



TAMIL NADU STATE COUNCIL FOR HIGHER EDUCATION

CHENNAI 600 005

Report of the Workshop on 'Zoology Education in the 21st Century'

August 2006

Introduction

A curriculum has to be considerably more than an aggregate of courses. The curriculum should be based upon human needs and structured to make educational sense to students, creative and intellectual satisfaction to the teachers and managerial sense to those responsible for administration. In achieving this the institutions face many problems. Colleges and universities struggle to incorporate programs and techniques to satisfy new/fresh demands and hence the curriculum becomes a major focus of attention.

While restructuring Zoology curricula at undergraduate level we should consider two things.

- a. Retaining essentials of the existing ones and
- b. Injecting sufficient modernization reflecting incorporation of elements of scientific and technological advances witnessed in the recent time.

The existing syllabi in all universities and colleges are to be screened, and necessary changes are to be incorporated both in the subjects and in the syllabus. While doing this we should consider the needs of students who are likely to take up employment after graduation and also those who would like to pursue higher studies. At the time of implementation it should bring in meaningful results.

While framing the curriculum and syllabus, higher secondary syllabus should be taken as a base. The teachers can also think about the preparation of standard textbooks in the concerned subjects so that materials can be made available to the students.

The general objectives of restructuring are

- To develop the language skill in students
- To give training in a specific skill for students who enter the job market
- To develop in-depth knowledge in the major area of study
- To broaden the outlook of the student through interdisciplinary approach

These are considered during the workshop on "Zoology Education in the 21st Century" held at Tamilnadu State Council for Higher Education, Chennai. The outcome of the workshop is circulated to the participants and the institutions so as to be used as a model in Zoology Education.

**TAMIL NADU STATE COUNCIL FOR HIGHER EDUCATION,
CHENNAI 600 005**

Workshop on “Zoology Education in the 21st Century”

23rd and 24th February 2006

PROGRAMME

23-2-2006

- 10.00 a.m. - Registration
- 10.30 a.m. - Inauguration
- Inaugural Address : Thiru. K.S. Sripathi, IAS,
Secretary to Government,
Higher Education Department
Vice-Chairman (i/c) &
Member-Secretary (i/c), TANSICHE
- Special Address : Prof. S. Swaminatha Pillai
- 11.30 a.m. - Tea
- 11.45 a.m. - Framing the Structure of the Curriculum
- 1.00 p.m. - Lunch
- 2.00 p.m. – 5.00 p.m. - Generation of Model Syllabi in groups

24-2-2006

- 10.00 a.m. – 11.15 a.m. - Generation of Model Syllabi in groups
- 11.15 a.m. – 11.30 a.m. - Tea
- 11.30 a.m. - Generation of Model Syllabi in groups
- 1.00 p.m. - Lunch
- 2.00 – 4.00 p.m. - Finalizing the Syllabi and Valediction
- Vote of Thanks - Dr. S. Padmavathy,
Research Officer, TANSICHE

CURRICULUM DEVELOPMENT PROCESS

S. SWAMINATHA PILLAI

COMPETENCIES TO BE DEVELOPED:

Knowing the form and function of a curriculum.
Understanding the need for a curriculum.
Following several steps in developing a curriculum.
Evaluating a curriculum.
Appreciating the role of curriculum in the social process of education.

ABSTRACT:

Curriculum is a contact document between the stakeholders of the educational process. It fulfils the need for directing, implementing and satisfying their role performance in the society. Being scientific in its approach a curriculum specifies all the required conditions for effective learning and teaching including testing, besides leading to continuous individual and social development. The philosophical foundations of an society is the basis for a curriculum; the practical and successful living is the result of well-developed curriculum. Economy of efforts, materials, manpower, time and money is achieved in the otherwise long, unwieldy and indirect process of education.

INTRODUCTION

The long and continuous social process of education is often offered in terms of specified periods. These periods are identified as stages of education viz., early childhood to university education. In each stage there may be several parallel forms or structures like general, special or professional education depending on the needs of the pursuers of education at that stage. To make them ready and interested in their direction of learning and teaching, it is required that both the teachers and the learners should have a clear idea about their plans and activities. This can be set by them if they are mature enough to draw the plan. Very often there arises a situation that quantitative expansion like population increase and transfer of persons like social mobility requiring some sort of uniformity or equality paving way for easy movement and comfort and confidence. Hence there is a need for a common source and plan to enable the younger generation to get the required education assuring a

sort of commonly recognized competencies at each stage of human development. This requirement is fulfilled by what is called curriculum.

WHAT IS A CURRICULUM?

A curriculum seeks to answer questions like 'What shall I teach or learn?', 'Why should I teach or learn?', 'How will I teach or learn?', 'What resources do I have at my disposal?', and 'How do I know if I have succeeded in my learning or teaching?' Thus a curriculum is **a conceptual scheme** for joint implementation by teachers and learners in core, observed and appreciated by parents and users of the product/ learners in effect and valued and admired by other stakeholders as a result. It is in fact **a changing and living entity** in view of its need for continuous modification as demanded by the members of the society in view of the fast and dynamic changes around. It is obtained from **three sources** such as replacing the familiar environment of **family and friends to school and college**, moving from the **present scenario** to a predicted or even unpredicted **future situation** and making the implementers or beneficiaries **dependent or independent**, or balancing between **individuality and conformity**.

A curriculum is in fact **a programme of studies** or activities (curricular, co-curricular and extra curricular) and guidance. It can function as a scale of values providing a set of criteria. Arising from the **basic needs** and moving on to **social, cultural, individual and traditional needs**, the curriculum very often attempts to fulfil **the ideal needs also**, such as intellectual, moral, aesthetic and religious needs. Curriculum is frequently viewed as **a school/college/university function** for preserving and transmitting traditional cultures, for the transformation of culture, and primarily **for individual development** of the participants.

PRESSURES AND PRINCIPLES OF CURRICULUM DEVELOPMENT

Curriculum is developed under **economic and social pressures**, caused by **knowledge explosion** and utilizing **research findings**. The principles of governing the development of a curriculum can be stated as follows:

*Curriculum should be **dynamic** enough to accommodate the changes in social environment; it should be specifically **goal-oriented** to move towards the accepted direction causing success; **scientific** method needs to be adopted in developing a curriculum to make it reliable and successful; and curriculum has to be*

evaluative with a built-in mechanism of evaluation; and however it should be comprehensive enough to bring in clarity, brevity and surety in its success.

Specifying the **objectives** in observable terms, describing a variety of alternative **learning experiences**, selecting the most appropriate **content** from the vast store of human knowledge, **organizing and integrating** the items into a homogeneous whole and providing for adequate and accurate measures of **evaluation** of the achievement of the state objectives so as to minimize, if not avoid, any loss or distortion of human development.

STAGES OF CURRICULUM DEVELOPMENT:

There are several stages in the development of a curriculum. The following are the most identifiable and adoptable stages as practiced by the curriculum developers:

PLANNING: Observing the gaps, if any, between the educational achievements and the social development there should be a systematic attempt to identify the new needs of the society by adopting the techniques of need analysis. Considering the social forces, needs, goals and objectives, knowledge has to be treated for human development on the philosophical tenets of the society incorporating the learning process with the selection of proper instructional procedure decision is to be taken on the proposed curriculum.

PREPARING: Collecting the available data, identifying the relevant sources, organizing adequate and suitable manpower, debating several styles of learning and strategies of teaching, arranging for several materials useful to cull out specific content from, a curriculum developer has to be prepared for the process. Following a systemic approach the constituent subsystems need to be integrated to deal with the collected data yielding the relevant content to be selected, organized and assessment pattern to be specified.

DESIGNING: Levels, types and structure of educational institutions which are to adopt the proposed curriculum, precepts and practices of educational technology, humanistic approach, vocational possibilities and social reconstruction contribute to the design of a curriculum. Even the concept of de-schooling or out-of-school or distance or on-line education will have a

bearing process. The popular and prominent curriculum models of Tyler and Taba offer potentials of the curriculum development.

DEVELOPMENT: Curriculum development considers instructional development, learning materials and instructional media development besides strategies of teaching and techniques of testing. It is an integrated process taking into account all possible educational practices. Three different diagrammatic approaches are presented in the next section of this paper.

IMPLEMENTATION: The chief implementers of a curriculum are teachers and learners although other educational managers have assigned roles to play. Policy-makers, system managers, auxiliary manpower like technicians and other personnel and evaluators along with users like higher education system and employment organizations definitely play a secondary role in this regard.

EVALUATION: After implementing a curriculum it is essential to evaluate the same for its effectiveness, deficiencies and mishaps. There are several models of evaluation of a curriculum proposed by experts as in the case of Stufflebeam's model or CIPP model. In any case teacher evaluation of students followed by an analysis of the latter's performance, student evaluation of students followed by their experiences, materials evaluation of all concerned and evaluation of the testing techniques adopted and the examination pattern used form the basis for valid, reliable and acceptable evaluation of a curriculum.

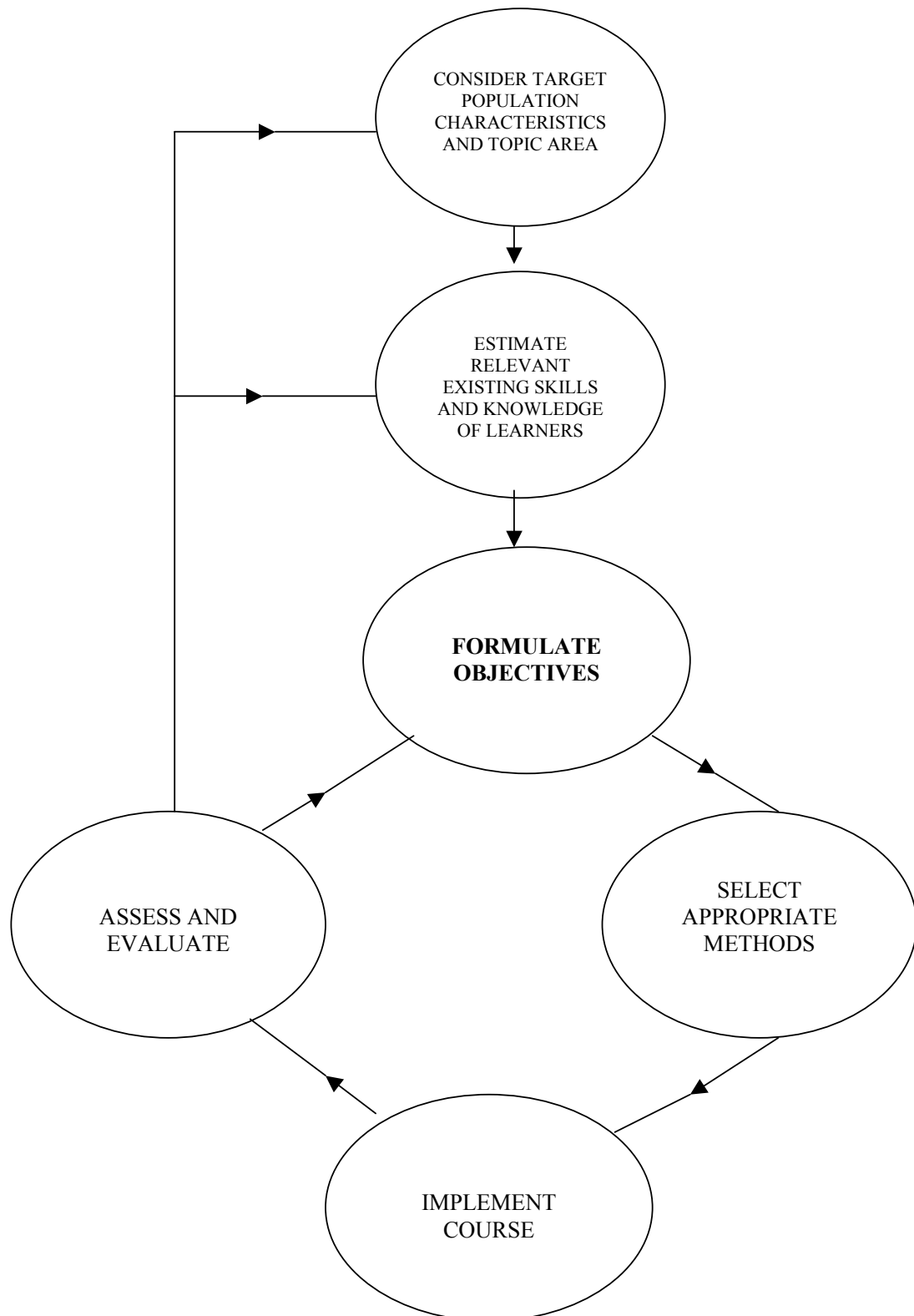
REVIEW: The after-effects of such evaluation will be the need and the mode of reviewing the developed and implemented curriculum periodically so as to make modifications in the relevant aspects of the curriculum. As per the present conditions the life of a curriculum is not even five years unlike in the past. Even annual review for making required changes in the curriculum makes it more dynamic, organizationally difficult though.

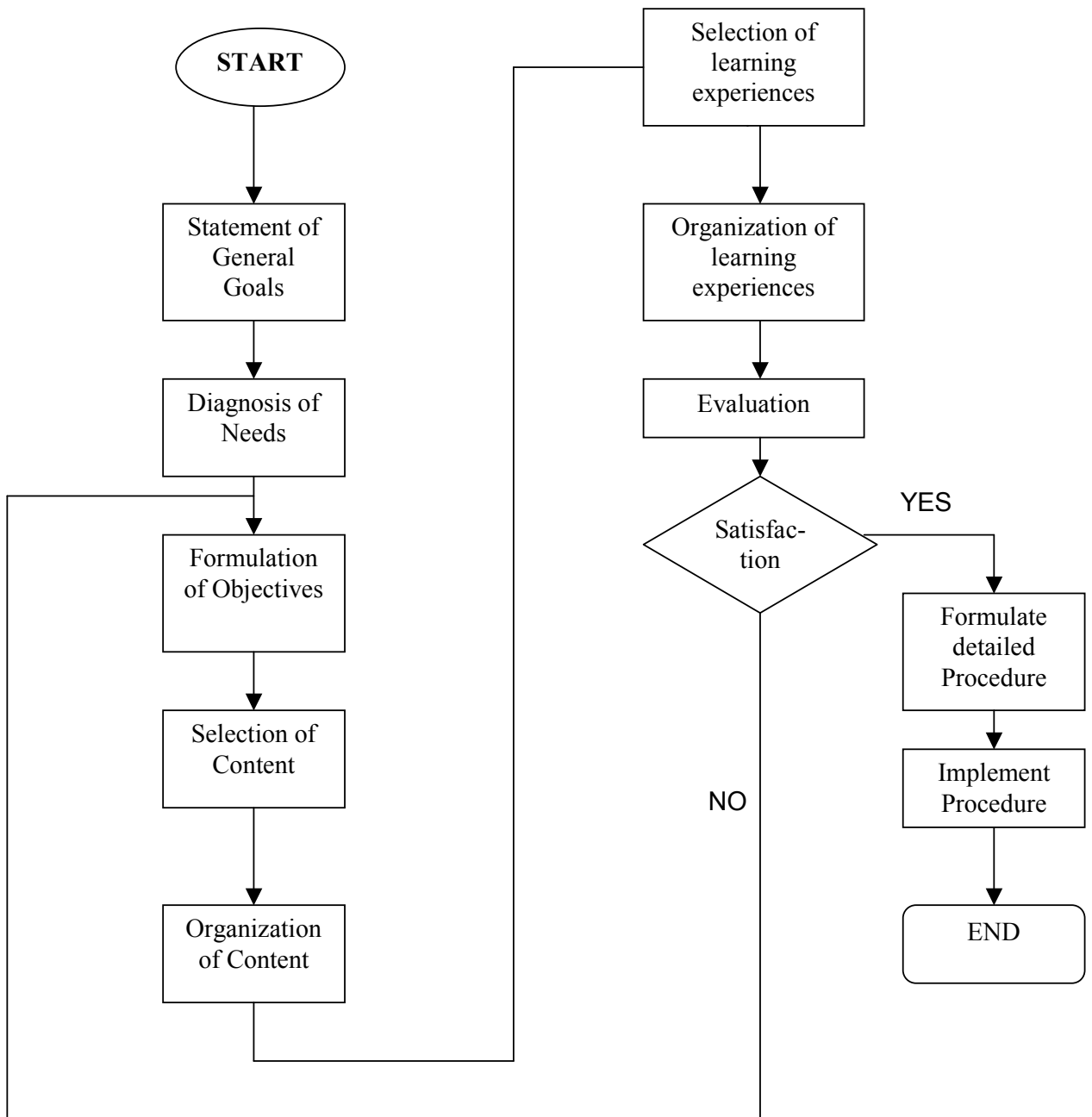
IMPROVEMENT: In order to improve a curriculum the process should have a re-look including restart from the scratch. Tinkering with a curriculum makes it lopsided and takes its life away. Total revision is always a must. In view of the fast changes in the social milieu and of the human knowledge and experience the concept of rolling curriculum will yield better results. Anyway

every five, or better, three years or period of duration of a course offered there is a need Curriculum improvement or revision or even reconstruction.

