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SUBJECT BENCHMARK STATEMENT

IN

ZOOLOGY

Committee of Vice-Chancellors & Directors
and
University Grants Commission
Sri Lanka

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FOREWORD

The work in connection with the development of Subject Benchmark Statements was begun in August 2003 as a part of the overall quality assurance framework that supports academic standards and the furtherance and dissemination of good practice in Universities in Sri Lanka.

Subject Benchmark Statements will support and promote quality and standards by:

- Providing universities with a common and explicit reference point for internal and external programme approval and review;
- Guiding and promoting curriculum development, especially in new departments and new universities, and in other institutions of higher education;
- Evolving over time to take account of changes and innovations that reflect subject development and new expectations;
- Providing an authoritative and widely recognized statement of expectations of what is expected of a graduate in a specific (or designated) subject area in a form readily accessible to students, employers and others with a stake in higher education qualifications;
- Providing a clear and transparent reference point for external examiners;
- Assisting international comparison and competitiveness of higher education awards and student achievement.

SUBJECT BENCHMARK STATEMENT

ZOOLOGY

1. INTRODUCTION

1.1 Subject Benchmark Statement - Scope and Purpose

Subject benchmarking is an essential component of quality assurance in the university system and provides points of reference for external review. This subject benchmark statement in Zoology is intended for undergraduate programmes leading to Bachelor of Science (B.Sc.) degrees with Zoology as a subject, offered by universities in Sri Lanka. It provides general guidelines on the nature, extent and scope of Zoology and the attributes of undergraduates who have read Zoology as a subject.

This benchmark statement outlines the general expectations about the standards that should be achieved at specific levels of attainment as well as the capabilities of those who achieve such standards. As such, it enables the comparison of the expected levels of attainment by graduates of relevant degree programmes offered by the all Sri Lankan universities.

The benchmark statement also provides guidelines for formulating learning outcomes for general and specific areas in Zoology, while enabling variety and flexibility in the design of the programmes, to achieve the skills and competencies required in Zoology. The statement is not intended as a syllabus or a prescription for the amount of time devoted to each specific area in Zoology. It has the provision to be reviewed, updated and revised, as the need arises, to reflect the developments in the subject and the experience of the institutions concerned.

The statement is intended to be valuable to a wide variety of stakeholders, mainly students, parents, employers as well as policy makers and those involved in validation and design of secondary and tertiary level education.

1.2 Level of Teaching

Most universities in Sri Lanka teach Zoology, as a subject in two B. Sc. degree programmes, i.e. a 3-year general degree and a 4-year special degree. The special degree programmes are designed in such a way that core areas and applied areas in Zoology are covered at a greater depth (compared to general degree programme).

1.3 Nature and Extent of Zoology

Zoology is the scientific study of animals and their interactions. Animals play an essential role as consumers in the intricate balance of nature, in both aquatic and terrestrial environments. They are inextricably intertwined in the life of humans and

with the environment, both positively and negatively. Thereby the scope of Zoology is extended into and overlaps with other disciplines such as Medicine, Veterinary Medicine, Agriculture and Environmental Science.

Zoology includes a wide range of core areas, which includes Cell Biology, Genetics, Developmental Biology, Anatomy, Physiology, Ecology and Behaviour, Taxonomy and Evolution. It can also be perceived as including several areas of specializations that focus on particular animal groups, such as Entomology, Ichthyology, Ornithology and areas that specialize in applied aspects such as Conservation Biology, Aquaculture, Parasitology, Pest Management and Immunology. Zoology also contributes significantly to some rapidly developing and modern areas such as Molecular Biology, Biotechnology and Bioinformatics. As such, Zoology is a multidisciplinary subject with strong practical, experimental and field components. Consequently, integration of basic principles and concepts, theoretical knowledge, practical and laboratory skills, field techniques, hypothesis formulation and testing, group work, problem-based learning, numeracy and Information and Communication Technology skills are essential components of the education required of a Zoology graduate.

