



A CRITICAL REVIEW OF THE F.Y. B.SC. ZOOLOGY THEORY SYLLABUS OF UNIVERSITY OF MUMBAI IMPLEMENTED FROM THE YEAR 2011-12

GOPALAN M.^{1*} AND SABLE S.S.²

¹Department of Zoology, SIES College of Arts, Science and Commerce, Sion- 400 022, Mumbai, MS, India.

²MCT College of Education and Research, Sector- 4, Airoli- 400 708, Navi Mumbai, MS, India.

*Corresponding Author: Email- maddy_gpn@yahoo.com

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Abstract- Syllabus is an integrative component of formal teaching as it unifies the objectives of teaching learning process. Universities all over India have shifted to credit system of education format as it is the need of the hour. In this work, we have compared unit- wise the F.Y. B.Sc. syllabus of University of Mumbai for credit system, with some other universities in the state of Maharashtra and critically reviewed it, certain aspects of the F. Y. B.Sc. syllabus of University of Mumbai have been analysed and we have suggested recommendations based on various needs of learner for any further revision of the syllabus.

Keywords- Mumbai University, Critical review, F.Y. B.Sc. Syllabus, North Maharashtra University, University of Pune, Sant Gadge Baba Amravati University, Zoology

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Introduction

Syllabus is one of the most important aspects of formal teaching learning process. Syllabus is the minimum level of proficiency that a learner must achieve during the course of his learning. Syllabus must however not be considered as the maximum level that a learner should learn during his course. Syllabus framing must be done considering various facts and understanding about the learner viz. his background, previous knowledge and his objective for registering his course. A learner must also understand the short comings of the syllabus.

This paper is a critical study of the First Year B.Sc. Zoology syllabus of the University of Mumbai and a tool to help in future revisions so that students are not at square one at the end of the course but are able to identify their strengths and plan their career.

Background

Syllabus should be designed such that it benefits the learners opting for the subject. Learners are usually classified into who take a course into two classes; ones who look for a vocation after the course and others who pursue higher education in the same field. Newer trends are seen, where students of Science background have pursue management studies, and other fields not related to the core Science, framing of syllabus needs to help all the category of students.

Most syllabi in the University of Mumbai are revised every five years. The revision is a method of incorporating new trends in the

syllabus and keeping the learners updated with the advancement in the field. However, most students and faculty members are of the opinion that the syllabus of Zoology in the University of Mumbai has been undergoing changes but not at the pace of advancement in the field of Biology. Many universities in India have changed the name of the course from Zoology to Animal Sciences and Animal Biotechnology. Does this kind of change actually justify the content or are these cosmetic changes, is a point that needs to be debated.

Keeping up with UGC norms, University of Mumbai has implement credit system from the academic year 2011-12. The Board of Studies of Zoology has incorporated changes in the older syllabus to fit it into the credit system, but what needs to be addressed in the next revision is the applying certain changes such that the learners are better prepared to meet the challenges that they come across in the advanced world of science.

Objectives of the Study

- To study the First year B.Sc. Zoology theory syllabus content of three different Universities in Maharashtra.
- To review the First year B.Sc. Zoology theory syllabus content of three different Universities in Maharashtra.
- To compare the syllabus content of three different Universities with University of Mumbai First Year B.Sc. Zoology theory Syllabus.
- To recommend improvements of course content during the next syllabus review.

Limitation of the Current Article on of First Year B.Sc. Zoology of University of Mumbai

This work is a review only of the theoretic aspects of the syllabus and does not include analysis of practical and internal assessment.

Review of First Year B.Sc. Zoology syllabus offered by some Universities in Maharashtra

Comparative chart of First Year B.Sc. Zoology syllabus offered by some Universities in Maharashtra is provided in [Table-1].

Review of North Maharashtra University, Jalgaon First Year Zoology with effect from 2009 Syllabus

The syllabus is subdivided into two theory papers and a practical based on the theory incorporating both the papers.