CURRICULUM DEVELOPMENT MODELS:

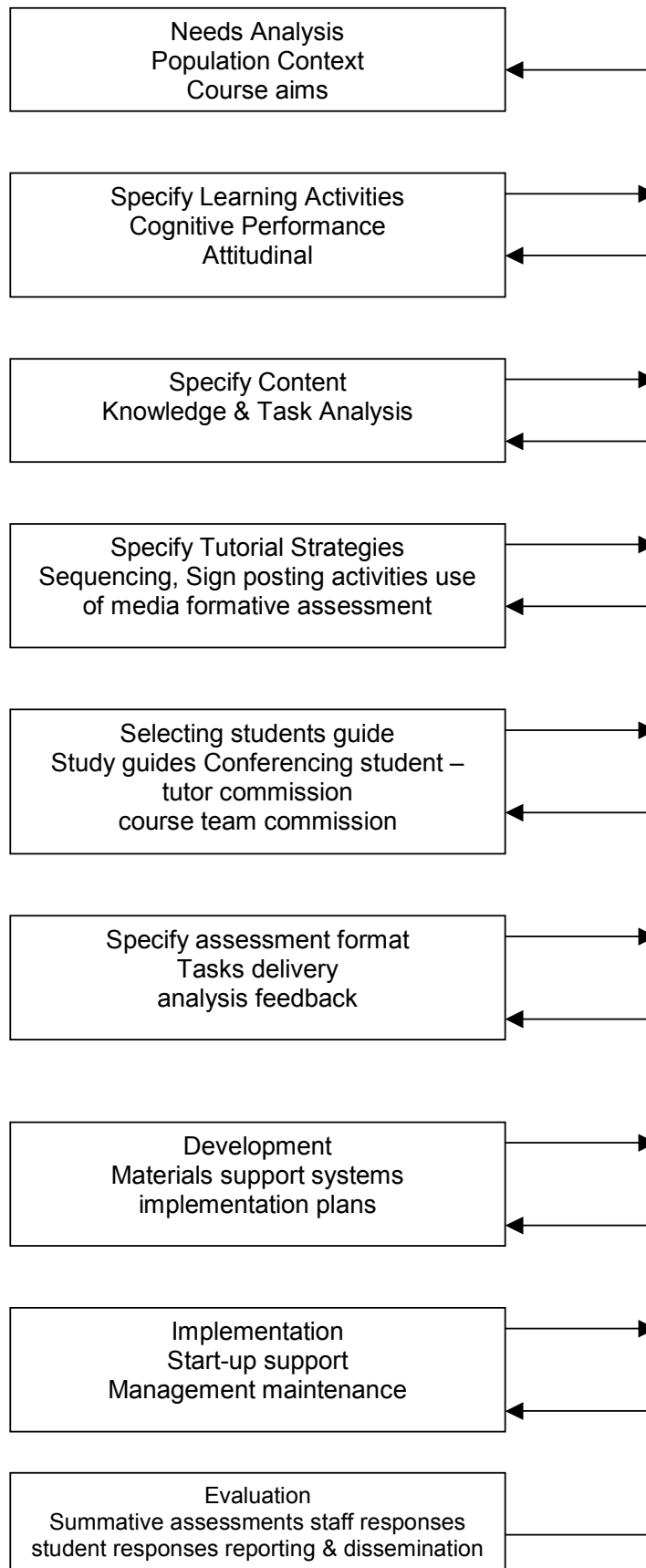
1. A SIMPLIFIED SYSTEMS APPROACH





FLOWCHART REPRESENTATION OF TABA-TYLER CURRICULUM DEVELOPMENT MODEL

3. THE COURSE DESIGN PROCESS



CURRICULUM & SYLLABUS STRUCTURE:

Structure of Curriculum

1. Introduction
2. Scope
3. Aims & Goals
4. Courses of Studies
 - Paper I
 - Paper II
 - Paper III
5. Methodology
6. Materials
7. Media
8. Evaluation
9. Outcome

Structure of Syllabus

1. Linkage
2. Objectives
 - General
 - Specific (Competences)
3. Structured Content
4. Materials
5. Methods & Media
6. Testing

F.N.:-

Objectives

Competencies

Achieve Objectives

Demonstrate Competences

Able to -----

Can do / does -----

'Learning outcome'

'Performance descriptors'

skills

indicators

CURRICULUM CHANGES:

National aspirations and needs, cultural change, social change caused by technological development, economic changes, political variations and changes in values, the value system in vogue, philosophical, sociological and psychological approaches tend to make changes in the curriculum. The National Framework for School Curriculum 2000 has now been revised as the National Framework for School Curriculum 2005. This is an example of curriculum change due to one or more of the above contexts affecting the same.

CONCLUSION:

As an MOU between the participants in the curriculum process, any curriculum is subjected to a variety of pressures, forces and changes. The vital factor involved is the societal need arising then and there in any modern set-up. Speed on the one hand and economy on the other hand provide the essential impetus to the periodical development of different curricula of different stages of education. From a one-month programme to even a five-year programme several curricula need to be developed to supply the specifically needed manpower meeting the demands of a nation.

References

Taba, Hilda (1988) Curriculum Development
Tyler, Robert (1986) Curriculum Development Process
(not available) (1990) The Course Design

PROPOSED MODEL CURRICULUM

B.Sc. Zoology

(Branch Vi)

or/and

B.Sc. Advanced Zoology and Biotechnology

(Branch Vi a)

List of Participants

Dr.(Mrs.) K. Anbu,
S.G.Lecturer in Zoology,
Kunthavai Nachiyar Government Arts College
(Women),
Thanjavur 613 007.

Dr. Alice Marcus,
HOD of Zoology,
Holy Cross College,
Post Box No.318, Teppakulam,
Tiruchirappalli – 620 002.

Prof. T. Ambrose,
Head, P.G. and Research Dept. of Advanced
Zoology and Biotechnology,
Loyola College,
Nungambakkam,
Chennai – 600 034.

Dr. G. Anbuganapathi,
Principal,
Kandaswami Kandars College,
Velur - 638 182.
Namakkal District.

Dr. N. Anbusaravanan,
Reader in Zoology,
Periyar EVR College,
Tiruchirappalli- 620 023.

Dr.(Mrs.) S. Angelina Glorita Parimala,
Lecturer (SS) in Zoology,
A.D.M. College for Women,
No.1, College Road, Vellipalayam,
Nagapattinam 611 001.

Dr. P. Badri Sriman Narayanan,
Reader and Head,
Department of Zoology,
Nallamuthu Gounder Mahalingam College,
Pollachi – 642 001.

Dr. S. Baskaran,
Reader in Zoology,
Ayya Nadar Janaki Ammal College,
Sivakasi – 626 124.

Dr. R. Bakthavathasalam,
Reader & HOD of Zoology,
Government Arts College,
Kumbakonam – 612 001.

Thiru. T. Chidambaram,
HOD of Zoology,
Nadar Mahajana Sangam,
S.Vellaichamy Nadar College,
Nagamalai, Madurai 625 019.

Dr. Mrs. S. Ezhilarasi Balasubramanian,
Reader, Dept. of Zoology,
Ethiraj College for Women,
No. 70, Ethiraj Salai, Egmore,
Chennai – 600 008.

Mrs. S. Felicia,
Lecturer in Zoology,
PSGR Krishnammal College for Women,
Peelamedu,
Coimbatore – 641 028.

Thiru. B.M. Gulam Mohideen
Lecturer (SG) in Zoology,
Jamal Mohamed College,
No.7, Race Course Road,
Khaja Nagar,
Tiruchirappalli 620 020.

Dr. P. Kalavathi,
HOD of Zoology,
Queen Mary's College,
Mylapore,
Chennai 600 004.

Mrs. S. Mallika,
S.G.Lecturer in Zoology,
PG Dept. of Zoology,
Arulmigu Palani Andavar Arts
College for Women,
Chinnakalayamputhur,
Palani 624 615.

Dr. Mary Jeyanthi Arulsingh,
Reader, Dept. of Advanced Zoology
& Biotechnology,
The Women's Christian College,
College Road, Nungambakkam
Chennai – 600 006.

Mrs. G. Manimekalai,
HOD of Zoology,
Kandaswami Kandars College,
Velur - 638 182.
Namakkal District.

Dr.(Mrs.) D. Maria Anthoniammal,
HOD of Zoology,
Fatima College,
Mary Land,
Madurai – 625 018.

Mrs. Neeratha,
HOD of Zoology,
Vellalar College for Women,
Erode 638 009.

Prof. R. Ramalingam,
Department of Zoology,
Annamalai University,
Annamalai Nagar -608 002.

Dr. G. Ramaswamy,
Reader in Zoology,
A.V.C. College,
Mannampandal,
Mayiladuthurai – 609 305.

Dr. M. Ramaswamy,
Reader in Zoology,
Government Arts College,
Arts College Road, Coimbatore 641 018.

Dr. L.S. Ranganathan,
Dean, Faculty of Science,
Annamalai University,
Annamalai Nagar -608 002.

Mrs. Rani Renganathan,
SG Lecturer in Zoology,
Sri Meenakshi Government College for
Women,
Madurai – 625 002.

Prof. M. Sankaran,
HOD of Zoology,
Rajah Serfoji Government College,
Thanjavur 613 005.

Mrs. T.S. Santhakumari,
HOD of Zoology,
Seethalakshmi Ramaswami College,
Post Box No.349,
Tiruchirapalli – 620 002.

Mrs. Sarah Sathiavathi,
Lecturer (S.S.) in Zoology,
Lady Doak College,
Madurai – 625 002.

Dr. Tmt. C. Sethukarai,
HOD of Advanced Zoology & Bio Technology,
Meenakshi College for Women,
Arcot Road, Kodambakkam,
Chennai – 600 024.

Dr. T.A. Sethuramalingam,
Reader in Zoology,
St. Xaviers College,
Palayamkottai – 627 002.

Mrs. J.P. Shanthakumari,
HOD of Zoology,
Bishop Heber College,
Post Box No.615,
Tiruchirappalli 620 017.

Dr. R. Sugumaran,
Reader & Head, Dept. of Zoology,
Vivekananda College,
Tiruvedagam (West)
Near Sholavandan Railway Station,
625 217

Dr. S.K. Sunder Raj,
Professor & Head, Department of Zoology,
Madras Christian College,
Tambaram,
Chennai – 600 059.

Mrs. V. Usharani,
S.G. Lecturer in Zoology,
Quaid-E-Milleth College for Women,
Anna Salai,
Chennai – 600 002.

Dr. P. Vivek Raja,
Reader & Head, Dept. of Zoology,
Presidency College,
Triplicane,
Chennai- 600 005.

Introduction

India, a subcontinent of megadiversity has a rich heritage of fauna and flora and it is the responsibility of biologists, to understand the biodiversity of all living organisms available in our country and to identify all of them, study their behaviour, life cycle, products that could be obtained from them, their interaction on other organisms and to protect the organisms, which are on the verge of extinction. B.Sc. Zoology graduate course in various universities and affiliated colleges in India was offering the basics of diversity of animals under the heading Invertebrata and Chordata as a major portion with basics of Physiology, Ecology, Genetics, Evolution, Developmental Biology and Cell Biology till early 60's.

In late 70's due to advancement in scientific knowledge and discovery of new techniques in biology, rapid development has occurred in special papers in Zoology such as Molecular Biology, Genetics, Immunology etc. From late 90's, with advances in Biomolecular biology, teaching of classical Zoology with an emphasis on morphological characters and breeding behaviour have changed the teaching with emphasis on biomolecular taxonomy and measures of conserving and improving the species by modern biotechnological tools. Biology is a living science, in which changing knowledge continually generates fresh perspectives and fresh opportunities for productive impacts on our society. The main aim of the revision of the existing syllabi for B.Sc. Zoology and Advanced Zoology and Biotechnology course is to include all latest developments in Zoology with a view to make the students to use modern tools and techniques to understand the subject in depth so as to qualify himself/herself to teaching, research or technical post.

Modern biology is rooted in an understanding of molecules within cells and of the interactions between cells that allow construction of multi cellular organisms. The more we learn about the structure, function and development of different organisms, the more we recognize that all life processes exhibit remarkable similarities. Molecular cell biology concentrates on the macromolecules and reactions studied by biochemists, the processes described by cell biologists and the gene control pathways identified by molecular biologists and geneticists. The fascinating discovery of the structure of DNA laid the foundation of modern Bioscience including Biotechnology that is transforming our lives in one or many ways.

Biotechnology based industries such as health care and pharmaceutical, crop and live stock breeding and use of microorganisms and plants to produce, valuable new materials to provide tremendous benefits to mankind. Biotechnology is developing at a phenomenal pace and will increasingly become a necessary part of modern life. Modern biotechnology involves improved methods for production of antibiotics, vaccines, monoclonal antibodies, new molecular innovations due to genetic engineering, raising transgenic plants and animals, gene therapy in humans to eradicate diseases and biological fuel production.

In view of these modern changes in the subject, it is imperative to include the term 'Biotechnology' as a suffix to the subject 'Conventional Zoology' and to name the title of the course as 'Advanced Zoology and Biotechnology' as approved by the Tamilnadu Government G.O. Ms.No.308, Higher Education Department, Govt. of Tamilnadu Dt. 7.6.2004 under branch VI-A in universities/colleges affiliated to universities in Tamilnadu.

