culture methods of microorganisms. [K2]

CO2: apply the knowledge on the microbes for the betterment of society. [K3]

CO3: analyze the characteristic features and the key role of microbes in the health of Mankind. [K4]

CO4: assess the impact of microbial action in various fields. [K5]

CO5: evaluate the role of microbes to promote productivity. [K5]

UNIT I

Introduction to Microbes – Outline classification of microbes, Sterilization techniques-Physical, Chemical and radiation methods. Culture techniques, Culture medium and types Microbial growth curve.

(18 Hours)

UNIT II

Food Microbiology: Fermented vegetables: Sauerkraut and soy sauce. Fermented meat and Idli. Intrinsic and Extrinsic parameters that influence microbial growth on foods.Pathogens associated with Food: *Salmonella*. Food poisoning caused by *Clostridium botulinum*. Food preservation methods-Pickling, Freezing, pasteurization and canning.

(18 Hours)

UNIT III

Medical Microbiology: Normal flora of the healthy human host, life cycle and pathogenesis of bacteria – *Mycobacterium tuberculosis*, Protozoa-Amoebiasis; fungi –*Penicillium*, virus – Flavivirus (dengue). Nosocomial infections (Hospital acquired diseases).

(18 Hours)

UNIT IV

Industrial Microbiology: Stages of fermentation-Fermentors- characteristics. BatchFermentor-components and types of fermentation process.Production, recovery and usesofYeast,Vinegarandethanol.(18 Hours)

UNIT V

Agricultural Microbiology: Role of symbiotic bacteria and VAM in nitrogen fixation, Microbial biofertilizers- BGA. Plant diseases-Virus– Bunchy top disease of Banana, Bacterium – Potato Scab, Fungus - rust. (18 Hours)

TEXT BOOK

1. Prescott, L.M. Harley. and J.P. Klein, (1999). *Microbiology*, WCB, Mcgraw Hill Publications.
2. Rajan, S.andR.Selvi Christy. (2018). *Essentials of Microbiology*.2nd edition.CBS Publishers and Distributors private limited.

REFERENCE BOOKS

1. Atlas, M. (2000). *Microbiology-Fundamentals and Applications*, London: Collier MacMillan Publication.
2. ShimshonBelkin. and Rita R. Colwell. (2005). *Ocean and Health:* Pathogens in the Marine Environment, Springer.
3. Tauro, P., Kapoor,K.K. and K.S.Yadav.(2016).*An introduction to Microbiology*.2nd Edition.New age international pvt.limited,Mumbai
4. Michael J. Pelzar, JR., Chan, E.C.S. and N.R.Krieg. (2018).Microbiology. 5th edition.McGraw Hill Education (India) Private limited,Chennai.

Course Code 20PZYC42	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	H	H	L	H	-	H	H	M	H
CO2	H	-	H	M	H	H	H	-	M	H
CO3	H	-	H	M	H	H	M	M	M	H
CO4	H	-	H	H	H	H	L	L	M	H
CO5	H	-	H	H	-	-	L	H	L	H

Dr.J.Rani
Head of the Department

Dr.V.Amsha Devi
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

M.Sc. ZOOLOGY

(2022 -2023 onwards)

Semester IV	**MICROBIOLOGY**	Hours/Week: 6	
Core course -11		Credits: 5	
Course code **20PZYC42N**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: describe the basic concepts and culture methods of microorganisms [K2].

CO2: apply the knowledge on the microbes for the betterment of society [K3].

CO3: identify the key role of microbes in the health of mankind [K3].

CO4: analyze the impact of microbial action in various fields [K4].

CO5: evaluate the role of microbes to promote productivity [K5].

UNIT I

Introduction to Microbes – Outline classification of microbes, Characteristics of microorganisms, Sterilization techniques- Physical, Chemical and radiation methods. Culture techniques, Culture medium, Reproduction. Growth- Microbial growth curve (18 Hours)

UNIT II

Food Microbiology: Fermented vegetables: Sauerkraut and soy sauce. Fermented meat and Idli. Intrinsic and Extrinsic parameters that influence microbial growth on foods. Pathogens associated with Food: *Salmonella*. Food poisoning caused by *Clostridium botulinum and E.coli.* Food preservation methods-Pickling, Freezing, pasteurization and canning. (18 Hours)

UNIT III

Medical Microbiology:Normal flora of the healthy human host, life cycle and pathogenesis of bacteria – *Mycobacterium tuberculosis,* Protozoa-Amoebiasis; fungi *Penicillium,* virus – Flavivirus (dengue). Nosocomial infections (Hospital acquired diseases). (18 Hours)