Paper I: *Animal Diversity of Non Chordates and Chordates*. The rationale for including the topics are explained in the beginning of the syllabus. The paper begins with the concept of animal diversity and its significance, followed by the other units. Each unit is the study of Phylum and its economic importance of various species. The syllabus encompasses most major phyla in the animal kingdom in two semesters. The last unit of the diversity in animal kingdom in the second semester is based on conservation of endangered species.

Paper II: This component is of *Applied Biology*, the first semester part is on the topic of pest management and the second semester is based on Apiculture. The paper begins with an introduction, objective of the course in applied biology. Pest management is the topic to be covered in first semester. Pest management is divided into nine units. Unit one is introduction to pest, concept, types and classification of pests, unit two is identification, life cycle, nature of damage and control measures of selected pests. Unit three, four and five is based on control measures, primary control, chemical control and biological control of insect pest respectively. Unit six, seven, eight and nine covers integrated pest management, pesticide applications, Preparation and method of application of herbal pesticides and Non - Insect Pest: Rat respectively. Semester two is a study of apiculture, similar to earlier papers this paper also begins with an introduction and reason to the study of apiculture. Unit one is introduction to modern bee keeping, taxonomy and distribution are studied in unit two. Unit three and four are morphology of bee and bee behaviour and communication. Unit five is an extension of bee behaviour- swarming, study of beehive, colony and scientific method of bee keeping. Unit six is the study of beekeeping equipment, unit seven deals with apiculture in agriculture, unit eight and nine deals with honey bee products and difficulties of beekeeping. The final unit is the study of courses and institutes for advance studies in apiculture.

Review of University of Pune, Pune First Year Zoology Syllabus

The first paper begins with the scope of the subject of Zoology, which enlists conventional and contemporary fields. Unit two is based on the concept of classification and two types of system usually followed. The following units are based on classification of each major phylum and certain unique character of the respective phylum. Units 8, 9, 10, 11 and 12 are based on certain characters of the some phyla. The last subunit is type study of the animal frog, different systems of the animal is covered.

The second term syllabus of paper one is brief and deals with the higher phylum of the animal kingdom. Certain unique characteristics of this phylum are discussed of each class with relevant examples.

The first term syllabus of paper two is on genetics. Units start from basic genetics and proceed to human genetics finally end with applications of genetics.

The second term syllabus covers parasitology. This field begins with introduction to parasitology, types of parasites and hosts. Few examples of life cycle of some important animal parasite needs to be studied. The final unit deals with human immune defence mechanism.

Review of Sant Gadge Baba Amravati University (SGBA) First Year Zoology Syllabus

Paper I: *Life and Diversity of Non Chordata* which is divided into six units. Unit one begins with the study of general characters of the each Phylum. The next subunit is called type study last sub unit is based on features of the type animal of parasitic adaptations of the Phylum.

Later units from unit 2 to unit 5 are study of two Phyla. Each Phylum has two subunit dedicated to it first subunit is general characteristics while second subunit is on type study.

Unit six has first subunit as study of Phylum Hemichordata and aspects of the example. Subunit two is study of corals. Subunit three is on parasitic adaptations of helminthes and last subunit is based on larval forms and their significance.

Paper II: *Cell and Development Biology*, the first unit deals with the study of cell types. Subunit two and three are study of cell organelles. Unit two and three are study of ultra-structure of other organelles. Unit three is however a specific study of nucleus and its contents. Unit four is study of cell divisions and types of cell division. Subunit four is based on type's fertilization and mechanism. Unit five is the study of early embryology of model animals. Unit six is a continuation of embryology subunit one is the study of types and function of placenta. Subunit two is based on parthenogenesis. Subunit three is study of regeneration and last subunit is study of certain features of stem cells.

Review of University of Mumbai, Mumbai First Year Zoology Syllabus

Each paper is divided into six units, three units are covered in the first semester and the remaining three in second semester.

Paper I

Sem. I, Unit I: *Diversity of Animal Kingdom I*; the contents of the unit are levels of organization, unicellular and multicellular organisation, triploblastic, acelomates, and pseudocoelomate organisation, the last subunit is triploblastic coelomate organisation.