Under this circumstance, it is essential to impart both knowledge and practical skill from all modern branches of Zoology. The present revision of syllabus on Zoology addresses these issues.

Objectives/Scope

Gives required basic knowledge with sound theoretical information with basic skill in techniques and applications of biological system and products. It facilitates the undergraduate zoology students to branch out to various postgraduate programmes which leads to research in vertical mobility. At the same time it gives opportunity to the students to choose their career as teachers or to get a job in modern biology related company or factories. It also provides opportunity to undergraduate students to become an entrepreneur in biotechnology or bioinformatics related fields. Special papers in core subjects and optional papers are introduced to provide opportunity to students to acquire theoretical and practical knowledge in the modern techniques. It makes the graduate a self-dependent person to face the grim realities of life and gives positive correlation to his knowledge and society requirement.

Aims and Goals

1. To acquire adequate knowledge in core and optional subjects of Zoology.
2. To facilitate the student to branch out to various postgraduate programmes encouraging vertical mobility.
3. To provide self-employment opportunities.
4. To cater the dynamic needs of the students considering their expanding job opportunities.
5. To design the course to meet the challenges posed by the national level tests for various administrative and technical posts.
6. To get practical and field experiences in all biology related fields to facilitate the students to get the job or to become an entrepreneur as soon as they complete the course.

Allied subjects

B.Sc. Zoology undergraduate students are encouraged to study two allied papers such as Botany and Chemistry or any other related subjects required for biologists.

The department of Zoology conducts Zoology Allied subjects with two theory papers and one practical paper for other undergraduate courses like B.Sc. Botany, Chemistry, Biochemistry, Microbiology etc.

Course of Studies

Core Subjects

13 papers and four practicals (Practical I to IV).

Optional Subjects

Choose any two papers from 12 papers and one practical (Practical V).

Allied Subjects

Two papers and one practicals.

For each of the above area separate syllabi have been prepared and presented.

Core Subjects (Syllabi)

Optional Subjects (Syllabi)

Allied Subjects (Syllabi)

Model question paper for theory and practical.

Model question paper for Theory

Model question paper for Practicals

Internal Valuation: 25 Marks

External Valuation: 75 Marks

Scheme for the entire course (3 years) is given semester wise with number of papers and contact hours for major subjects, Allied subjects and language classes

I Semester -

II Semester -

III Semester -

IV Semester -

V Semester -

VI Semester -

B.Sc., ZOOLOGY
CORE PAPERS

No.	Title of the Paper	Hours per Week	Total Hours	Credits
1	Invertebrata-I	5	75	3
2	Invertebrata – 2	5	75	3
3	Chordata	5	75	3
4	Cell and Molecular Biology	5	75	3
5	Evolution	5	75	3
6	Genetics	5	75	3
7	Biochemistry and Tools in Biology	5	75	3
8	Developmental Biology	5	75	3
9	Animal Physiology	5	75	3
10	Biophysics, Biostatistics, Bioinformatics and Computer Application	6	90	4
11	Environmental Biology and Animal Behaviour	5	75	3
12	Microbiology and Immunology	5	75	3
13	Biotechnology	6	90	4

Total Papers = 13

Total Credits = 41

B.Sc., ZOOLOGY

PRACTICALS

No.	Title of the Practical	Hours per Week	Total Hours	Credits
1	Practical – I. Invertebrata and Chordata	2	60	3
2	Practical – II. Cell Biology, Genetics, Biochemistry, Evolution and Instrumentation	2	60	3
3	Practical – III. Physiology, Developmental Biology, Biophysics, Biostatistics and Computer Applications	3	90	4
4	Practical – IV. Biotechnology, Environmental Biology, Microbiology and Immunology	3	90	4
5	Practical –V. Practical for Two Optional Papers (select them from the list)	3	90	4

Total Practical Papers in Core and Optional subjects = 5

Total credits = 18

B.Sc., ZOOLOGY

ALLIED PAPERS

No.	Title of the Paper	Hours per Week	Total Hours	Credits
1	Paper – 1 Animal diversity and organisation	4	60	3
2	Paper – 2 General Principles of Zoology	4	60	3
3	Zoology Allied Practicals.*	2	60	3

Theory paper = 2, Practical = 1

Total credits = 9

* Theory paper is conducted in one semester. Practical is conducted in two semesters.

B.Sc., ZOOLOGY

OPTIONAL PAERS (CHOOSE ANY TWO PAPERS)

No.	Title of the Paper	Hours per Week	Total Hours	Credits
1	Aquaculture	5	75	3
2	Vermiculture	5	75	3
3	Human Genetics & Genetic Councelling	5	75	3
4	Sericulture	5	75	3
5	Apiculture	5	75	3
6	Clinical Laboratory Technology	5	75	3
7	Wild life Diversity & Conservation	5	75	3
8	Dairy Farming	5	75	3
9	Poultry Science & Management	5	75	3
10	Public Health and Hygiene	5	75	3
11	Bioinformatics	5	75	3
12	Fishery Biology	5	75	3

Total Papers = 2

Total Credits = 6

Question Paper Pattern
Common to all Theory Papers in Zoology
Core, Allied and Optional Papers

Duration 3 hours

Max Marks: 75

N.B.: Draw diagrams and formula wherever necessary

Section A

20 X 1 = 20

Answer all questions

Q.1 to Q.20

Multiple choice	-	5
True or False	-	5
Fill in Blanks	-	5
Match the following	-	5

Section – B

5X5=25

Answer all questions
Answer should be about 400 words

Q.No.21 to 25

Either or pattern – One question from each unit

Section – C

Answer any three questions not exceeding four pages or 100 words

Answer should be about 1200 words

Q.No.26 to 30

(Open choice pattern)
5 questions – one from each unit

Internal Assessment: 25 Marks

1.	First Continuous Assessment Test	-	5	
2.	Second Continuous Assessment Test	-	5	
3.	Model Exam	-	10	
4.	Assignment	-	5	

	Total	-	25	Marks

Question Paper Pattern: Practicals
Common to all Practicals in Zoology

Lab Experiments - Core, Allied and Optional Practicals

Duration 3 hours

Max Marks: 75

Q.1	Major dissection / Major Experiment	-	25	Marks
Q.2	Minor dissection a mounting / Minor Experiment	-	10	Marks
Q.3	Spotters. A, B, C, D, E, Identification and notes/ Importance / Application etc.	5X4	-	20 Marks
Q.4	Submission of Field Report	-	10	Marks
Q.5	Record	-	10	Marks
		Total	<u>75</u>	Marks

Internal Assessment = 25 Marks

Test	=	10	
Lab work, Assignment and Regularity	=	15	

		25	Marks

B.Sc., ZOOLOGY

Overall distribution of papers and credits

Core Papers	13 Nos.	41 Credits
Optional Papers	2 Nos.	6 Credits
Practical (4 core & 1 optional)	5 Nos.	18 Credits
Environmental Studies (Common Paper)	1 No.	4 Credits
Allied – I (2-Theory and 1-Practical) (First year)	3 Nos.	9 Credits
Allied – II (2-Theory and 1-Practical) (Second year)	3 Nos.	9 Credits
Language	4 Nos.	12 Credits
English	4 Nos.	12 Credits
Grand Total	35 Nos.	111 Credits

Distribution of hours in each semester and year

I Year (Semester I)

No.	Paper	Hours per week	Credits
1	Core paper – 1	5	3
2	Core paper – 2	5	3
3	Allied – I Paper 1	4	3
4	Language – Paper 1	6	3
5	English – Paper 1	6	3
6	Practical – I	2	-
7	Allied – I Practical	2	-
	Total hours per week =	30	15

I Year (Semester II)

No.	Paper	Hours per week	Credits
1	Core paper – 3	5	3
2	Environmental Studies (Common Paper)	5	4
3	Allied – I Paper 2	4	3
4	Language – Paper 2	6	3
5	English – Paper 2	6	3
6	Practical – I	2	3
7	Allied – I Practical	2	3
	Total hours per week =	30	22

II Year (Semester III)

No.	Paper	Hours per week	Credits
1	Core paper – 4	5	3
2	Core paper – 5	5	3
3	Allied – II Paper 1	4	3
4	Language – Paper 3	6	3
5	English – Paper 3	6	3
6	Practical – II	2	-
7	Allied – II Practical	2	-
	Total hours per week =	30	15

II Year (Semester IV)

No.	Paper	Hours per week	Credits
1	Core paper – 6	5	3
2	Core paper – 7	5	3
3	Allied – II Paper 2	4	3
4	Language – Paper 4	6	3
5	English – Paper 4	6	3
6	Practical – II	2	3
7	Allied – II Practical	2	3
	Total hours per week =	30	21

III Year (Semester V)

No.	Paper	Hours per week	Credits
1	Core paper – 8	5	3
2	Core paper – 9	5	3
3	Core paper – 10	6	4
4	Optional paper – I	5	3
5	Practical – III	3	-
6	Practical – IV	3	-
7	Practical for Optional – Practical V	2	-
	Total hours per week =	30	13

III Year (Semester VI)

No.	Paper	Hours per week	Credits
1	Core paper – 11	5	3
2	Core paper – 12	6	4
3	Core paper – 13	6	4
4	Optional paper – II	5	3
5	Practical – III	3	4
6	Practical – IV	3	4
7	Practical for Optional – Practical V	3	4
	Total hours per week =	30	26

CORE PAPERS

1. Dr. P. Vivek Raja, Coordinator
Reader & Head, Dept. of Zoology,
Presidency College,
Triplicane,
Chennai- 600 005.
2. Dr.(Mrs.) K. Anbu,
S.G.Lecturer in Zoology,
Kunthavai Nachiyar Government Arts College (Women),
Thanjavur 613 007.
3. Prof. T. Ambrose,
Head, P.G. and Research Dept. of
Advanced Zoology and Biotechnology,
Loyola College,
Nungambakkam,
Chennai – 600 034.
4. Dr.(Mrs.) S. Angelina Glorita Parimala,
Lecturer (SS) in Zoology,
A.D.M. College for Women,
No.1, College Road,Vellipalayam,
Nagapattinam 611 001.
5. Dr. G. Anbuganapathi,
Principal,
Kandaswami Kandars College,
Velur - 638 182.
Namakkal District.
6. Dr. S. Baskaran,
Reader in Zoology,
Ayya Nadar Janaki Ammal College,
Sivakasi – 626 124.
7. Dr. Mrs. S. Ezhilarasi Balasubramanian,
Reader, Dept. of Zoology,
Ethiraj College for Women,
No. 70, Ethiraj Salai,Egmore,
Chennai – 600 008.
8. Mrs. S. Felicia,
Lecturer in Zoology,
PSGR Krishnammal College for Women,
Peelamedu,
Coimbatore – 641 028.
9. Thiru. B.M. Gulam Mohideen
Lecturer (SG) in Zoology,
Jamal Mohamed College,
No.7, Race Course Road,Khaja Nagar,
Tiruchirappalli 620 020.

10. Dr. P. Kalavathi,
HOD of Zoology,
Queen Mary's College,
Mylapore,
Chennai 600 004.
11. Mrs. G. Manimekalai,
HOD of Zoology,
Kandaswami Kandars College,
Velur - 638 182.
Namakkal District.
12. Dr. Mary Jeyanthi Arulsingh,
Reader, Dept. of Advanced Zoology
& Biotechnology,
The Women's Christian College,
College Road
Nungambakkam
Chennai - 600 006.
13. Mrs. Neeratha,
HOD of Zoology,
Vellalar College for Women,
Erode 638 009.
14. Mrs. T.S. Santhakumari,
HOD of Zoology,
Seethalakshmi Ramaswami College,
Post Box No.349,
Tiruchirapalli - 620 002.
15. Mrs. Sarah Sathiavathi,
Lecturer (S.S.) in Zoology,
Lady Doak College,
Madurai - 625 002.
16. Dr.Tmt. C. Sethukarai,
HOD of Advanced Zoology & Bio Technology,
Meenakshi College for Women,
Arcot Road, Kodambakkam,
Chennai - 600 024.
17. Dr. T.A. Sethuramalingam,
Reader in Zoology,
St.Xaviers College,
Palayamkottai - 627 002.
18. Dr. S.K. Sunder Raj,
Professor & Head,Department of Zoology,
Madras Christian College,
Tambaram,
Chennai - 600 059.
19. Mrs. V. Usharani,
S.G. Lecturer in Zoology,
Quaid-E-Milleth College for Women,
Anna Salai, Chennai - 600 002.

INVERTEBRATA – I & II

Objectives

1. To understand biodiversity, adaptation, organization and taxonomic status of invertebrates.
2. Explaining the basic aspects of classification, structural and functional details of the invertebrates.

1. INVERTEBRATA – I

Phylum Protozoa to Annelida

Type Study/

Detailed Study: Systematic position, Habit and Habitat, Structure of Body wall, body cavity, locomotion, digestive system, excretory system, nervous system, sense organs, reproductive system, life history, pathogenicity and parasitic adaptation etc.

Unit – I Binomial nomenclature – rules of nomenclature, outline classification of invertebrates **Protozoa:** Classification upto orders and their characters with suitable Indian examples, Detailed study of Paramecium. **Parasitic Protozoans:** Entamoeba, Plasmodium Monocystis & Trypanosoma **General Topics:** Locomotion and Nutrition in Protozoa, Protozoan diseases and their control.

- 15 hrs

Unit – II **Porifera:** Classification upto orders and their characters with suitable Indian examples, Detailed study of Leucosolenia. **General Topics:** Histology of sponges, Canal system and Reproduction in sponges, Affinities.

- 15 hrs

Unit – III **Coelenterata:** Classification upto orders and their characters with suitable Indian examples, Detailed study of Obelia, Aurelia and Sea anemone **General Topics:** Coral and Coral reefs Polymorphism in hydrozoa. Mesenteries in Anthozoa. **Ctenophora:** Characteristic features and classification – Pleurobranchia.

- 15 hrs

Unit – IV Helminthes: Classification upto orders and their characteristics with suitable Indian examples, Detailed study of Fasciola and Taenia solium. **General Topics:** Parasitic adaptations in Platyhelminthes. Detailed study of Ascaris. **General Topics:** Brief account on Nematode parasites. Host parasitic relationship

- 15 hrs

Unit – V Annelida: Classification upto orders and their characteristics with suitable Indian examples, Detailed study of Megasclox, Nereis and Leech. **General Topics:** Modes of life in Polychaetes Nephridia and Coelomoducts in Annelida, Modes of life in polychaeta, Reproduction in Annelids.

- 15 hrs

Books for Study

1. Barnes, R.D. 1982, Invertebrate Zoology IV Edn. Holt Saunders International Edn.
2. Barrington, E.J.W, 1979 Invertebrates Structure and function 2nd Edn. ELBS and Nelson.
3. Kotpal, R.L, S.K.agarwal, R.P.R.Khetarpal 1989 Modern text book of Zoology, Rastogi Publication.
4. Prasad S.N. 1976. Text Book of Invertebrate Zoology Kitab Mahal, Allahabad.
5. Rajesh Karyakarle & Ajit Damle, 2005. Medical Parasitology Books and Allied (P) Ltd. Kolkata.