1.4 Scope for Employment of Zoology Graduates

Graduates who study Zoology at either General or Special degree level, can enter the employment market in various sectors. Main employment sectors include:

- State and private, secondary and tertiary level institutes of education;
- Research laboratories in universities and institutes such as Coconut, Rubber, Tea, Sugarcane and Medical Research Institutes, Institute of Fundamental Studies, Industrial Technology Institute and National Aquatic Resources Research and Development Agency;
- Pathology laboratories in state and private hospitals and diagnostic clinics;
- Government Ministries dealing with subjects of Science and Technology, Education, Agriculture, Fisheries and Aquaculture, Environment, Forestry, Wild Life Conservation, Health, Small and Medium scale enterprises, Animal quarantine, Import and Export;
- Organizations involved in the ornamental fish and plant industries, food processing and export, ecotourism and pest control;
- Private sector and Non Governmental Organizations that offer consultancy services in environmental management, biodiversity assessment and conservation, environmental education and awareness and rural development;
- International organizations such as IUCN, IWMI, World Bank and UN that are involved in programmes related to biodiversity conservation, environmental monitoring and development projects;
- Sri Lanka Administrative Service and Sri Lanka Foreign Service;
- Self-employment (Entrepreneurship).

2. KNOWLEDGE, UNDERSTANDING, SKILLS AND ATTITUDES

In order to achieve a holistic view of Zoology, the degree programmes, at either general or special level, should cover a core curriculum together with other subject areas, to ensure that the necessary knowledge and understanding are gained and skills and attitudes are developed by the programme. It is recognized that the variety and flexibility of the specific content of the curriculum should suit the nature and objectives of each programme.

Special degree programmes in Zoology should include courses that cover core areas at a greater depth and courses in applied aspects in Zoology. In addition to the theory and practical courses offered, students in special degree programmes are required to carry out a research project, submit a report in the format of a dissertation and make an oral presentation based on the project.

2.1 Subject Knowledge and Understanding

To ensure wider/broader coverage of Zoology, the degree programmes should include

- the following core areas of Zoology
 - Genetics and Cell Biology;
 - Development, Form and Function of Animals;
 - Animal Diversity, Taxonomy and Evolution;
 - Ecology;
 - Animal Behaviour/Ethology;
- Other specialized areas, based on the nature, objectives and requirements of the programme;
- Major concepts, principles, theories and subject knowledge of chosen areas in Zoology;
- Zoological terminology, nomenclature and classification systems, as appropriate;
- An interdisciplinary approach towards understanding the biological processes and mechanisms, from molecular to community level;
- Methods of gathering, sorting/collating, interpreting and analysing (using statistical and computer applications where appropriate) information related to Zoology.

Further, the degree programmes should also provide

- An integration of theoretical knowledge with practical, experimental and field applications and techniques;
- An awareness of the applicability of Zoological information in the 'real world'.

2.2 Skills

The degree programme in Zoology should attempt to develop generic as well as subject specific skills in a graduate.

2.2.a Generic Skills

The generic skills should include the following:

- Ability to extract information from appropriate sources of literature;
- Ability to critically assess the information gathered and relate them to appropriate situations;
- Analytical Skills;
- Comprehension and Synthesis Skills;
- Interpersonal and Teamwork Skills;
- Leadership Skills;
- Communication/Presentation Skills (Oral and Written);
- Ability to adapt to varying situations and take up new challenges;
- Competence in Mother Tongue and English;
- Problem Solving Skills;
- Ability to think and work independently;
- Quantitative Reasoning and IT Skills;
- Self Management and Professional Development Skills;

2.2.b Subject Specific Skills

The subject specific skills should include the following:

- Scientific thinking ability to analyse a problem using scientific methods;
- Ability to apply acquired subject knowledge to the broader social and environmental aspects, with special reference to Sri Lanka;
- Ability to undertake laboratory and/or field investigations in a safe, responsible and ethical manner and to be able to design, conduct, observe, collect, analyse, interpret data and present the findings;
- A working knowledge of taxonomy and biology of animals;

2.3 ATTITUDES

A balanced view of ethical aspects relating to (professional) honesty and integrity, to the study and use of animals as test subjects, appreciation and conservation of nature in relation to economic and social development issues of the country, should be an essential component of any degree programme in Zoology. However, the difficulties in assessing such attitudes in students should be noted.