UNIT IV

Industrial Microbiology:Fermentors:- characteristics, components and Stages of fermentation- BatchFermentor-components and types of fermentation process. Production, recovery and uses of Yeast, Vinegar and Ethanol. (18 Hours)

UNIT V

Agricultural Microbiology:Microorganisms in agriculture. Role of symbiotic bacteria and VAM in nitrogen fixation, Microbial biofertilizers- BGA. Plant diseases-Virus– Bunchy top disease of Banana, Bacterium – Potato Scab, Fungus - rust. (18 Hours)

TEXT BOOK

1. Prescott, L.M. Harley. and J.P. Klein, (1999). *Microbiology,* WCB, Mcgraw Hill Publications.
2. Rajan, S.andR.Selvi Christy. (2018). *Essentials of Microbiology*.2nd edition.CBS Publishers and Distributors private limited.

REFERENCE BOOKS

1. Atlas, M. (2000). *Microbiology-Fundamentals and Applications*, London: Collier MacMillan Publication.
2. ShimshonBelkin. and Rita R. Colwell. (2005). *Ocean and Health:* Pathogens in the Marine Environment, Springer.
3. Tauro, P., Kapoor,K.K. and K.S.Yadav.(2016).*An introduction to Microbiology*.2nd Edition.New age international pvt.limited,Mumbai
4. Michael J. Pelzar, JR., Chan, E.C.S. and N.R.Krieg. (2018).Microbiology. 5th edition.McGraw Hill Education (India) Private limited,Chennai.

	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
Course Code **20PZYC42N**	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	H	H	H	H	H	H	M	H	L
CO 2	H	-	H	H	H	H	-	H	H	H
CO 3	H	-	H	H	H	H	-	H	H	L
CO 4	H	-	H	H	H	H	-	L	H	H
CO 5	H	-	H	H	-	-	L	-	H	H

Dr.J.Rani — Head of the Department

Ms. C. Sundareswari — 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

M.Sc. ZOOLOGY
(2020 -2021 onwards)

Semester IV Core course -12	**MOLECULAR BIOLOGY**	Hours/Week: 6 Credits: 6	
Course code **20PZYC43**		Internal 40	External 60

COURSE OUTCOMES

CO1: explain the key concepts of structure and functions of genetic molecules.[K2]

CO2:identify the functional mechanisms and molecular pathways by knowing the central dogma of life. [K3]

CO3:analyse the molecular aspects and techniques to lead a healthy life.[K4]

CO4:assess the molecular level alterations with the aid of suitable applications. [K5]

CO5: justify the novel techniques in molecular biology for the betterment of society. [K5]

UNIT I

Basics of Molecular Biology: Nucleic acids, Nucleotides and nucleosides Molecular structure of DNA, types of DNA and properties of DNA, RNA-primary and secondary Structure, types of RNA,informosomes, Chargaff's rules, DNA topology, Chromosome and Gene - Gene organization in Prokaryotes and Eukaryotes. DNA Replication in Prokaryotes and Eukaryotes. (18 Hours)

UNIT II

Central dogma of molecular Biology: Protein synthesis - Central dogma of Molecular Biology and Mechanism. Regulation of gene action in Prokaryotes and Eukaryotes.Operonhypothesis.Analysis of gene- Reporter gene.DNA- Protein interaction.Entrapment of vectors.Analysis of Proteins and Protein - Protein interaction.

(18 Hours)

UNIT III

Molecular basis of abnormality in genes: Concepts- Mistakes and mutation in DNA - Types. Biochemical mutation in man - Mutagens and Mutagenesis, Teratogens and Teratogenesis. Molecular aspects of Sickle cell anaemia, Thalassemia and Cystic fibrosis.

(18 Hours)

UNIT IV

Methods in Molecular Biology: Purification and characterization of protein - Chromatography, SDS-PAGE, Mass spectrometry, Protein sequencing, DNA sequencing, Cell disintegration and Subcellular fractionation - Cell fractionation, Differential Centrifugation, Extraction and Purification of Protein and Nucleic acid. (18 Hours)

UNIT V

Techniques in Molecular Biology: Introduction, Gel electrophoresis - DNA electrophoresis, Blotting techniques- Southern, Northern and Western blot, Restriction fragment length polymorphisms (RFLP), Random amplification of polymorphic DNA (RAPD) and Polymerase chain reaction (PCR)- Components, Types and Applications. (18 Hours)

TEXT BOOKS

1. Verma, P.S. and V.K.Agarwal.(2009).*Molecular Biology*, New Delhi: S.Chand& company PVT.LTD.
2. Rastogi, S.C., Cell and Molecular biology, (2010). New Age International Publishers, New Delhi.