3. CHORDATA

75 hours
No. of Hours: 5 hr/week

Objective To discuss diversity, adaptations & Organisation and taxonomic status of Chordates

Unit – I PROCHORDATA, AGNATHA & PISCES (15 hrs)

- Characteristics and classification of Prochordata, Agnatha and Pisces up to order level.
- Prochordata: Amphioxus and Balanoglossus – Organisation & Affinities, Ascidia Retrogressive metamorphosis
- Agnatha : Structure & Affinities of Cyclostomata
- Pisces : Scoliodon and Mugil and Dipnoi Organisation
 - Economic importance
 - Accessory Respiratory organs
 - Air bladder
 - Migration, Parental Care, Electric Organs.

Unit – II AMPHIBIA (15 hrs)

- Characteristics and Classification of Amphibia up to order level.
- Frog: Organization
- Parental care in Amphibia
- Gymnophiana: Structure and Biological significance
- Origin of Amphibia
- South Indian Amphibians

Unit – III REPTILIA (15 hrs)

- Characteristics and Classification of Reptilia up to order level.
- Calotes: Organization
- Sphenodon: Structure and Affinities
- Skulls in Reptiles (Arcades & Fossae)
- Identification of Poisonous snakes
- Snakes of South India
- Poison apparatus, biting mechanism and venom

Unit – IV AVES & MAMMALIA (18 hrs)

- Characteristics & Classification of Aves and Mammalia up to order level
- Columba livia: Organization
- Flight adaptations in birds
- Flightless birds and their distribution
- Origin and evolution of birds
- Migration in birds
- Oryctolagus: Organisation
- Prototheria and Methatheria: Structure and Affinities
- Dentition in Mammals
- Aquatic and flying Mammals

Unit – V GENERAL & COMPARATIVE STUDIES (12 hrs)

- Origin of Chordates
- Fate of aortic arches
- Impact of terrestriation
- Origin of tetrapod limbs
- Jaw suspension in vertebrates
- Primates and taxonomic position of man

Books for Study

1. Ekambaranatha Ayyar and T.N.Ananthakrishnan, 1995. "A Manual of Zoology". Vol 2 (Part 1 & 2), S. Viswanathan, Chennai
2. Jordan E.L and P.S. Verma, 2000 "Chordate Zoology" S. Chand, New Delhi.
3. Newman. H.H, 1939, "The Phylum Chordata", Mc Millan, New York.

Books for Reference

1. De Beer G, 1966, "Vertebrate Zoology", Sedgwick & Jackson, London.
2. Young J.Z, 1950, "The Life of Vertebrates", Oxford University Press, London.

Methods & Media

1. Charts
2. Prepared Slides
3. Preparation & Staining of Slides
4. Power point presentations
5. CDs
6. Reference books, e-journals
7. Different channels of TV – Animal planet, Discovery, National Geographic.
8. Magazines & Newspapers

4. CELL AND MOLECULAR BIOLOGY

75 Hrs

Objectives Illustrating, elucidating and describing the basic structure and functions of cell as a basic fundamental unit of an organism – Exploring the molecular architecture of biomolecules and their complex interactions.

Unit – I **Microscopy:** Principles of light and electron microscope. Cell as the basic unit of living organism – Cell theory – Isolation of cellular components – Homogenisation – fractionation – Centrifugation – Fundamentals of fixation – Staining methods.

(15 hrs)

Unit – II **Plasma Membrane:** Ultrastructure – Chemical composition and functions, **Endoplasmic reticulum:** Morphology, structure types and functions. **Golgi complex:** Morphology, Structure, Composition, Functions **Lysosome:** Structure, forms, functions and origin.

(15 hrs)

Unit – III **Mitochondria:** Structure, Chemical composition – Functions – Kreb's cycle – Oxidative phosphorylation **Ribosomes:** Structure – Chemical composition – Functions and Origin.

(15 hrs)

Unit – IV **Nucleus & Nucleolus:** Structure and functions **Chromosome:** Structure Giant chromosomes **Cell Cycle:** Cell division – Mitosis & Meiosis Cancer Cells – Cell aging.

(15 hrs)

Unit – V **Nucleic Acids:** Molecular structure of DNA & RNA – Types of RNA-DNA replication, Role of RNA and ribosomes in protein synthesis, Regulation of protein synthesis.

(15 hrs)

Books for Study

1. De Robertis E.D.P. & De Robertis E.M.F. (1988) Cell and Molecular Biology.
2. Verma P.S. & Agarwal V.K. (1991) Cytology. S.Chand & Co, New Delhi
3. Swanson C.P.(1990). The Cell – 8th Edn. Prentice Hall of India Pvt. Ltd. New Delhi.
4. Hans S.S. (1986) Cell Biology – Allen & Unwin.

5. EVOLUTION

75 Hrs

- Linkage** This paper links subjects like Invertebrate, Chordata and Genetics.
- Objectives** To enable the students: To know the origin of life, diversity of animal life in earth and the mechanism of their evolution.
- Unit – I** Origin of Life: Oparin-Haldane Theory, Evidences for Evolution from comparative Anatomy, Biochemistry and Serology. Lamarckism and Neo-Lamarckism.
Darwinism: Artificial, Natural and Sexual Selection, Neo-Darwinism – Concept – Stabilizing, Directional and Diversifying Selection – Experimental evidences, Hardy-Weinberg's Law – Behaviour of genes in natural population.
- 15 hrs
- Unit – II** Micro evolution: Mechanism – Transient Polymorphism – Industrial Mechanism, Balanced Polymorphism – Sickle Cell Anaemia. Modern synthetic theory of evolution.
- 15 hrs
- Unit – III** The Geological Records –Geological time – Survey of Geological periods – Fossils: Lead and Carbon Method, Living fossils – Definition and examples, Mimicry and coloration.
- Unit – IV** Genetic Drift – Evolutionary Significance, Species Concept – Sub Species and Sibling Species, Allopatric and Sympatric Speciation, Isolating Mechanism – Types and Examples, Macro evolution – Mechanism – Punctuate equilibrium model.
- 15 hrs
- Unit – V** Adaptive Radiation in Mammals, Evolution of Man and Horse – Fossil Record, Distribution of Animals – Barriers – Continental Drift Hypothesis, Extinction – Types and Causes.
- 15 hrs

Books for Study

1. Verma, P.S. and Agarwal, V.K., 2002, Concept of Evolution, S.Chand and Company Limited, New Delhi.
2. Arumugam, N., 2002, Organic Evolution, Saras Publication, Nagercoil.

Books for Reference

1. Minkoff E.C. 1983, Evolutionary biology, Addison Wesley Publishers.
2. Arora, M.P., 2000, Animal Behaviour, Himalaya Publishing House, Mumbai.
3. Dobzhansky, T., Ayala, F.J., Stebbins, G.L. and Valentine, J.W., 1977, Evolution, W.H.Freeman and Co., San Francisco.
4. Stansfield, W.D., 1977, The Science of Evolution, Collier Macmillan, London.
5. Colbert. E.H. 1970, Evolution of the Vertebrates, Wiley Eastern Edn.

Materials

1. Fossils – Different type
2. Specimens of living fossils
3. Charts showing comparative anatomy of vertebrates and invertebrates
4. Charts showing geological time scale
5. Book plates on origin of life, Theories of Evolution, Industrial Mechanism, Evolution of Man and Horse and Polymorphism.

Methods and Media

1. CD's on Fossils, Radiometric dating of fossils, Continental Drift Hypothesis, Mimicry, Colorations
2. Online teaching of theories of evolution.
3. Viewing topics related to Evolution in TV channels like National Geographic Channels, Discovery Channel, Animal Planet etc.
4. Visiting Ariyalur for observation of fossils.
5. Observing World Map with reference to distribution of animals, Continental drift etc.

Testing

1. Identification of biogeographical zones
2. Observation of animals with reference to adaptive coloration and Mimicry
3. Understanding adaptive radiation in nature by field visit
4. Differentiating different types of fossils.
5. Observing evidences for evolution in nature.

6. GENETICS

Total: 75 Hrs

Objectives Defining and Explaining the basic principles of heredity and the mechanism of inheritance.

Explaining the practical application of Genetics

Describing the various genetic disorders in Man and Animals.

Unit – I Mendalism – Mendel's experiments and Laws of Mendal-Back or Test cross, Phenotype and Genotype, Dihybrid cross, Tri and Poly hybrid crosses, Incomplete dominance, Interaction of Genes – Complementary factors, supplementary factors, inhibitory and lethal factors, Multiple Alleles, in Drosophaila, coat colour in Rabbit and Blood group inheritance in man.

- 15 hrs

Unit – II Linkage in Drosophila – Morgan's experiments, theories of linkage, factors affecting linkage, Crossing over, Types, mechanisms, Cytological evidence for crossing over, Significance of Crossing over, factors affecting crossing over. Mapping of Chromosomes, interference and coincidence, Sex-limited and Sex-influenced inheritance in Drosophila and Man, Sex determination and cytoplasmic inheritance.

- 15 hrs

Unit – III Fine structure of the gene – Cistron, recon, muton – operon concept, genetic code, Mutation-Molecular basis of mutation – Gene mutation, chromosomal obberations, mutagens

- 15 hrs

Unit – IV Animal breeding, inbreeding, Out breeding – heterosis in Hybrid Vigour, Eugenics, Euphenics and Euthenics, Inborn errors of metabolism and inherited disorders in Man.

- 15 hrs

Unit – V Hardy – Weinberg's principle, gene frequency, genotype frequency and factors affecting gene frequency, DNA as genetic material – Bacterial recombination, conjugation, Transformation, Transduction and Sexduction

- 15 hrs

Books for Study

1. Verma P.S. and Agarwal V.K. (2004) – Genetics, S.Chand & co. New Delhi.
2. Dalela R.C., and Verma S.R. 1970, A text book of Genetics, Jaiprakash Nath and Company, Meerut.

Books for Reference

1. Sinnot E.W, L.C.Dunn and T.Dobzhansky, Principles of Genetics (1973) 4th Edn., Tata Mc Graw Hill Pub. Co. Ltd,
2. Winchester A.M. Genetics (1967) 3rd Edn. Oxford and IBH Publications
3. Rothwell, N.V. 1979, Human Genetics Prentice Hall of India, New Delhi.
4. Weaver, R.F. and Hedrick, P.W. 1997, Genetics, W.H.C. Brown Publishers – London
5. Gupta P.K., 2000, Genetics, Rastogi Publications, Meerut.
6. Brown, T.A. 1998, Genetics – A molecular approach, Champion Hall, London.

Methods and Media

1. Charts
2. Prepared Slides
3. Preparation and Staining slides
4. Power point presentations
5. Reference books and Journals
6. Different Channels of T.V. Animal Planet, Discovery, National Geography.
7. Magazines and News Papers
8. CDs

7. BIOCHEMISTRY AND TOOLS IN BIOLOGY

Total: 75 Hrs

Objective Defining and explaining the basic principles of biochemistry and the instruments useful for biological studies.

Unit – I Classification, structure and functions of carbohydrates, proteins and Lipids. Vitamins - Water soluble and fat soluble vitamins occurrence, functions and deficiency diseases. Enzymes - Classification, Properties, Chemical nature and mechanism of enzyme action - Factors affecting enzyme action - Enzyme kinetics - Enzyme inhibition.

(15 Hrs)

Unit – II Metabolic pathways of Carbohydrates – Glycogenesis, Glycogenolysis, Glycolysis, Kreb's cycle, and gluconeogenesis, protein metabolism – Deamination, Transamination. Lipid metabolism – Oxidation of fatty acids.

(15 Hrs)

Unit – III Microscopy – Principle - Working Mechanism – Uses of light, Phase contrast, fluorescent and electron microscope (TEM, SEM), Photomicrography, Micrometry, and Microdrawing.

(15 Hrs)

Unit – IV Radioactivity – Isotopes, Autoradiography. Histological techniques – Fixation and Preservation, Blockmaking, embedding, Sectioning, Staining and Mounting. Histochemical and histo pathological techniques.

(15 Hrs)

Unit – V Separation techniques – Chromatography (Paper, TLC), PAGE, Centrifugation, Analytical techniques – Balance, PH meter, Electrophoresis, Colorimeter, Spectrophotometer, Biochemical analysis of carbohydrates, proteins lipids and enzymes.

(15 Hrs)

Books for Study

1. N.Gurmani - Research Methodology for Biological Sciences (2006), MJP Publishers, Chennai.
2. L.Veerakumari - Biochemistry (2004) MJP Publishers, Chennai
3. M.A.Subramanian - Biophysics (2005) MJP Publishers, Chennai.

Books for Reference

1. J.Jayaraman - Lab manuals in Biochemistry, New age International (p) Ltd., Mumbai.
2. Plummer - An Introduction to practical biochemistry, Tata McGraw Hill, Bombay.
3. Instrumental methods of Chemical analysis B.K. God Publishing House, Meerut.
4. Slater - Radiomoliques in Biology, IRL Press Oxford.
5. David - Handbook of Histological and Histochemical techniques -CBS Publishers.
6. Barron Chapman and Hall London - Using the Microscopes.
7. W.H. Freeman & Co, - Lodish et al (1999) Molecular cell Biology, New York.

8. DEVELOPMENTAL BIOLOGY

Total: 75 Hrs

- Objectives**
1. Knowing the aims and scope of developmental biology.
 2. Understanding the basic concepts in embryology
 3. Analyzing the mechanism of Organogenesis.
 4. Getting an exposure to the experimental aspects of embryology.
- Unit – I** Theories: Preformation, Epigenetic, Recapitulation and Germplasm – Gametogenesis: Spermatogenesis, Types of Sperm: Oogenesis – Types of eggs and egg membranes – Structure of Spermatozoan and ovum in mammals.
- 15 hrs
- Unit – II** Fertilization: Acrosomal reaction, Cortical reaction, Physiological and Biochemical changes, significance – Parthenogenesis – Types of cleavage patterns, Planes factors controlling and laws in cleavage – Fate maps in Frog and Chick.
- 15 hrs
- Unit – III** Blastulation and Gastrulation in Amphioscus, Frog and Chick and Mammal – Organogenesis: Development of eye and brain in Frog – Chick embryo 24 hrs, 48 hrs, 72 hrs – Foetal membranes in Chick – Types of Placenta – Functions of Placenta.
- 15 hrs
- Unit – IV** Human reproduction; Puberty, Menstrual cycle – Menopause, pregnancy and related problems – Parturition – lactation – Amphibian metamorphosis: Anatomical and Biochemical changes – Regeneration: Definition, Types.
- 15 hrs
- Unit – V** Double gradient theory – Cell lineage – Experiments in Sea urchin and Polychaetes – Organizer: Concept, Mechanism of Induction, types – Nuclear transplantation – Teratogenesis – Test tube baby merits and demerits – Infertility causes – Cloning – Stem Cell Research.
- 15 hrs

Books for Study

1. Verma, S. and Agarwal, V.K., 2000, Chordate Embryology, S.Chand & Co., New Delhi

Books for Reference

1. Balinsky, B.I., 1981, An Introduction to Embryology, Holt Saunders, New York.
2. Berrill, N.J., 1986, Developmental Biology, McGraw Hill, New Delhi.
3. Patten, B.M., 1958, Foundations of Embryology, McGraw Hill, New York.
4. Saunders, J.W., 1982 Developmental Biology – Patterns and Principles, Macmillan, New York.