Sem. I, Unit II: *Life Process I*; is a description of various processes in the animal kingdom; subunits covered are movement and locomotion, nutrition, respiration and circulation.

Sem. I, Unit III: *Ecology*; subunits included are concept of ecosystem, concepts of energy flow, food chain and food web; concept of biogeochemical cycles; human activities affecting biogeochemical cycle and concept of animal interactions.

Sem. II, Unit I: *Diversity of Animal Kingdom II* is triploblastic coelomate organisation, Phylum Hemichordata, Phylum Chordata, and subphylum Vertebrate.

Sem. II, Unit II: *Life Process II*; the other process covered is excretion and osmoregulation, control and coordination, reproduction.

Sem. II, Unit III: *Ethology*; development of behaviour, animal learning are the two subunits covered in this unit.

Paper II

Sem. I, Unit I: *Molecular basis of Life I*, unit covers basic biochemistry. The subunits covered are biological micro and macro molecules, Proteins, and carbohydrates. Each subunit follows simple to complex rule.

Sem. I, Unit II: *Biotechnology I*; subunits making this unit are: - Concept of biotechnology, fundamentals of laboratory techniques in biotechnology, food biotechnology and enzyme technology.

Sem. I, Unit III: *Genetics* covers, gene and gene concept, definition of gene and gene expression. Mendelian inheritance, cytoplasmic inheritance, effect of environment on heredity and Introduction to human genetics.

Semester two of paper two is also made of three units

Sem. II, Unit I: *Molecular basis of Life II*, subunits deals with two macromolecules i.e., are Lipids and Nucleic acids.

Sem. II, Unit II: *Biotechnology II*, the fields covers transgenic animals and animal cloning, biotechnology and gene therapy, environmental biotechnology.

Sem. II, Unit III: *Evolution and Biodiversity*, The subunit of evolution deals in topics from origin of life to evolution at macro scale, while biodiversity subunit begins from definition of diversity to future of evolution.

Comparison of the Syllabus Content of University of Mumbai with other Universities of Maharashtra

University of Mumbai with North Maharashtra University, Jalgaon

The syllabus of both universities is divided into two semesters and each paper of North Maharashtra University is allotted a total of 80 lectures while Mumbai University is allotted 45 lectures.

The first unit of University of Mumbai deals about the classification of animals, and various aspects of the body features and development are included in the study; however North Maharashtra University also is a study of classification, but seems to stress on the classical method of classification and does not include the aspects covered in University of Mumbai. Other units in University of Mumbai syllabus viz. life process I and II, Genetics and evolution, ecology and ethology are not covered in the syllabus.

North Maharashtra University however deals with application biology topics viz. Pest management and Apiculture.

University of Mumbai with of University of Pune, Pune

The syllabus of University of Pune is allotted 85 lectures in the two semesters for paper 1 while paper 2 is allotted 82 lectures. Whereas University of Mumbai syllabus is allotted 90 lectures for each paper in both semesters divided equally. The units covered in paper I are the same but like North Maharashtra University the units of paper I are to be taught in the classical method.

In paper II, Unit on Genetics and parasitology are extensively to be studied are covered in detail in the University of Pune but not in the University of Mumbai syllabus, this is due to the other units in the Mumbai University syllabus like biotechnology biochemistry etc.

University of Mumbai with of University of Sant Gadge Baba Amravati (SGBA) University

In syllabus of SGBA University, each paper is to be covered in a 75-80 lectures. Like university of Pune and North Maharashtra paper I follows the same classical pattern of studying the subject. Whereas

in paper II is a study of cell biology and Developmental Biology both topics are intensively dealt with in the SGBA University.

Analysis of Key Aspects of University of Mumbai F.Y. B.Sc. Syllabus

After reviewing the syllabus of four Universities of Maharashtra the analysis in the following criteria were done regarding to the University of Mumbai [Table-2].