2.3.a Ethical Aspects

- Ethics of (professional) conduct in relation to honesty and integrity (during examination/assessment, report writing, take home examinations etc.) and plagiarism;
- Ethics of nature conservation;
- Ethical issues related to the use of live animals in experimentation;
- Ethical issues that is consequent to new technologies & modern developments, such as cloning, transgenic animals, use of stem cells etc.

2.3.b Appreciation and Conservation of Nature

- Fostering appreciation of the value of nature;
- Understanding of issues relating to conservation of nature/biodiversity, on the one hand and development and progress of the country on the other hand.

3. TEACHING AND LEARNING STRATEGIES

The teaching and learning strategies in Zoology should be aimed at equipping the students with the progressive acquisition of the subject knowledge and skills, and encouraging them to change from study methods of a dependent learner to those of an independent learner, as the programme advances.

The teaching and learning strategies should be adaptable to changes in philosophy and advances in science and technology.

The heavy dependence of Zoology related studies on empirical research requires teaching and learning strategies that emphasize field work so as to provide opportunities for the students to apply the theoretical, technical and scientific knowledge and laboratory methods to the complex real life situations in the environment

The teaching and learning strategies in Zoology should also provide guidance and direction to students on developing the ability to conduct scientific investigations and report/communicate/disseminate the findings in a scientific manner.

The choice of strategies should also motivate and challenge the students. This requires a skilled and balanced combination of teaching and learning methodologies such as:

- Lectures
- Tutorials and Assignments
- Laboratory Exercises/Field Exercises
- Field Excursions/Studies
- Independent Laboratory and Field Investigations/Projects
- Seminars/Discussions/Workshops
- Distance Learning Methodologies using Multiple Media:
 - Print based material
 - Audio visual aids
 - Interactive CD ROMs
 - E-learning
- Directed Reading
- Invited Lectures by Experts from Professional Organizations and Other Institutions
- Group Activities
- Work Experience/Individual Training
- Case Studies

This list is neither prescriptive nor exhaustive.

4. ASSESSMENT METHODS

Assessment should be aligned with the teaching and learning strategies employed and the expected learning outcomes of each course. They should be designed to test subject knowledge and understanding as well as the skills and competencies that are expected of a graduate in Zoology. A combination of assessments methods may be used, depending on the attributes to be tested. Wherever possible, students should be given feedback on their performance and attainment.

The following methods may be used:

- Written Examinations Closed and/or Open Book
- Continuous Assessments
- Viva Voce Examinations
- Assignments
- Practical Examinations
- Field Reports
- Project Reports
- Critical Analysis of Case Studies
- Presentations Oral, Poster, Audio-Visual
- Take Home Assignments
- Peer Assessments
- Work Experience/Industrial Training Reports
- Web Based/Computer Based Assignments/Examinations

This list is neither prescriptive nor exhaustive.

5. MAINTENANCE OF STANDARDS

Quality assurance of curricula, teaching and learning methodology and relevant procedures should be ensured through mechanisms such as:

- Departmental Reviews
- Peer Evaluations
- Student Evaluations
- Tracer Studies

Quality assurance of assessments must be ensured through mechanisms such as:

- Moderation of Question Papers
- Second Marking of Answer Scripts
- Assessment by External Examiners

6. LEVELS OF ACHIEVEMENT

The achievement expected of graduates in Zoology relate to generic and subject specific skills and knowledge. Two levels of achievement have been identified as threshold level and good level.

Threshold Level: This is the minimum acceptable standard or benchmark, which is expected to be achieved by a graduate.

Good Level: This level describes the standard or benchmark which is expected to be achieved by a graduate who obtains a second-class upper division or first class.

Benchmark standards for the achievement at the threshold level and good level are defined separately for the three year general degree programme and for the four year special degree programme. The special degree graduate is expected to achieve the required standards in specific areas in addition to those expected of a general degree graduate.

6.1 B. Sc. General degree

Threshold Level

A graduate should:

- be able to think scientifically and apply this thinking in all activities and situations;
- be able to access zoological information from a variety of sources and communicate the principles and related areas of study;
- demonstrate basic knowledge and appreciation of Cell Biology, Genetics, Ecology, Evolution and the Diversity, Development, Form and Function and Behaviour of animals;
- demonstrate basic knowledge and appreciation of biological and zoological phenomena from molecular level to the level of the biosphere;
- be knowledgeable in basic practical skills & field techniques;
- be able to develop basic strategies to update knowledge in Biosciences and Zoology;
- have a balanced attitude towards nature, life and ethics, making a good and responsible citizen contributing to national development.