9. ANIMAL PHYSIOLOGY

Total: 75 Hrs

Objectives Explaining various aspects of physiological activities of animals with special reference to humans. Describing osmotic and osmotic regulation, thermo regulation and biological rhythm of different animal groups. Illustrating different kinds of food, their structure, function and metabolism.

Unit – I Nutrition – Nutrients – Digestion and absorption of carbohydrates, proteins and lipids, Role of gastro intestinal hormones in digestion. Respiration – Respiratory pigments – Types, Properties and function, Exchange and transport of gases, Respiratory quotient.
- 15 hrs

Unit – II Circulation – Composition and Functions of blood, Types of heart, Cardiac cycle, cardiac rhythm, Pace maker, Origin of heart beat and its regulation, ECG, Blood pressure, Theories of blood clotting, Excretion – Classification of animals based on excretory products, Ornithine cycle, mechanism of urine formation and hormonal control. - 15 hrs

Unit – III Osmoregulation – Osmo-iono-regulation in freshwater, marine and migratory fishes, Thermoregulation – Acclimation, Acclimatisation, heat death, cold death, physiology of hibernation and aestivation, Biological rhythm – Types, examples and adaptive significance.
- 15 hrs

Unit – IV Nerve Physiology – Types of neuron, conduction of nerve impulse along a nerve fibre, Synapses, Synaptic transmission of impulse, Neurotransmitters, Muscle physiology – Types of Muscles, Ultrastructure and properties, muscle proteins, Theories of muscle contraction Isotonic and Isometric contraction. - 15 hrs

Unit – V Endocrine glands – Structure, secretions and functions of pituitary, thyroid, adrenal, islets of langerhans and gonads, Receptors – Photo and Phono reception in Man.
- 20 hrs

Books for Study

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

Books for Reference

1. Goyal & Sastri "Animal Physiology" Rastogi Publication, Meerut.
2. Nagabhushanam "Animal Physiology" Oxford and IBH Publishing Co.
3. Jain, P.C. Anantharaman, M.S. Animal Physiology and related Biochemistry " Vishal Publications, Jalandhar.
4. Prosser C.L. Comparative Animal Physiology" Prentice Hall.
5. Saradha Subramanian, Madavankutty K. Text book of Human Physiology S.chand and Co. Ltd.
6. Berry A.K. "A text book of Animal Physiology with related Biochemistry" Emkay Publications, New Delhi.
7. Ambika S. Fundamentals of Biochemistry for medical students published by the author.
8. Jain J.L. Fundamentals of Biochemistry S.Chandra & Co., Pvt. Ltd. New Delhi.
9. Murray R.K., Granner, K.D, Maynes P.A. and Rodwell, V.W. "Harper's Biochemistry, 25th Edition. Mac Graw Hill, New York.
10. Debajyoti Das (2005), Biochemistry Academic Publishers, Kolkata.
11. Veerakumari L. 2005 Biochemistry MJP Publishers, Chennai 5.
12. Prakash S.Lohar (2005) 'Endocrinology-Harmones and Human Health, M.J.P.Publishers, Chennai – 5.
13. Gurumani N. (2006) Research Methodology for Biological Sciences MJP Publishers, Chennai.
14. Meenakumari S.(2005), Microbial Physiology, MJP Publisher, Chennai.

10. BIOPHYSICS, BIOSTATISTICS, BIOINFORMATICS AND COMPUTER APPLICATIONS

90 hrs

Objective To understand the basic principles and applications of biophysics, biostatistics and computers.

Unit – I Scope of Biophysics: Colloids – Description, types and properties, Electrokinetic properties, tyndall effect, surface tension Brownian movement, filtration, osmosis, dialysis and Absorption, Instrumentation: Principle and Applications, pH meter, Calorimetry, Spectrophotometry, Electrical Conductivity, paper chromatography Electrophoresis.

- 20 hrs

Unit – II Data Collection – Sources of Primary and secondary data – Classification and Tabulation, Organization of data: Individual, discrete frequency series – Types of variables – Derived variables.

- 15 hrs

Unit – III Diagramatic Representation of Data – Bar diagram, Pie diagram, Histogram, Frequency polygon, Frequency Curve, Ogive, Pictograph, Scatter diagram, Measurement of Central tendency – Mean, Median and Mode, students t test, Analysis of Variance, Correlation and Regression.

- 20 hrs

Unit – IV Bio informatics: History Definition Scope, Databases: Protein databases – DNA data base, Comparison of sequences – FASTA and BLAST – Methods to access and download genome sequences of several organisms from GENBANK, EMBL and other sources.

- 20 hrs

Unit – V Definition of Computer – History and Generation of Computer, Basic components of Computer, Input/ Output devices, CPU – Memory and its types. Brief account on packages – MS Word and MS Excel for data entry. Basic ideas about internet – Website, Email – Other uses of Internet.

- 15 hrs

Books for Study

1. Das, D. 1996, Biophysical and Biological Chemistry, Academic Publishers, Kolkata.
2. Subramanian, M.A.2005, Biophysics, Principles and Techniques, M.J.P. Publishers, Chennai
3. Upadhyay, Upadhyay and Nath, K.1993. Biophysical Chemistry. Himalaya Publishing House.
4. Gurumani, N. 2004, Introduction to Biostatistics, M.J.P. Publishers, Delhi
5. Ardert T. (2002), Information Technology, Pitman Publishers.

Books for Reference

1. Daniel, M. 1992, Biophysics Biologist, Wiley Internation, New Delhi.
2. Das, D, and Das, A. 2004, Statistics in Biology and Psychology Academic Publishers, Kolkata.

Biostatistics

1. Ramakrishnan, P. 1996, Biostatistics, Saras Publications, Nagercoil.
2. Sokal, R.J. and Rohlf, S.J. 1981, Introducton to Biostatistics, W.H.Freeman, London.

Bioinformatics and Computer Applications

1. Lodish H. etal. 2000 Molecular cell Biology, W.H. Freeman & West Company N.Y.
2. Leon F. and Lean M. (2004) Fundamentals of Computer Science and Communications Engineering, Lean Tech World.
3. Mittal C. (2003) Fundamentals of Information Technology, Pragathi Prakasam, Meerut.

11. ENVIRONMENTAL BIOLOGY AND ANIMAL BEHAVIOR

75 hrs

- Objective** To understand the principles and applications of experimental biology and understanding animal behaviour.
- Unit – I** Scope-Branches of Ecology-Abiotic factors – Water, Light, Temperature and Soil. Biotic factors – Animal relationships – Symbiosis, Commensalism, Mutualism, Antagonism, predation, parasitism and competition. Ecosystem – Pond ecosystem – Primary production, Secondary Production, Food Chain – Food Web – Trophic Levels – energy flow - Ecological Pyramids - Pyramid of Biomass, Number and energy, Biogeochemical cycles – Nitrogen, Carbon and oxygen.
- 15 hrs
- Unit – II** Population – Definition – Natality, Mortality, Population fluctuation dispersal, Age pyramid, Population estimation – Population equilibrium – Regulation. Wild Life resources – Wild life conservation and Management. Community ecology – Types of Communities - characteristics of community. Stratification – Ecotone – edge effect – Ecological niche – Ecological succession.
- 15 hrs
- Unit – III** Pollution – Types, their biological effect and control. Air Pollution, Water Pollution, Sewage and solid waste disposal and management, Recycling process – Green house effect – Ozone layer and its significance, Global warming, Acid rain, Biomagnification – Environmental Impact Assessment, Biological indicators and their role in environmental monitoring.
- 15 hrs
- Unit – IV** Animal behaviour, Introduction – Definition – Stereotype and Acquired behaviour, Role of nervous system in behaviour and behaviour without nervous system, Types of behaviour – Tropism, Instinctive behaviour – Instinct and intelligence, Learning, Imprinting, Reasoning, Stimulus – Orientation – Communication – Touch and Visual Communication.
- 15 hrs

Unit – V Motivation – Goal oriented behaviour, Effects of motivation on behaviour – Patterns of motivation – Biological, hunger thirst and sexual drive, Aggressive, feeding and mating behaviour, Social behaviour – insects, birds and human society, periodicity and Biological clock, Role of pheromones in behaviour, Mimicry and colouration.

- 15 hrs

Books for Study

1. Verma P.S. and Agarwal V.K. 2000, Environmental Biology, S.Chand & Co, New Delhi.
2. Gunadevia H.S. & Hare Govinda Singh, Text book of Animal Behaviour (2000)

Books for Reference

1. Odum, E.P. (1983) Basic Ecology, Saunder's College Publishing New York.
2. Clarke, G.L.(1954) Elements of Ecology, John Wiley & Son Inc. New York London 534 pp.
3. Kotpal, R.L. and N.P.Bali 1986 Concepts of Ecology, Vishal Publications Delhi.
4. Ananthkrishnan, T.N. and S.Viswanathan, Principles of Animal Ecology
5. Bandopadhyay, J. India's Environment crisis and response, Nataraj Publishers, Dehra Dun.
6. Verma and Sharma, Ecology and Animal Behaviour Jaiprakashnath & Co, Meerut.
7. Bateson, P.P.G. and Hinde R.A., eds. Growing Points in Ethology, Cambridge University Press.
8. Hinde R.A, Animal behaviour (2nd ed) Mc Graw Hill 1970.
9. Manning A, An introduction to Animal Behaviour Addison Wesley 1972.
10. Murugesan A.G., Rajakumari. C., (2005) Environmental Science and Biotechnology, MJP Publishers, Chennai 5.
11. Mohan P. Arova (1992) Animal behaviour 'Himalaya Publishing House'
12. Amita Sarkar 2003, Sexual Behaviour in Animals, Discovery Publishing House, New Delhi.
13. Ranga (2000), Animal Behaviour, Agrobios, India.

12. MICROBIOLOGY AND IMMUNOLOGY

75 hrs

Objective To understand the basic principles and applications of microbiology and immunology

Unit – I History and Scope of Microbiology; Classification of Microorganisms; Salient features of Bacteria, Virus, Actinomycetes, Fungi; Structure and Reproduction of Viruses. (T4 phage and HIV)

Bacterial growth and nutritional requirements; Culture of microorganisms – Types of Culture media, Cultural characteristics of bacteria, methods of maintenance of culture; Reproduction in Bacteria – Conjugation, Transformation, Transduction.

- 15 hrs

Unit – II **Diary Microbiology:** Pasteurization – Milk products – Curd, butter and Cheese

Food Microbiology: Fermented food, Food spoilage, Food Poisoning, Physio-Chemical methods in food preservation.

Soil Microbiology: Common Soil microbes; symbiotic and asymbiotic organisms; Physiology of nitrogen fixation.

Water Microbiology: Coliform bacteria and MPN, Estimation of Total Plate Count, Index, Fecal Strepto cocci.

- 15 hrs

Unit – III Study of Common bacterial and viral diseases of man – Causative organisms, mode of transmission, pathogenicity, symptoms & their preventive measures. Diseases of Gastro – Enteric System – Cholera, Typhoid & Viral Hepatitis, Respiratory System – Diphtheria, Whooping Cough, Pneumonia, Tuberculosis, Nervous System – Meningitis, Leprosy, Tetanus, Polio and Rabies, Genital System – Gonorrhoea and Syphilis, Viral Cancer and AIDS

- 15 hrs

Unit – IV Immune System – Types of Immunity – Innate and acquired Immunity: Passive and active; Lymphoid organs – Primary and Secondary Organs, GALT & BALM. Lymphocytes – Sub-Population of T&B Cells; Antigen –

Types structure and functions; Vaccines – Preparations and Immunization; Immunoglobulin – Types, Structure and Functions.

- 15 hrs

Unit – V Immune Response – Acquired Immune Response – Humoral Immunity and Cell Mediated Immunity – Complements – Components – Mode of Activation – Classical and Alternate Pathway – MHC and HLA – Structure and Functions, Immune Techniques – Principles of Precipitation – VDRL slide test, Double Immuno diffusion and Immunoelectrophoresis – ELISA, Radio Immuno Assay.

- 15 hrs

Books for Study

1. Ananthanarayanan, R. & C.K.Jayaram Panicker, 1990. Text Book of Microbiology, Orient Longman.
2. Chakravarthy A.K. (1996) Immunology, Tata Mc Graw, New Delhi.

Books for Reference

1. Sharma, P.D., 1998, Microbiology, Rastogi Publications.
2. Mani, A., Narayanan, L.M.Selvaraj, A.M., & N.Arumugam (1996)
3. Pelczer, M.J. (2000) Microbiology, Mcgraw Hill Book Company, New Delhi.
4. Meena Kumari, S. 2005, Microbial Physiology, M.J.P.Publishers, Chennai.
5. Vijaya Ramesh, K.2005, Environmental Microbiology, M.J.P.Publishers, Chennai.
6. Roitt, I. 1987, Essential Immunology, P.G. Publishing Pvt. Ltd. New Delhi.
7. Kuby, T.(1994) Immunology, P.G.Publishing Pvt. Ltd. New Delhi.
8. Tizard, I.R. (1995) Immunology – An Introduction IV Ed. Saunders College Publications, Philadelphia.

13. BIOTECHNOLOGY

90 Hrs

Objectives

1. Enable understanding of biodiversity as resources that could yield products useful to man.
2. Enables understanding of Principle behind techniques involved in Biotechnology.
3. Imparts awareness on Intellectual property rights and safety issues involved in handling of transgenic organism s.

Unit – I Introduction

Origin and Definition – Scope and Importance of Biotechnology – Biotechnology in India – GATT, IPR, TRIPS – recombinant DNA technology – Genetic Engineering – Restriction Enzymes – Gene cloning – Cloning Vectors – Plasmids, Phages, Cosmids –Polymerase chain Reaction – CDNA Library – Electroporation and Microinjection

15 hrs

Unit – II Animal Biotechnology

Animal tissue culture – In vitro fertilization – embryo transfer in man and Cattle – Transgenic animals, Biotechnology and medicine – Hybridoma – Monoclonal anti bodies – hormone production – Viral Vaccines – Edible and designer Vaccines, interferons – Gene Therapy.

20 hrs

Unit – III Plant Biotechnology

Plant tissue culture – Protoplast culture – Disease resistant Plants – Stress tolerant plants – Ti-Plasmids – Nif genes – genetically transformed Plants – Terminator gene technology – Plant vectors – Phytoremediation – Biosafety – Safety issues – Ecological, Social, Legal Issues regarding Handling of transgenic Plants.

15 hrs

Unit – IV Industrial Biotechnology

Bioreactors – Fermentation process – Fermentation Industry – Microbial Enzymes and their application – Products of Microbial Fermentation – Biogas Plant structure – Biogas Production – Biofertilizers – Bioinsecticides – Biosensors – Biopolymers –Application of genetically engineered bacteria.

20 hrs

Unit – V Environmental Biotechnology

Renewable Energy – Energy and Fuel using Micro organisms – Biomass production through forestry – Gene Banks – Species conservation – Solid waste management – Vermi composting – Bioremediation – Bio-Teaching.