Criteria Related to the Objectives of Teaching

The theory syllabus of F.Y. B.Sc. for the University of Mumbai needs to provide clear objectives of the syllabus or a unit and this has enabled the flexibility is given to individual teacher, however for a university like University of Mumbai that caters to many colleges, it would seem logical to set broad objectives to help the learner and teacher to understand the level of proficiency a student must reach at the end of the course.

Criteria related Learning Experiences and Situations

The theory syllabus of F.Y. B.Sc. for the University of Mumbai, does not list learning experiences for the objectives and a teacher need to frame the same well in advance keeping in mind the broader objectives of the curriculum. The number of time allotted per week are at par with other universities compared in this study, however most classes start at the end of June or early July which makes it difficult to cover syllabus.

The syllabus does not cater to special needs of a student but this aspect is looked into during examination as LD and handicapped students are provided additional hours to answer the question paper.

The syllabi referred in this study provides little scope for project or hobbies as most work require at least laboratory with basic requirements, however the teacher can influence students to take up projects which can be done during free time. The time needed to complete the syllabi is adequate. The University of Mumbai has a syllabus designed so that many of the theory topics are also covered in the practical's, which provides good learning experiences.

The methods or models for teaching have not been mentioned and a teacher needs to device methods for the same.

The syllabi of Mumbai University provide a good list of books and referencing material at the end of each paper.

Criteria Related to Evaluation

The evaluations for internal and external theory papers are mentioned in the syllabus. Since the objectives of the curriculum have not been mentioned the evaluator has freedom to frame his objectives and do justice to the same.

Recommendation for Improvements of Course Content of University of Mumbai

Ordinances with respect to the syllabus and its utility should be provided.

While framing the syllabus the most important aspect is to use pedagogy (Constructivist, Inquiry-based learning, Reciprocal, Learning, action based learning etc.).

Provide broad objective for the syllabus/paper/unit, to aim at the final objective of a Zoology graduate. The syllabus must not only cater to students to planning to study zoology at higher studies but also encourage entrepreneurship skills.

Table 1- Chart of current University Zoology syllabus for the F.Y. B.Sc.

S. No	University	Semester/ Term	Paper	Units
1	North Maharashtra, Jalgaon	I	I - Diversity of Non-Chordates	1. Concept of animal diversity and its significance. 2. Protozoa 3. Porifera 4. Coelenterata 5. Helminthes 6. Annelida 7. Arthropoda 8. Mollusca 9. Echinodermata
		I	II- Pest Management	1. Introduction to Pest 2. Study of selected insect pest with respect to their marks of identification, life cycle, nature of damage and control. 3. Primary Control Measures. 4. Chemical Control 5. Biological Control of Insect Pest 6. Integrated pest management 7. Pesticide-appliances 8. Preparation and method of application of herbal pesticides 9. Non-Insect Pest : Rat
		II	I. Diversity of Chordates	1. Diversity of Chordates 2. Protochordata 3. Cyclostomata 4. Pisces 5. Amphibia 6. Reptilia 7. Aves 8. Mammals 9. Conservation of species
		II	II- Apiculture	1. Introduction of Modern bee keeping 2. Taxonomy, Bee Species and their Distribution 3. Morphology of Honey bee (<i>Apis cerena indica</i>) 4. Bee behavior and Communication 5. Beehive, Swarm and Colony of bees and Scientific bee keeping 6. Beekeeping equipments 7. Apiculture in Agriculture 8. Honeybee products 9. Problems of beekeeping industries
2	University of Pune, Pune	I	I- Nonchordates	1. Scope of Zoology, Introduction to various branches of Zoology 2. Introduction to classification of living organisms. 3. Protista. 4. Porifera 5. Cnidaria 6. Platyhelminthes 7. Annelida 8. General introduction to other invertebrates 9. Shell and pearl formation in Mollusca 10. Bioluminescence in invertebrates 11. Regeneration and autotomy in Echinodermata 12. Mimicry in butterflies
		I	II- Genetics	1. Introduction to genetics 2. Multiple Alleles 3. Gene Interaction 4. Chromosomes

Table 1-Continue..