REFERENCE BOOK

1. David FreiFelder.(2008).*Molecular Biology*, New Delhi: Narosa Publishing House.
2. PrakashS.Lohar.(2009).Cell and MolecularBiology,3rd edition,MJPPublishers,Chennai
3. De Robertis, E. D. P. and E. M. F. De Robertis.(2010). *Cell and Molecular Biology*, Saunders Elsevier.
4. Malathi, V., Essentials of Molecular biology, (2013). Dorling Kindersley(India)Pvt. Ltd. Pearson Education in South Asia.
5. Kumar, H.D., *Molecular Biology*. (2014) Vikas Publishing House Pvt Ltd., India.
6. Ajoy Paul., *Text Book of Cell and Molecular Biology*, (2016). Books and Allied (P) Ltd., Kolkata.

Course Code 20PZYC43	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	-	H	L	-	L	L	H	M	-
CO2	H	-	H	M	-	L	H	H	M	-
CO3	H	H	H	M	L	H	L	-	M	-
CO4	H	H	H	H	-	H	H	-	M	L
CO5	H	H	H	H	M	H	M	H	M	H

Dr.J.RANI

Head of the Department

Mrs.S.Jeyaruby

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

M.Sc. ZOOLOGY

(2020-21 onwards)

Semester IV	**SERICULTURE**	Hours/Week: 6	
Core Course-13		Credits: 5	
Course code **20PZYC44**		Internal 40	External 60

COURSE OUTCOMES

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

CO1:explain the key concepts and scope of Sericulture. [K2]

CO2:make use of the acquired knowledge to promote self employment.[K3]

CO3: analyze the features of culturable species and methodology for successful rearing. [K4]

CO4:assess the merits of culture methods to produce disease free layings for the enhancement of productivity and to promote entrepreneurship. [K5]

CO5: Evaluate the better techniques of sericulture to get more profit. [K5]

UNIT I

Introduction to Sericulture: Morphology of silkmoth,structure of silk gland,life cycle of mulberry silkworm-*BombyxMori*,Non mulberry silkworm-Eri,Muga and Tasar, uses of silk. Support of funding agencies for the development of sericulture industry. (18 Hours)

UNIT II

Moriculture- Morphology of mulberry plant- planting. Pruning -weeding- mulching-pruning and harvesting, Steps involved in cultivation – Irrigation, pruning, harvesting and storing of mulberry leaves. Medicinal and nutritional values of mulberry.Methods of propagation – vegetative propagation. (18 Hours)

UNIT III

Rearing methods of silkworm – shelf rearing and floor rearing. Rearing operations of silkworm – disinfection, hatching, brushing, bed cleaning, feeding, mounting, harvesting and reeling. Rearing appliances of silkworm – stand, Tray, Foam Rubber Strip, Chopsticks, Leaf chamber, Chopping board, Knife and Mountages. (18 Hours)

UNIT IV

Cocoon marketing – Transport of cocoons, physical characters of cocoons considered for commercial purposes, Defective cocoons, Cocoon markets. Silk reeling – Methods of reeling operation -Reeling end formation, Twisting, Drying, Reeling, Re-reeling and finishing.

(18 Hours)

UNIT V

Diseases of silkworm –Bacterial disease – Flacherie.Fungal disease- Muscardine, Viral disease – Grasserie. Pests of silkworm – Indian Uzi fly, Disease of mulberry – Fungal disease – Powdery mildew disease, Bacterial disease – Leaf blight disease. (18 Hours)

TEXT BOOKS

1.Ganga, G. and J. SulochanaShetty. (2006). *An Introduction to sericulture*, 2nd Edition.Oxford and IBH Publishing Co. Pvt. Ltd.

REFERENCE BOOKS

1.HisaoAruga. (1991). *Principles of Sericulture*, Published by Oxford Publications.

2.Jaiswa, K. (2009). *Moriculture*, New Delhi: APH Publishing Corporation.

3. Aminul Islam.(2016).*Economic Zoology*,1st Edition.IK International publishing House pvt. ltd. New Delhi

Course Code 20PZYC44	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PS O 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	-	H	L	-	L	L	H	H	M
CO2	H	-	H	M	-	M	L	H	H	M
CO3	H	-	H	M	L	M	-	H	L	L
CO4	H	-	H	H	M	H	M	H	M	-
CO5	H	-	H	H	L	H	M	H	H	-

Dr.J.RANI
Head of the Department

Dr.V.Amsha Devi
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

M.Sc. ZOOLOGY

(2022 -2023 onwards)

Semester IV	**SERICULTURE**	Hours/Week: 6	
Core Course-13		Credits: 5	
Course code **20PZYC44N**		Internal 40	External 60

COURSE OUTCOMES

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

CO1:explain the key concepts and scope of sericulture[K2].