20 hrs

Books for Study

1. F.C. Dubey - Biotechnology, 2005, U. Satyanarayanan - Ref. Biotechnology, 2005.

Books for Reference

1. Murugesan, A.G. and Raj Kumar, C. - Environmental Science and Biotechnology, 2005 – MJP Publishers – Triplicane, Chennai – 600 005.
2. Kalaichelvan, P.T. - Microbiology and Biotechnology – A Laboratory Manual, 2005 – MJP Publishers – Triplicane – Chennai –5.
3. Lohar P.S., - Biotechnology, 2005 – MJP Publishers – Triplicane, Chennai –5.
4. Prema, L.P. - Applied Biotechnology, 2006 – MJP – Publishers, Chennai –5.
5. Roitt, I.M., Brostoff and Male – Immunology – 1994, 1995 2nd, 3rd, 4th Ed. Gower Medical Publishing.
6. Jogdand, S.N., - Environmental Biotechnology, 1995. Himalaya Publishing House, Bombay.
7. Pathade, G.P., God, P.K. - Environmental Pollution and Management of waste waters by Microbial techniques, 2001, ABD Publishers.
8. Subbaram N.R., - Handbook of Indian Patent Law and Practice, 1998, S.Vishwanathan Publishers, Chennai.
9. Mansi, E.M, - Fermentation Microbiology and Biotechnology, 2002, Taylor and Francis Group, USA.
10. Freshney, R.I., - Culture of Animal Cells – A Manual of Basic techniques, 2000, Wiley Liss Publication.
11. Analytical Biochemistry and Separation Techniques – A Laboratory Manual for B.Sc. and M.Sc Students, (2001), Kalaimani Printers, Madurai.
12. Trivedi, P.C. - Plant Biotechnology – Recent advances, 2000, Panimar Publishing Corporation, New Delhi.

13. Narayanasamy S., - Plant Cell and Tissue culture, 1999, Tata McGraw – Hill Publishing Company, New Delhi.
14. Pareck, L.K, - Trends in Plant tissue culture and Biotechnology, 2002, Agrobios, Jodhpur,
15. Vijaya K., - Environmental Microbiology, Ramesh, 2005, MJP Publishers, Chennai – 5.

B.Sc. ZOOLOGY
PRACTICALS

PRACTICAL I

INVERTEBRATA & CHORDATA PRACTICALS

Semester: I & II

Max. Marks: 75

Category: MC (P)

No. of hours: 2h/week

OBJECTIVE To illustrate the organization, relate structures and functions of Invertebrates & Chordates, and to inculcate surgical skill.

DISSECTIONS

Earthworm: Nervous System

Cockroach: Digestive System

25 Marks

Nervous System

Reproductive System

Pila/Freshwater mussel Digestive system:

Fish/Frog: Arterial System

Venous System

5th Cranial Nerve

Male and Female urinogenital system

MOUNTINGS

Earthworm: Penial setae

10 Marks

Body Setae

Cockroach: Mouth Parts

Salivary Apparatus

Mosquito

House fly

Honey bee

Mouth Parts

Fresh water mussel: Pedal ganglion

Pila : Radula

Fish : scales

SPOTTERS

5 x 4 = 20 marks

1. Classify giving reasons:

Paramecium, Any one coral, *Obelia* colony/ *Obelia* medusa, *Ephyra* larva, *Penaeus*/Palaemon, *Asterius*, *Amphioxus*, *Salpa*/*Doliolum*, *Scoliodon*, *Testudo*, *Columba*, *livia*,

2. Draw labeled sketches:

T.S of Planaria, *Fasciola*, *Taenia*, *Ascaris*, *Hirudinaria*,

T.S through pharynx of *Amphioxus*

Rana: Skull, Girdles (pectoral & pelvic)

3. Biological significance:

Gemmule of sponges, *Physalia*, *Peripatus*, *Limulus*, *Petromyzon*, *Ammocetus*, *Balanoglossus*, *Hippocampus*, *Ichthyophis*, *Axolotl*/ *Ambystoma*, *Chamaeleon*, *Pteropus*.

4. Relate Structure & Function:

Spicules, scolex (*Taenia*), Parapodium (*Neries*) radula (*Pila*), placoid scales, electric organ (*Narcine*/ *Torpedo*), quill feather, carapace & plastron, sternum, synsacrum.

5. Descriptive Notes:

Chaetopterus, *Glochidium*, *Lepas*/*Balanus*, *Bipinnaria*, *Echeneis*, *Exocoetus*, *Anguilla*, *Hyla*, *Rhacophorus*, *Draco*, *Naja*/*Bangarus*, Dentition (*Oryctolagus*), *Talpa*.

FIELD VISIT

Report must be submitted along with lab record note book.

10 marks

RECORD of the work done in the laboratory must be submitted

10 marks

Books for Study

1. Ekambaranatha Ayyar and T.N.Ananthkrishnan, 1995, "A Manual of Zoology" Vol: 2 (part 1 & 2), S. Viswanathan, Chennai.
2. Lal, SS 2004, A Text Book of Practical Zoology: Invertebrate, Rastogi, Meerut.
3. Lal, SS 2004, A Text Book of Practical Zoology: Vertebrate, Rastogi, Meerut.
4. Newman. H.H., 1939, "The Phylum Chordata", McMillan, Newyork.

Books for Reference

1. De Beer G, 1966, "Vertebrate Zoology", Sedgwick & Jackson, London.
2. Young J.Z., 1950, "The Life of Vertebrates", Oxford University Press, London.

PRACTICALS II

CELL BIOLOGY, GENETICS, BIOCHEMISTRY AND INSTRUMENTATION

Cell Biology

1. Microscopy - Cell Observation
- Cell Measurements
2. Preparation of Cells and tissues
 - a) Squamous epithelium
 - b) Striated, Smooth and Cardiac Muscle.
3. Cell division
 - a) Mitosis – Root tips
 - b) Meiosis – Grass hopper testis
4. Cell Counts
 - a) Total count RBC & WBC – Human
 - b) Differential Count.

Genetics

1. Mendelian ratios observations in peas/ Beads.
2. Collection and culture of Drosophila to observe heritable characters.
3. Mounting polytene chromosomes – Dipteran flies
4. Observation of chromosomal variation from permanent slides or pictures provided.

Biochemistry

1. Estimation of Proteins, carbohydrate and lipids.
2. Qualitative analysis of protein, carbohydrates and lipids.

Instrumentation: Principle and uses of

1. Electrophoresis
2. Chromatography
3. Spectrophotometer/Colorimeter
4. Centrifuges

PRACTICAL III

ANIMAL PHYSIOLOGY, DEVELOPMENTAL BIOLOGY, BIostatISTICS AND COMPUTER APPLICATIONS

3 hours

Animal Physiology

1. Estimation of oxygen consumption of fish with reference to body weight.
2. Qualitative analysis of nitrogenous waste products in fish tank water, frog tank water, bird excreta and mammalian urine.
3. Amylase activity in human saliva in relation to pH.
4. Effects of temperature on ciliary activity of freshwater mussel.

Spotters Sphygmomanometer, Kymograph, Respirometer.

Developmental Biology

1. Observation of egg and sperm of different animals.
2. T.S of Testis and ovary.
3. Observation of different stages of development. Vertebrates or invertebrates (Life Cycle).
4. Fertilization and early development of invertebrate/ vertebrate. (Polychaetes, Sea urchin, Frog etc.,)

Spotters Slides and Specimens

Bio Statistics

1. Frequency distribution of the given samples to findout, Arithmetic Mean, Median, Mode, Range and Standard Deviation for a biological data.
2. Regression and Correlation using any biological data.

Computer Application

1. Computer Components, Usage of computer.
2. Internet and E-mail.
3. Download and study atleast two samples of Genome sequences.

Spotters Parts of computer, Copies of genome sequences, DNA and Proteins

PRACTICAL IV
BIOTECHNOLOGY, ENVIRONMENTAL BIOLOGY, MICROBIOLOGY
AND IMMUNOLOGY

Ecology

1. Estimation of salinity in water sample
2. Estimation of O₂ and CO₂
3. Identification of Planktons
4. Visit of shore, pond, hills and desert – report of fauna.
5. Usage of Sacchis' Disc, Hygrometer, pH meter, rain gauge etc.
6. Report/Method to survey pollution.

Biotechnology

1. Isolation of DNA/RNA
2. Electrophoretic separation of DNA
3. PCR (Demo-through C.D.)
4. Preparation of culture medium.
5. Study of toxicity using embryo culture.
6. Visit to Biotechnology industries.

Immunology

1. Blood grouping – Man.
2. Immuno diffusion (Demonstration) - (Optional)
3. Immuno electrophoresis (Demonstration/ From & CD figures) – (Optional)
4. Hyper sensitivity test using antigens (optional).
5. Lymphoid organs in any animal.

Microbiology

1. Identification and staining of bacteria.
2. Identification and staining of protozoan parasites
3. Observation of permanent slides and identification of spotters.
4. Simple staining and Gram staining
5. Hanging drop method.

B.Sc. ZOOLOGY
ALLIED SUBJECTS

B.Sc Zoology – Allied Subject

Co-ordinator

Thiru. T.Chidambaram,
HOD of Zoology,
MSS Vellaichamy Nadar College,
Nagamalai, Pudukkottai, Madurai.

Members

1. Dr.R.Sugumaran,
HOD of Zoology,
Vivekananda College,
Tiruvedakam West.
2. T.mt.Rani Renganathan,
Selection Grade Lecturer in Zoology,
Sri Meenakshi Govt.
College for Women,
Madurai- 2.
3. Mrs.S.Mallika,
APA College for Women,
Palani.
4. Dr.N.Anbu Saravanan,
Reader in Zoology,
Periyar EVR College,
Trichy.
5. Mrs.T.S.Shanthakumari,
HOD of Zoology,
Seethalakshmi Ramasamy College,
Trichy.
6. Thiru. M.Sankaran,
HOD of Zoology,
R.S. Govt. College,
Thanjavur.

Allied Zoology Course

Zoology is offered as allied course to Non-Zoology Major Courses like Botany, Chemistry and Home Science Major. The aid of offering allied Zoology in to expose students of other Major subjects to gain comprehensive and basic knowledge in Zoology. This will help the students to develop themselves in any area of interest in their future.

The Allied Zoology curriculum will give an exposure to a student in all the branches of Zoology.

Paper I Animal diversity and organization

Paper II General Principles of Zoology

Two more papers if required, the syllabi can be framed by the faculty

Linkage: Allied Zoology is offered to Botany, Chemistry and Home Science Major students.

Competencies to be developed

1. To recognize the diversity of the fauna and to enable the students to identify the specimen.
2. To enable the students to gain knowledge on the Biology of living organism and their activities.
3. To expose the non-zoology students to the Frontier areas in Life Science.
4. To exploit the knowledge of Zoology for the benefit of human beings.

B.Sc., Allied Zoology

Paper I

Animal Diversity and Organisation

Total hours: 60

Contact hours per week: 4

Objective To acquire a basic knowledge of animal diversity and its organization

Unit – I Diversity of Invertebrates – I
Principles of taxonomy. Criteria for classification – Symmetry and Coelom – Binomial nomenclature. Classification of Protozoa, Coelenterata, Helminthes and Annelida upto classes with two examples.

Unit – II Diversity of Invertebrates – II
Classification of Arthropoda, Mollusca and Echinodermata upto class level with examples.

Unit – III Diversity of Chordates – I
Classification of Prochordata, Pisces and Amphibia upto orders giving two examples.

Unit – IV Diversity of Chordates – II
Classification of Reptilia, Aves and Mammalia upto orders giving two examples.

Unit – V Animal organisation
Structure and organization of
(i). Earthworm (ii) Rabbit/Rat (iii) Prawn/Fish

Books for Study

1. Ekambaranatha Iyer, - Outlines of Zoology Viswanathan Publication

Books for Reference

1. Ekambaranatha Iyar and T.N.Ananthakrishnian - A Manual of Zoology Invertebrata – Vol I: Viswanathan Publishers.
2. Ekambaranatha Iyar and T.N.Ananthakrishnan, - A Manual of Zoology- Invertebrata – Vol II: Viswanathan Publishors.
3. Ekambaranatha Iyar and T.N.Ananthakrishnan, - A Manual of Zoology: Chordata Viswanathan Publishers.
4. Jordan E.L. and P.S. Verma - Invertebrate Zoology, S. Chand & Co.

B.Sc., Allied Zoology

Paper II

General Principles of Zoology

Total hours: 60

Contact hours per week: 4

- Unit – I** Respiration - Respiratory pigments and transport of gases. Mechanism of blood clotting. Types of excretory products – Ornithine cycle. Structure of neuron – Conduction of nerve impulse, Mechanism of vision and hearing.
- Unit – II** Carbohydrates – Classification, structure, Isomerism Protein and amino acid classification and structure Fat- Classification and structure. Biological oxidation – Glycolysis, TCA cycle, Oxidative Phosphorylation. Classification of enzymes, Mechanism of enzyme action.
- Unit – III** Fertilization, Cleavage, Gastrulation and Organogenesis of Frog – Immunological organs – responses in humans.
- Unit – IV** DNA as a genetic material Structure and application of DNA Genetic Code Protein synthesis, Molecular basis of mutation – tautomerization and base analog method.
- Unit – V** Structure, classification and culture of Virus – Viral diseases AIDS, Hepatitis. Bacteriology – Structure of bacteria, classification. Bacterial diseases – Recombinant DNA technology, cloning.

Books for Reference

1. N.Arumugam - Physiology Gen.comparative, Sars Publications
2. Hoar S.William - Physiology
3. N.Arumugam - Biochemistry, Saras Publications
4. Ambika Shanmugam - Biochemistry

5. N.Arumugam - Microbiology, Saras Publication
6. Michael J Pelezar - Microbiology
7. Verma P.S. & Agarwal - Developmental Biology, Chordata embryology S. Chand & Co.
8. De Robertis - Cell Biology, Molecular Biology.
9. Lohar P.S. - Biotechnology (2005) M.S.P. Publishers.

Zoology
Allied Practicals

Lab I Practical I

Contact hours per week: 02

Dissections

Earthworm-Body setae and Penial setae

Earthworm-Nervous system.

- *Frog - Digestive system (Demonstration only)
Reproductive system (Demonstration only)
- Frog - Arterial system (Demonstration only)
- Fish - Digestive system, mounting scales
- Prawn - Appendages and nervous system

Experiments

Qualitative test for ammonia, uric acid and urea

Qualitative test for carbohydrate, protein and fat.

Simple staining of microbes.

Observation of microbes by hanging drop method

Spotters: Invertebrata and Chordata – animals covered in theory.

* Field Report of the local fauna.

B.Sc. ZOOLOGY
OPTIONAL SUBJECTS

Optionals/Elective

1. Aquaculture - Dr.R.Bakthavatchalam,
Govt. College,
Kumbakonam.
2. Vermiculture - Dr.R.Ramalingam,
Annamalai University.
3. Human Genetics & Genetic
Counselling - Dr.Alice Marcus,
Holy Cross College,
Trichy.
4. Sericulture - Dr.Badrinath,
5. Apiculture - Dr.Marino Anthoni Ammal,
Fatima College,
Madurai-6.
6. Clinical Lab Technology - Dr.M.Ramaswamy,
Govt. College,
Coimbatore.
7. Wildlife Diversity &
Conservation - Dr.G.Ramaswamy, (Coordinator)
AVC College,
Mayiladuthurai.
8. Dairy Farming - Dr.Sukumar,
Vivekananda,
Thiruvedagam.
9. Poultry Science & Management - Dr. G. Ramasamy,
AVC College,
Mayiladuthurai.
10. Public health & hygiene - Dr.G.Ramaswamy,
Mayiladuthurai.
11. Bioinformatics - Dr. G. Ramasamy,
AVC College,
Mayiladuthurai.
12. Fisheries biology - Dr.L.S.Renganathan,
Annamalai University.