S. No	University	Semester/ Term	Paper	Units
2	University of Pune, Pune	I	II- Genetics	5. Sex- determination 6. Human genetics 7. Sex linked inheritance in human 8. Cytoplasmic inheritance 9. Application of genetics
		II	I- Chordates	1. Distinctive features and broad classification of Phylum 2. General organization of Cyclostomata 3. Fishes (Pisces) 4. Evolution and adaptive radiation 5. General adaptations for aerial mode of life in birds 6. Egg laying and Marsupial mammals 7. Diversity and adaptive radiation of placental mammals 8. Study of Frog
		II	II- Parasitology	1. Introduction, scope and branches of parasitology 2. Types of parasites 3. Types of hosts 4. Host- parasite relationship 5. Parasitic adaptations 6. Life cycle, pathogenicity and control measures 7. Study of the following parasites with reference to morphology, life cycle, pathogenicity and control measures 8. Human defence mechanism
3	SGBA University, Amravati	I and II	I-Life and Diversity of Non-Chordata	1. Classification of Non-Chordata 2. Phylum Porifera 3. Phylum Platyhelminthes 4. Phylum Annelida 5. Phylum Mollusca 6. Phylum Hemichordata
		I and II	II-Cell And Developmental Biology	1. General organization of Prokaryote and Eukaryote Cell; Ultra structure and functions of Plasma membrane; Ultra structure types and functions of, Endoplasmic reticulum 2. Ultra structure and functions of : Golgi complex; Ribosome; Mitochondria; Lysosomes; 3. Ultra structure and functions of nucleus and nucleolus; Chromosome and its general organization; Structure of Polytene and Lamp brush Chromosome. 4. Cell division; gametogenesis; fertilisation. 5. Cleavage, and development up to coelome formation in Amphioxus, Frog, Chick; Extra embryonic membranes in chick: 6. Placentation in mammals; Parthenogenesis; Regeneration; Stem cells studies
4	University of Mumbai, Mumbai	I	I- Diversity of Animal Kingdom-I, Life Processes-I and Ecology	1. Diversity of Animal Kingdom-I 2. Life Processes-I 3. Ecology
		I	II- Biochemistry-I, Biotechnology -I and Genetics	1. Biochemistry-I 2. Biotechnology-I 3. Genetics
		II	I- Diversity of Animal Kingdom-II, Life Processes-II and Ethology	1. Diversity of Animal Kingdom-II 2. Life Processes-II 3. Ethology
		II	I- Biochemistry-II, Biotechnology -II and Evolution and Biodiversity	1. Biochemistry-II 2. Biotechnology-II 3. Evolution and Biodiversity

Table 2- Comparison of certain aspects of F.Y. B.Sc. syllabus

	NMU, Jalgaon	Pune University, Pune	SGBA University, Amravati	University of Mumbai
Lectures per paper	80+80	85+82	75+80	90+90
Contemporary	Classical	Classical	Classical	Contemporary
Approach	Concentric	Concentric	Concentric	Concentric and Spiral
Focused content	Basic Zoology and Applied Zoology	Basic Zoology and Applied Zoology	Basic Zoology	Basic Zoology and Applied Zoology

Each paper and unit should help learners to reach a level of proficiency in the unit or paper.

Each semester can be divided into modules with unit.

The syllabus can be made in such a manner that hobbies like science writing, photography, movie making etc. and skill based activities can be incorporated to make concept much clearer. Framing a syllabus that does not encourage rote learning but provide proper learning experiences such that learners understand the essence of animal sciences.

The syllabus can incorporate learning models for easier learning.

References provided can incorporate hyperlinks of animations and videos from internet.

Conclusion

Syllabus is known to be one of the neglected aspects of the curriculum, in India not much of research is done in revising syllabus and during revision of syllabus pedagogical approach is neglected. Higher education rests on two main curriculum models: the disciplinary model, and the vocational / professional model. While learners enroll with an exam centered view it is for the educator and the curriculum framers to give the learning experiences to the learners and make the concepts more easily understandable. An attempt is made here to provide few suggestions to the authority/conveners of the syllabus in the University of Mumbai while framing the syllabus during the next revision.

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