CO2:identify the features of culturable species and methodology for successful rearing. [K3]

CO3:make use of the acquired knowledge to promote self employment. [K3]

CO4: analyze the merits of culture methods for the enhancement of productivity. [K4]

CO5: assess the rearing methods to and to promote entrepreneurship. [K5]

UNIT I

Introduction to Sericulture: Sericulture in India. Morphology of silkmoth, structure of silk gland, life cycle of mulberry silkworm-*Bombyx mori*, Non mulberry silkworm-Eri, Muga and Tasar, uses of silk. Races of mulberry silkworms (voltinism). Objectives of CSB and NABARD. Support of funding agencies for the development of sericulture industry.

(18 Hours)

UNIT II

Moriculture- Mulberry - varieties – Geographic distribution of Mulberry plant. Morphology of mulberry plant- planting. Pruning -weeding- mulching-pruning and harvesting, Steps involved in cultivation – Irrigation, pruning, harvesting and storing of mulberry leaves. Medicinal and nutritional values of mulberry. Methods of propagation – vegetative propagation. (18 Hours)

UNIT III

Rearing methods of silkworm – shelf rearing and floor rearing. Rearing operations of silkworm – disinfection, hatching, brushing, bed cleaning, feeding, mounting, harvesting and reeling. Rearing appliances of silkworm – stand, Tray, Foam Rubber Strip, Chopsticks, Leaf chamber, Chopping board, Knife and Mountages. (18 Hours)

UNIT IV

Cocoon marketing – Transport of cocoons, physical characters of cocoons considered for commercial purposes, Defective cocoons, Cocoon markets. Silk reeling – Methods of reeling operation -Reeling end formation, Twisting, Drying, Reeling, Re-reeling and finishing. Mountages used in India-Chandrika, Screen Type Mountage, Plastic Mountage and Polymer Mountage. (18 Hours)

UNIT V

Diseases of silkworm –Bacterial disease – Flacherie. Fungal disease- Muscardine, Viral disease – Grasserie. Pests of silkworm – Indian Uzi fly, Disease of mulberry – Fungal disease – Powdery mildew disease, Bacterial disease – Leaf blight disease. (18 Hours)

TEXT BOOKS

1.Ganga, G. and J. SulochanaShetty. (2006). *An Introduction to sericulture,* 2nd Edition.Oxford and IBH Publishing Co. Pvt. Ltd.

REFERENCE BOOKS

1.HisaoAruga. (1991). *Principles of Sericulture,* Published by Oxford Publications.

2.Jaiswa, K. (2009). *Moriculture,* New Delhi: APH Publishing Corporation.

3. Aminul Islam.(2016).*Economic Zoology,*1st Edition.IK International Publishing House pvt.ltd.NewDelhi

	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
Course Code 20PZYC44N	**PSO 1.a**	**PSO 1.b**	**PSO 2**	**PS O 3.a**	**PSO 3.b**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	H	-	H	H	-	H	M	H	H	L
CO 2	H	-	H	H	-	H	H	H	H	M
CO 3	H	-	H	L	L	H	H	H	H	M
CO 4	H	-	H	M	M	M	H	M	H	M
CO5	H	-	H	L	L	-	M	M	H	L

Dr.J.Rani
Head of the Department

Dr. J. Rani
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

M.Sc. ZOOLOGY
(2020-2021 onwards)

Semester IV	**PROJECT**	Hours/Week: 6	
Core Course-14		Credits: 4	
Course Code **20PZYC41PR**		Internal 40	External 60

COURSE OUTCOMES

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

CO1:Find out the contemporary issues in their chosen field of research.[K3]

CO2:build the protocol of the work with appropriate objectives relevant to the study. [K3]

CO3:experiment the data using scientific methods. [K3]

CO4:examine the results. [K4]

CO5:interpret the obtained data. [K5]

- Project will be done by II M.Sc Zoology students during final semester.
- Internal marks will be provided by their respective guides and external marks will be given by the External examiners at the time of external viva-voce Examinations.
- The report of the project should be in MS word with the following standard format
  - Font size -12 pt
  - Font style -Times New Roman
  - Line spacing -1.5
- The format of the project report should have the following components.
  - ❖ First page should contain:

    Title of the project report

    Name of the candidate

    Register number

    Name of the supervisor with designation

Address of the Institution with College logo

Month & year of submission

- ❖ Table of Contents
- ❖ Certificate by supervisor
- ❖ Declaration by candidate
- ❖ Acknowledgement
- ❖ Chapters
- ❖ Bibliography

- The project report should be written in 25 - 30 pages.
- Four copies of the project report should be submitted.