OPTIONALS

INTRODUCTION

Scope Optional papers give a specialization to the undergraduate Zoology student to be an entrepreneur or a self-employed youth. He or she is acquiring a theoretical and practical knowledge of the optional paper to understand the problems and challenges and prepares them to face it out with a strong knowledge. Knowledge updation and incorporation of modern techniques may be introduced immediately to the student only through the optional paper without disturbing the core papers. The scope of the optional paper depends on the need of the society and infrastructures available. Optional papers make the graduate a self-dependent person to face the grim realities of life and give a positive correlation to his knowledge and society requirement.

* To facilitate student to branch out to various postgraduate programmes encouraging vertical mobility.

AIMS and GOALS

1. To acquire adequate knowledge in applied fields of Zoology such as Aquaculture – Vermiculture, Apiculture, Sericulture, Poultry science, Fishery biology, Clinical lab Techniques, wild-life Biodiversity and conservation, Human Genetics and Genetic counseling, Public health and Hygiene.

1. AQUACULTURE

Total: 75Hrs

OBJECTIVE To acquire the basic knowledge of aquaculture in setting up, maintenance and management of different culture farms for the welfare of human beings and to be a self-employed youth.

Unit – I History of aquaculture – Purpose and importance of aquaculture – Physical and chemical characteristic features of water bodies (Freshwater brackish water and marine water) – Types of culture systems (Traditional, intensive, semi-intensive and extensive) – Levels of management (Zero level, I level, II level and III level) – Feeding habits of cultivable aquaculture species. (15hours)

Unit – II Selection criteria for cultivable species – Site selection for fish farming – construction of fish and prawn ponds – Types of fish ponds (breeding pond, hatchery unit, brooders pond, nursery pond, stocking pond and rearing pond) – Maintenance and management of different ponds. Feeds for cultivable species – natural, supplementary and artificial feeds. (15 hours)

Unit – III Types of culture – Monoculture, monosex-culture & poly culture – Integrated fish farming (paddy cum fish culture, paddy cum prawn culture and Duck cum pig cum fish culture) – Induced breeding in Indian major carps- Live feed culture (Rotifers and Artemia) – Carp culture (Poly culture/Composite fish culture). (15 hrs)

Unit – IV Culture of air – breathing fishes (Murret and cat fish) Monosex culture of tilapia – Culture of mullet (Mugil sp)- Sewage fed fish culture – culture of pearl oyster and edible oyster. (15 hrs)

Unit – V Culture of marine and freshwater prawns-common fish/diseases (bacterial, fungal, viral and parasitic) – Prevention and treatment – Fishing technology (Crafts and gears) – Preservation and processing of fish and prawn – Agencies involved in aquaculture. (15 hrs)

Competency

1. Acquire basic knowledge of various aquaculture systems, levels of management and feeding habits of cultivable species.
2. To have first hand information about the set up and management of different ponds and feeds of different species.
3. To provide thorough knowledge about various culture farms.
4. To adopt different culture practices and techniques.
5. To have sufficient knowledge regarding prawn culture, common diseases affecting cultivable species, prevention and treatment of diseases, fishing technology and preservation and processing of aquaculture products.

Practicals

1. Analysis of water samples – Estimation of pH, total hardness, Dissolved Oxygen, Salinity, Calcium, nitrate, phosphate and silicate.
2. Identification of important cultivable species (available fin fishes and shell fishes)
3. Analysis of phytoplanktons.
4. Analysis of Zooplanktons.
5. Morphometric and meristic characters of fishes.
6. Gut content analysis of fishes of different feeding habits.
7. Collection and identification of different parasites of fishes/prawns.
8. Induced breeding experiment in any one carp species either in late or in any hatchery unit.
9. Field visit to any aquaculture unit.

Books for Reference

1. R.Santhanam, N.Sukumaran and Natarajan, - A manual of fresh water aquaculture, Oxford and IBH Publishing Co Pvt. Ltd., Bombay.
2. B.N.Yadav, - Fish and fisheries, Daya Publishing House, Delhi.
3. Mathew Landan, - Introduction to aquaculture, John Wilay and Sons Inc. 1991.

4. V.R.P.Sinha - A compendium of aquaculture Technologies for developing countries, Oxford and IBH Publishing Company Pvt. Ltd. 1993.
5. V.G.Jhingran - Fish and fisheries of India, Hindustan Publishing Corporation, Delhi, 1991.
6. T.V.R.Pillay - Aquaculture principles and Practices, Fishing News Books, Blackwell Science Ltd., Oxford.
7. Shanmugam, K. - Fishery Biology and Aquaculture, Hindustan Pub. Corporation, New Delhi, 1990.
8. C.V.Kurian and Sebastein - Prawn and Prawn fisheries of India, Hindustan Publishing Corporation, New Delhi.
9. Elvire Balugul, A. - Aquaculture systems and Practices – A selected Review, Daya Publishing House, New Delhi, 1984.
10. B.N.Yadav - Fish Endocrinology, Daya Publishing House, New Delhi, 1995.

2. VERMI CULTURE

Total: 75 Hrs

- Scope** To prepare the students to acquire knowledge in vermiculture and vermicomposting to get self-employed.
- Aim** To train and impart knowledge of earthworm, their culture practices, ecological and economic importance – maintenance and management of vermifarms.
- Unit – I** Earthworms: Classification-morphological and anatomical characteristics – reproduction – Biology of composting earthworms *Eudrilus lugeniae* and *Lampito mauritii*.
(15 hours)
- Unit – II** Ecological groups of earthworms-epiglic, endoglic, anlicic, saproplagus and geoplegus worms, humes form, Less and humus feeders – earworm burrows- earthworm casts – An outline of Earthworm importance in agriculture, fishing, Therapeutics and pollution.
(15 hours)
- Unit – III** Soil Physical, chemical and biological features – soil types – soil formation – Soil organic matter – organic matter decomposition – humus formation.
(15 hours)
- Unit – IV** Organic wastes sources - problems in traditional composting-vermicomposting definition – types – small scale and large scale pit method, heap method, window method, Indoor method – Factors affecting vermicomposting: pH, moisture, temperature, nutritional value of feed, earthworm species – and microbes and earthworms.
(15 hours)
- Unit – V** Application of vermicomposting in agricultural and horticultural practices – Economics of vermiculture – NABARD – Nationalised Banks. KUB supports for vermiculture
(15 hours)

Practicals

1. Morphological features of composting earthworms *Lampito mauritii* and *Eudrilus lugenae*.
2. Identification of earthworm cocoons and a vermi casts.
3. Dissection of earthworm digestive system.
4. Mounting of body setae, and pineal setae.
5. Vermicomposting-Demonstration of preparation pit method, heap and window method.
6. Estimation of digestive enzymes – anylase
7. Visit to agricultural forms to identify earthworm burrows, vermicomposting units.

Books for Reference

1. Edwards, C.A. and Bother, 1996 Biology of Earthworm.
2. Lee G - Earth worm ecology.
3. Stevenson - Biology of earthworms.
4. Ismail M.S. - Vermitechnology.
5. Ranganathan, LS - 2006- Vermicomposting technology-from Soil health to Human Health.

VERMICULTURE

- Unit – I** Acquiring skill of identification of worms. Appreciating their economic importance.
- Unit – II** Knowledge of earthworm community.
- Unit – III** Appreciation of Geological importance of soil farms and understanding of soil properties.
- Unit – IV** Skill development regarding vermi composting.
- Unit – V** Application of skill for economic development

3. HUMAN GENETICS & GENETIC COUNSELING

Total: 75 hours

Unit – I Introduction: The growth of Human Genetics. Human Chromosomes: Preparation of human Chromosome complement; Banding techniques; Chromosome painting.

Karyotype preparation; classification; application. Chromosome mapping: cytological maps; cloning and gene arrangement. Human genome project; Social ethical and legal implications. Modes of inheritance: Pedigree charts; construction of pedigree charts for autosomal dominant and recessive traits, Sex linked recessive traits and Y linked traits.

(15 hrs)

Unit – II Multiple allelic inheritance; ABO blood groups; Rh blood group and significance.

Polygenic inheritance: Skin colour in man and Intelligence

Sex determination – heterogametic theory; HLA antigens; SRY genes; Sex Chromatin; Lyon hypothesis.

Sex limited and sex influenced genes.

Chromosome anomalies: Syndromes – Down, Klinefelter, Turner, XYY, Intersex, Cri-du-Chat, Philadelphia.

(15 hrs)

Unit – III Common genetic disorders:

Metabolic blocks in phenylalanine metabolism albinism.

Genetic cause, diagnosis and treatment of the following disorders – thalassemia and sickle cell anemia, Haemophilia, Muscular dystrophy, Diabetes and hypertension.

G6PD and favism – Primaquine sensitivity.

Congenital defects-critical period in fetal development chromosome anomalies and spontaneous abortion.

(15 hrs)

Unit – IV Genes and mental illness: Schizophrenia and psychosis, self-mutilation and Lesch Nyhan syndrome.
Immunogenetics: Antibody diversity; histocompatibteteng; HLA genes.
Jerotablity and Environment: Twin studies and impact of environmental factors on heredity.
DNA polymorphism – DNA profiling and applications. Dermatoglyphics and genetic analysis.

(15 hrs)

Unit – V Genetic counseling – Determining risk; consanguinity; Teratogen; age 35 threshold; strategies – Prenatal diagnosis: Ultrasound scanning; Amniocentesis; Chronic villus sampling; AFP Test; Triple test; genetic screening; options available.
Management of genetic disorders: Therapeutic measures; Gene therapy; alternative reproductive technologies; stem cell therapy.
Cancer and genes; protoncogenes, oncogenes and artioncogenes; BRAC genes.

(15 hrs)

Books for Study

1. Bharnagar, Kottari and Mehta (1986) Essentials of Human genetics, Orient Longman's Ltd.

Books for Reference

1. Edlin.G. (1984) Human Genetics, Jones and Bartlett publishers, Boston.
2. Elane Mangae and Mangae (1993), Human genetics. Freeman and company.
3. Ricki.L.,(1994) Human Genetics. WCB Publishers.
4. Sam Singer (1985) Human Genetics, Freeman and Company, New York.
5. Ursula Good enough (1985) Genetics. Holt Reinhart and winstan New York.

Practicals

1. With a photocopy of the human chromosome complement, A to G groups are classified and numbered.
2. Distinguishing a normal male and female karyotypes.
3. Abnormal karyotypes for Down, Turner and Klinefelter syndrome.
4. Identifying some common Mendelian traits.
5. Collection of data on family history of some common genetic traits and preparing pedigree charts.
6. ABO and Rh blood grouping for the family and construction of pedigree.
7. Barr body identification with a prepared buccal smear.
8. Photocopies of DNA fingerprinting analysed and interpreted.
9. Variation in Dermatoglyphics in normal population
10. Collection of data and ABO blood groups/taster and non taster genes in human population and Calculation of gene frequency applying Hardy Weinberg law.

4. SERICULTURE

Total: 75 Hours

- Unit – I** History and Economic Importance of Sericulture - Types of Silk worms – Mulberry and Non-mulberry (Tasar, Eri and Muga) - Systematic Position of *Bombyx mori*.
(15 hrs)
- Unit – II** Horticulture – Cultivation of Mulberry - Environmental conditions for Mulberry cultivation – Soil, Climatic Factors, environmental Factors - Preparation of Land - Methods of propagation - Planting practices - Methods of Irrigation – Manuring, Mulching – Inter cultivation – Pruning Methods - Harvesting - Diseases and Pests of Mulberry – Control methods.
(15 hrs)
- Unit – III** Life cycles of *Bombyx mori* - Morphology of Silk worm – Silk gland - Rearing House Facilities and rearing equipments - Seed Production (Grainage) - Feeding of Silk worm, Bed cleaning, spacing .
(15 hrs)
- Unit – IV** Mounting – Process ripening - Process of Spinning – Harvesting - Cocoon Composition - Physical and commercial characteristics of Cocoons - Defective Cocoons - Pathology of silk worm.
(15 hrs)
- Unit – V** Stiffling - Process of Reeling - Finishing and Testing - Reeling appliances - Bye products of silk reeling and Silk - Marketing Sericulture as Cottage Industry.
(15 hrs)

Books for Reference

1. Ullal and Narasimhan.M.N. - Handbook of Practical Sericulture
2. Manual of Sericulture, FAO Volume
3. G.Ganga of J.Sulochana Chetty - An Introduction to Sericulture.

Practicals

1. Identification of Mulberry and Non-Mulberry Silk worms.
2. Collection of different types of Mulberry leaves.
3. Spotters on various parts of Mulberry.
4. Insects box preparation of the Life Cycle of *Bombyx mori*.
5. Identification of eggs, pupa, cocoon and adults.
6. Dissection of Silk – gland.
7. Mounting of mouth – parts of Silk worm.
8. Dissection of nervous system in Silk worm.
9. Dissection of Reproductive system in Silk worm.
10. Silk worm seeds collection.
11. Spotters – Defective cocoons.
12. Spotters – Bye – Products of silk worm rearing and Reeling.
13. Field visit to Sericulture house, rearing house, Cocoon markets, reeling and weaving centres.

5. APICULTURE

Total: 75 Hours

Objective Entrepreneur motivation for practicing Apiculture as cottage Industry.

Unit – I History - Biology of honey bee classification, species of honey bees - Social organisation of honey bee colony.

(15 Hrs)

Unit – II Bee hive – Flora for apiculture - Selection of bees for apiculture, Method of bee Keeping - Indigenous method Extractions of honey - Drawbacks of Indigenous method.

(15 Hrs)

Unit – III Modern method of apiculture - Appliances for modern method - Advance of modern method - Diseases of Honey Bee and control measures.

(15 Hrs)

Unit – IV Product of bee keeping: Honey – Bee wax and Bee Yeman - Honey: Production, Chemical composition - Economic importance of Honey bee wax.

(15 Hrs)

Unit – V Bee enemies - Bee keeping industry - Recent efforts - Modern method in employing honey bees for cross pollination in horticultural gardens.

(15 Hrs)

Practicals

1. Identification of workers, Queen and drone in the bee hive.
2. Artificial hive and its parts – Identification.
3. Examinations of comb.
4. Enemies and diseases of Honey Bees and their identification.
5. Field trip to Apiculture Farm.
6. Browning is insisted for the collection of data on orchards where honeybees are used for cross – pollination.