Good Level

A graduate should:

- be able to think scientifically and apply this thinking in all activities and situations;
- be able to access and evaluate zoological information and communicate the principles in a well- organized manner;
- demonstrate in depth knowledge, comprehension and appreciation of Cell Biology, Genetics, Ecology, Evolution and the Diversity, Development, Form and Function and Behaviour of animals;
- demonstrate in depth knowledge, an understanding and appreciation of biological and zoological phenomena from molecular level to the level of the biosphere;
- have competency in basic and applied practical skills & field techniques;
- have well developed strategies for updating and enhancing knowledge in Biosciences and Zoology;

- have a balanced attitude towards nature, life and ethics, making a good and responsible citizen contributing to national development;

6.2 B. Sc. Special degree

Threshold Level

A graduate should:

- be able to think scientifically and apply this thinking in all activities and situations;
- be able to access zoological information from a variety of sources and communicate the principles and related areas of study;
- demonstrate knowledge and appreciation of Cell Biology, Genetics, Ecology, Evolution and the Diversity, Development, Form and Function and Behaviour of animals;
- demonstrate knowledge and appreciation of biological and zoological phenomena from molecular level to the level of the biosphere;
- be knowledgeable in basic practical skills & field techniques;
- be able to develop basic strategies to update knowledge in Biosciences and Zoology;
- have a balanced attitude towards nature, life and ethics, making a good and responsible citizen contributing to national development;
- be able to plan and execute a project, which illustrates good time management and achieve the targets;
- have the ability to collect, analyse and interpret zoological data and test a hypothesis;
- be able to record, quantitative and qualitative data accurately and analyse the data using appropriate statistical methods and interprets results;
- have knowledge of the advances in the Biosciences and the related ethical issues along with their impacts on society.

Good Level

A graduate should:

- be able to think scientifically and apply this thinking in all activities and situations;
- be able to access and evaluate zoological information and communicate the principles in a well-organized manner, recognizing the current hypotheses;
- demonstrate in depth knowledge, comprehension and appreciation of Cell Biology, Genetics, Ecology, Evolution and the Diversity, Development, Form and Function and Behaviour of animals;
- demonstrate in depth knowledge, understanding and appreciation of biological and zoological phenomena from molecular level to the level of the biosphere;
- have competency in basic and advanced practical skills & field techniques;
- have well developed strategies for updating and enhancing knowledge in Biosciences and Zoology;
- have a balanced attitude towards nature, life and ethics, making a good and responsible citizen contributing to national development;

- be able to independently plan and execute a project, which illustrates good time management and achieve the targets, demonstrating problem solving abilities while being critically aware of the quality of data;
- be proficient in appropriate techniques and skills relevant to zoological research including the ability to place the work in context and suggest directions for further research;
- be able to record, quantitative and qualitative data accurately and analyse the data using appropriate statistical methods and interpret results logically;
- be able to defend one's position on the advances in Biosciences and the related ethical issues and their impacts on society.

APPENDIX 1 - MEMBERS OF THE BENCHMARKING PANEL

1.	Prof. Nalini Ratnasiri (Chair)	The Open University of Sri Lanka
2.	Dr. Priyanthi Chandrananda	The Open University of Sri Lanka
3.	Mrs. Dilrukshi de Silva (Rapporteur)	University of Colombo
4.	Dr. Meena Dharmaretnam	Eastern University of Sri Lanka
5.	Prof. Amaramali Jayatunge	University of Colombo
6.	Dr. Padmini Krishnarajah	University of Jaffna
7.	Prof. Asoka Pathiratne	University of Kelaniya
8.	Prof. Swarna Piyasiri	University of Sri Jayewardenapura
9.	Prof. Upali Amerasinghe	University of Kelaniya
10.	Prof. W.D. Ratnasooriya	University of Colombo
11.	Dr. Hemantha Wegiriya	University of Ruhuna
12.	Prof. Jayantha Wijeyaratne	University of Kelaniya