Course Code 20PZYC41PR	PO1		PO2	PO3		PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	H	H	H	H	H	H	H	H	H	L
CO2	H	H	H	H	H	H	M	H	H	L
CO3	H	H	H	H	H	H	M	M	H	L
CO4	H	M	H	H	H	H	M	L	H	-
CO5	H	L	H	H	H	H	M	H	H	-

Evaluation:	Internal Assessment	: 40 marks
	External Examination	: 60 marks
Internal Assessment:	Pre-submission Presentation	: 10 Marks
	Review Report	: 20 Marks
	One Open Online Course related to the Project	: 10 Marks
External Examination:	Project Report	: 40 Marks
	Viva Voce	: 20 Marks

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

M.Sc. Zoology
(2022-2023onwards)

Semester IV	**PROJECT - RESEARCH METHODOLOGY & ETHICS**	**Hours/Week: 6**	
Core Course-14		**Credits: 4**	
Course Code 22PZYC41PR		**Internal 60**	**External 40**

COURSE OUTCOMES

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

CO1: identify and discuss the role and importance of research in the field of biology. [K3]

CO2: select the appropriate experimental work to find the solutions for research problems [K4]

CO3: analyze the advanced methodologies and recent tools to carry out research. [K4]

CO4: analyze the ethical issues related to scientific research. [K4]

CO5: evaluate and justify the results obtained through experiments. [K5]

Unit I

Research Formulation and Research: Introduction- Objectives of research- types of research- Significance of Research-Stages of research Process-Techniques for generating research topics. Topic selection and justification. Types of research report- Dissertation and thesis, research paper, review article, short communication, conference presentation and meeting report.

Unit II

Research ethics, plagiarism and impact of research: Research ethics, Responsibility and Accountability of the Researchers, Ethical issues-CPCSEA guidelines, Plagiarism detection softwares - Turnitin, paperrater. Reference managing softwares in research -MENDELEY, ENDNOTE.

- Project will be done by II M.Sc. Zoology students during final semester.
- Course comprises two units Research Methodology theory paper and Project Completion.
- An Internal Assessment for a maximum of 20 marks will be carried out for the theory paper.

- Internal marks will be provided by their respective guides and external marks will be given by the External examiners at the time of external viva-voce Examinations.
- The report of the project should be in MS word with the following standard format

➢ Font size -12 pt

➢ Font style -Times New Roman

➢ Line spacing -1.5

- The format of the project report should have the following components.
  - ❖ First page should contain:

    Title of the project report

    Name of the candidate

    Register number

    Name of the supervisor with designation

    Address of the Institution with College logo

    Month & year of submission
  - ❖ Table of Contents
  - ❖ Certificate by supervisor
  - ❖ Declaration by candidate
  - ❖ Acknowledgement
  - ❖ Chapters
  - ❖ Bibliography
- The project report should be written in 25 - 30 pages.
- Four copies of the project report should be submitted.
- Research Methodology should be written during an internal examination.

Text book

1. Gurumani N, 2006. Research Methodology: for biological Sciences, MJP Publishers, Chennai.

Reference books:

1. Kothari C. R., 1990. Research Methodology: Methods and Techniques, II Edition and above, New Age International.
2. Research Methodology: A Step By Step Guide for beginners- Ranjeet Kumar
3. Shanti Bhushan Mishra &ShashiAlok: Handbook of Research methodology: A compendium for Scholars and Researchers.

Course Code 20PZYC4PRN	**PO1**		**PO2**	**PO3**		**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO2**	**PSO 3.a**	**PSO 3.b**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO 8**
CO1	H	H	H	H	H	H	H	H	H	L
CO2	H	H	H	H	H	H	M	H	H	L
CO3	H	H	H	H	H	H	M	M	H	L
CO4	H	M	H	H	H	H	M	L	H	-
CO5	H	L	H	H	H	H	M	H	H	-

Evaluation Pattern (100 marks)					
Internal Assessment (60marks)				External Assessment (40 marks)	
One Periodic Test (20)	Project Report (20)	Pre-Submission Presentation (10)	One Open online Course related to the Project (10)	Project Presentation (30)	Viva Voce (10)

Dr.J.Rani
Head of the Department

Ms. C. Sundareswari
Course Designer