6. CLINICAL LABORATORY TECHNIQUES

Total: 75 Hrs

- Unit – I** Scope of Clinical Laboratory Techniques (CLT) -General Lab apparatus and general procedures – Glass wares used in CLT studies – Clearing/sterilization and disposal of infected materials - Structure and types of microscope – Dissection microscope, compound microscope, Phase contrast microscope, Fluorescent microscope, Darkfield microscope and Electron microscope -Clinical Lab instruments – Colorimeter, Electrophoresis apparatus, Haemoglobino meter, Haemocytometer, Albumiometer and Urinometer - First aid in laboratories.
(15 hrs)
- Unit – II** Trypanosoma and Leishmania - Life cycle of malarial parasite - Life cycle of intestinal round worms - Life cycle of Tape worms.
(15 hrs)
- Unit – III** HAEMATOLOGY: Blood collection Procedures – Blood Coagulation – anticoagulants - Bleeding Time and Clotting time - Blood cell count of RBC & WBC - Staining of bloodsmear and different leucocyte count - Haemoglobin estimation and anaemia - ESR of blood & blood biochemical estimation of urea, Creatine and Sugar - ABO Bloodgrouping and Rh. Blood grouping - Cross matching of blood - Blood donation and blood bank - Basic principles of blood transfusion PARASITOLOGY: life cycle Amoeba.
(15 hrs)
- Unit – IV** BACTERIOLOGY, VIROLOGY, PROTO-ZOOLOGY & HELMINTHOLOGY: clinical diagnosis of bacterial diseases such as Tuberculosis, Typhoid, Cholera, Diphtheria and Pertusis - Clinical diagnosis of viral disease such as AIDS Jaundice , Measles, Polio, Influenza and Mumps - Clinical diagnosis of Protozoan disease such as Amoebiasis, Trypanosomiasis, malaria.
(15 hrs)

Unit – V ESTIMATION OF STOOL, URINE AND OTHER FLUIDS: Gastric juice analysis - Liver function test - Examination of stool specimen – microscopic examination for ova. Cyst, occult blood, parasitic infestation-amoebic dysentery - Examination of urine – microscopic examination for deposits, RBC, casts, pussells – estimation sugar, albumin, bile pigments and Ketone - Examination of seminal fluid- microscopic observation of motility of sperms – sperm counting - Examination of pus and sputum – microscopic examination of normal and pathological Sputum.

(15 hrs)

Books for Reference

1. KANAI, I.Mukerjee, Medical Laboratory Technolgy, Vol I, II, III Tata Mr Grand Hill, Publicising Co., New Delhi.
2. Sonual, K.M. Notes on clinical Lab Techniques, Published by M.K.Gopalan, Chrompet, Chennai.
3. Ramnick Sood, M.D.Medical Labretory Technology – Jaypee Brothers, Medical Publishers (P) Ltd., New Delhi.
4. Arumugam N.Microbiology (General and Applied) Saras Reblication Nagarcoil.
5. J.E.Park Benarsides Bharot - Text Book of Proventive medicine – Napier Town.
6. Baker P.J.Silverton - Int. to Medical Laboratory Technology.
7. Lynch - Medical Laboratory Technology
8. Moniks Cheesbrough - Medical Laboratory Manual of Tropical countries
9. V.H.Talib - A Hand Book of Medical Laboratory Technology.
10. June H.Cella - Manual of Laboratory Tests.
11. Manual of Basic Techniques

Practical

1. Determination of bleeding time.
2. Determination of Clothing time.
3. Estimation of ESR.
4. Estimation of haemoglobin by Haemoglobinometer.

5. Preparation of stained blood smear and identification of different leucocytes.
6. Differential leukocyte count from the stained blood smear.
7. Blood grouping – ABO & Rh system.
8. Qualitative estimation of bile salts in urine.
9. Determination of pH using pH paper.
10. Microscopic examination of urine deposits.
11. Determination of sp. Gravity of urine using urinometer.
12. Qualitative analysis of glucose in urine Benedict's test.
13. Quantitative estimation of protein in urine using Albuminometer.
14. Observation of different microbial culture.
15. Microscopic observation of sperm motility.
16. Sperm Count.

7. WILDLIFE DIVERSITY & CONSERVATION

Total: 75 Hrs

Objective To acquire basic knowledge of Wildlife as a renewable natural wealth. Prepares the students to understand the wildlife fauna and diversity in order to appreciate, admire and conserve it.

Unit – I Wild life definition(s) – values of wildlife – importance of wildlife – depletion of wildlife - world and Indian Scenario – need of wildlife conservation – methods.
(15 hours)

Unit – II Wildlife diversity – fish diversity – Marine, F.Water – distribution Herpetology – reptiles – major groups – Snakes, turtles, crocodiles. Amphibians – frogs, toads and Caecilians distribution and status.
(15 hours)

Unit – III Aves: Selected families – distribution, status and description. Mammals: selected orders –distribution, status and description.
(15 hours)

Unit – IV Zoos, Sanctuaries, National parks: Definition, aims and management-account of sanctuaries of Tamilnadu - Role of Zoo- Wildlife diseases.
(15 hours)

Unit – V Wildlife Management – Projects: Tiger Project – crocodile - Musk deer – hangul - Elephant-Wildlife census techniques – Wildlife Protection Act-Salient features – Forest conservation Act – Biodiversity act.
(15 hours)

Reference

1. V.B.Saharia (1976) wildlife in India, Nataraj Publications, Dehradun.
2. Giles (1990), Wildlife Techniques, Oxford publications.
3. Seshadri (1992)- Govt of India.
4. ENVIS.
5. IWPA (1992)- Govt of India.
6. IUCN – SSP.

Practicals

1. Collection of Pictures of wild animals having anthropomorphic values.
2. Proverbs and sayings of wildlife
3. Mapping the Sanctuaries, NP and Zoos of TN/India.
4. Identification and description of any ten Marine/F.W. fishes and their economic value.
5. Identification and description of any ten reptiles, amphibians, birds and mammals.
6. Wildlife census method – Line transect, Point centered, Capture recapture.
7. Collection & Identifications of Wildanimal Scats/faeces.
8. Pug mark making and Foot print tracing
9. Endangered Mammal list and its distribution
10. Study of Vegetation types and assessment of the quality.
11. Observations of the Behaviour of birds and mammals.
12. Field visit to a Sanctuary/National Part and Zoo.

8. DAIRY SCIENCE

Total: 75 Hrs

- Unit – I** Dairy breeds & breeding
- Scope of Dairy farming
 - Dairy breeds of India – both cows & buffaloes – Exotic cow breeds .
 - Systems of breeding – Hybrid vigour – grading pure breeding merits and demerits of inbreeding and outbreeding.
 - Anatomy and physiology of mammary glands – milk secretion importance of colostrums.
- (15 hrs)
- Unit – II** Feeding and Nutrition:
- Structure of digestive system and physiology of digestion
 - Common cattle feed – their nutritive value – minerals, feed additives and silage preparation.
 - Ration – its computation and qualities
 - Computation of a balanced ration.
- (15 hrs)
- Unit – III** Live stock diseases:
- Viral diseases – rinderpest, Foot and mouth disease and cow pox.
 - Bacterial diseases – Mastitis, Anthrax, Tuberculosis, Haemorrhagic – septicaemia, Brucellosis.
 - Metabolic diseases – Milk fever and blood.
 - A brief account of external and internal parasites.
- (15 hrs)
- Unit – IV** Dairy Technology & Marketing:
- Milk – composition and Nutritive value
 - Techniques to detect milk adulteration
 - Spoilage of milk
 - Pasteurization of milk
 - Preparation of Dahi, Butter and Ghee.

- Role of co-operative societies in milk production & Marketing.

(15 hrs)

Unit – V Farm management

- Housing and equipments for dairy cows.
- Feeding and Management of pregnant cows and goats.
- Feeding and management of young calves.
- Technique of producing quality milk
- Artificial insemination – Semen collection, storage & insemination Techniques.

(15 hrs)

Books for Study

1. G.C. Banerjee - A Text book of Animal Husbandry – Oxford & IBH Publication, New Delhi.
2. KAR - Hand book of Animal Husbandary, 1990.
3. GH Schmidt; T.D.Van Vleck, - Principles of Dairy Science – Surgeet Pvt. Ltd., 1982.
4. N.S.R. Sasting or C.K.Thamas - Farm Animal Management – Vikas Publishing House P. Ltd., 1976.
5. Dr.A.K.Sachetic - Animal Reproduction and Artificial insemination: NCERT, 1989.
6. M.M.Rai, - Dairy Chemistry and Animal Nutrition –Kalrant Publishers, 1985.

Practicals:

1. Analysis of milk – specific gravity
2. Qualitative test for developed acidity
3. Testing the quality of milk
4. Estimation of fat in milk
5. Estimation of Total Solids in milk
6. Estimation of S.M.T. in milk
7. Identification of milk breed

8. Visit to animal husbandary.
9. Visit to Aavin milk farms.
10. Case study – Farm management/ model dairy Farm.

9. POULTRY SCIENCE & MANAGEMENT

Total: 75 Hrs

- Unit – I** External features of fowls – skeletal system – digestive system – endocrine system – feathers – Respiratory system – Reproductive system. Genetics of fowls: Breeds of fowls – inheritance of morphological characters (List of autosomal and sexlinked character – breeding methods – systems of breeding – modern methods of breeding.
(15 hrs)
- Unit – II** Poultry industry in India a survey – choosing commercial layers and broilers – Poultry housing – The deep litter system – cage rearing – poultry methods.
(15 hrs)
- Unit – III** Practical aspects of chick rearing – management of growers Management of layers – management of broilers – lighting, summer winter management – debeaking.
(15 hrs)
- Unit – IV** Poultry Nutrition: Energy – Protein and aminoacids – Vitamins – essential organic elements – Non-nutrition feed additives – feed stuffs for poultry – feed formation.
(15 hrs)
- Unit – V** Diseases: Virus, bacterial, fungal, parasitic disease – vaccination programme.
(15 hrs)

10. PUBLIC HEALTH AND HYGIENE

Total: 75 Hrs

- Unit – I** Scope of Public Health and Hygiene - Concepts of Health and Disease – History of Public Health in India. Nutrition and Health: Classification of foods – Nutritional deficiencies – Vitamin deficiencies – Balanced diet – Nutritional requirements of special groups.
(15 Hrs)
- Unit – II** Environment and Health: Water-sources, Pollution, Purification – Water quality standards. Air: Ventilation - Air pollution – Noise pollution - Radiation effects - Solid waste and excreta disposal - Sewage treatment.
(15 Hrs)
- Unit – III** Communicable diseases: 1. Respiratory infections: Measles, Rubella, Mumps, Diphtheria 2. Intestinal infections: Poliomyelitis, Cholera, Typhoid, Amoebiasis 3. Arthropod infections: Malaria, Filariasis, Dengue 4. Zoonosis: Rabies, Plague, Japanese encephalitis 5. Surface infections: Tetanus, Leprosy, STD AND AIDS.
(15 Hrs)
- Unit – IV** Non-Communicable Diseases: Coronary Heart Disease – Hypertension – Diabetes – Obesity – Blindness – Stroke. Occupational Health Hazards: Physical, Chemical, Mechanical, Biological and Psychological. Mental health: Causes of mental ill-health-alcoholism and Drug dependence.
(15 Hrs)
- Unit – V** Health Education: Health planning in India – Health programmes in India – WHO – Non-governmental Voluntary Health Organizations. First aid and Nursing: Methods – Dressing –care – Duties – Preparations.
(15 Hrs)

Books for Study

1. Park and Park, 1995. Text Book of Preventive and Social Medicine. M/S. Banarsidas Bhanot Publishers, Jabalpur.
2. Verma S. 1998. Medical Zoology, Rastogi Publications, New Delhi.

11. BIOINFORMATICS

Total: 75 Hrs

- Unit – I** Computer networking LAN, WAN, MODEM and Fiber Optics Networks – Introduction to Internet, WWW, NICNET, ERNET, VSNL, ISDN.
(15 hrs)
- Unit – II** Database – Definitions – Biological database – Primary Database (EMBL, Genbank, DDBJ) – Protein Databases (SWISS – PROT, TREMBL, NRL – 3D PIR MIPS); - Secondary databases (PROSITE, Pfam, BLOCKS, PRINTS IDENTIFY) – Composite databases (NRDB, OWL MIPSX); - protein structure databases (PDB, MMDB);
(15 hrs)
- Unit – III** Pair wise alignment – Local and global alignment – BLAST, FASTA, Multiple Sequence Analysis (MSA).
(15 hrs)
- Unit – IV** Evolution of Bioinformatics – Potentials of Bioinformatics – Human Genome Project – Bioinformatics in India – Future in Bioinformatics.
(15 hrs)
- Unit – V** Scope of bioinformatics – Useful bioinformatics sites – Bioinformatics in Pharmaceutical industry – Bioinformatics orientation in IT industry.
(15 hrs)

Books for Reference

1. T.K. Attwood and D.J. Parry – Smith, Introduction to Bioinformatics, Pearson Education Ltd., New Delhi (2004).
2. Arthur M. Lesk, Introduction to Bioinformatics, Oxford University Press, New Delhi (2003).
3. S. Sundara Rajan and R. Balaji, Introduction to Bioinformatics, Himalaya Publishing House – New Delhi (2002).
4. Irfan A. Khan and Atiya Khanum, Emerging trends in Bioinformatics Ukaaz Publications, Andhara Pradesh (2002).

12. FISHERY BIOLOGY

Total: 75 hrs

Objective To make the students acquire knowledge and get jobs in fisheries and other selected departments. To make the student acquire a knowledge of the general aspects of morphology, physiology biochemistry of fishes, crafts and gears for their capture.

Unit – I Fish biology: Introduction, scope and importance- classification up to orders with South Indian examples – South Indian food fishes fresh water, estuarine and marine – fishes
(15 hours)

Unit – II FISHERIES – freshwater fishery, marine fishery - outline of skill fishers, crustacean fishery, molluscs (pearl oyster) fishery – Age and growth- Age determination methods: length frequency, scale, bones, length - weight relationships – reproductive cycle and spawning in Mirgal and Rohu.
(15 hours)

Unit – III Endocrine system in fishes- Hypophysation and induced breeding – Cryopreservation of gametes. Food and nutritional requirements of fishes - synthetic feed.
(15 hours)

Unit – IV Fishing crafts and gears – different types of fishing boats – different types of nets – modern fishing vessels – principles of harvesting, transport and marketing.
(15 hours)

Unit – V Fish preservation techniques – rigormortis chilling, freezing, drying and salting, smoking, canning – Fish by products. Liver oil, fish glue, fish meal etc – Fish diseases: Symptoms and causes of bacterial, Viral, fungal and protozoan diseases.
(15 hours)

Practicals

1. Identification of marine, breeksh and viland fishes (Two insect) South Indian examples)
2. Identification of commonly available ornemsital fishes.
3. Morphometric clasactevs of fishes.
4. Determinations of fish age with scales otolit (frequency distribution method)
5. Length and weight relationship in freshwater and marine fish.
6. Identification of different crafts and gears
7. Identification of fish barasites and diseases.
8. Study of scales of temporary mounting.
9. Visit of fish farms fisheries related institutions.

Books for Study

1. Jingran U.G. 1968. Fish and Fisheries of India, Hindustan publishing company, New Delhi.
2. Shanmugam.K. 1992. Fishery Biology and Aquaculture, Leo pathipegam, Chennai-83.
3. Yadav 1995. Fish and Fisheries, Daya Publishing House, New Delhi.
4. Day. F. 1978. Fishes of India, Vol I and II Williams Danison and Sons.
5. Jayaraman K.C. The Fresh water fishes of Indian Region – Navendra Publishing House, Delhi.
6. Robert, R.J.Sed, 1978. Fish Pathology Ballaire Tridele, London.
7. Khma, 1933 An Introduction to Fishes Central Book Dept, Allahabad.
8. Govindan G.K. Fish processing Technology Oxford IBH publishing Co.