

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY



CIRCULAR NO.SU/Sci./M.Sc.Zoology/73/2022

It is hereby inform to all concerned that, the syllabus prepared by the Board of Studies in Zoology and recommended by the Dean, Faculty of Science & Technology the Hon'ble Vice-Chancellor has accepted the **Revised Syllabus of M.Sc. Zoology Ist semester for affiliated Colleges and University Department** in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as appended herewith.

This shall be effective from the Academic Year 2021-22 and onwards.

All concerned are requested to note the contents of this circular and bring notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.No. SU/Sci/2022/6438
Date:- 07.01.2022.

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[Signature]
**Deputy Registrar,
Academic Section.**

Copy forwarded with compliments to :-

- 1] **The Principal of all concerned affiliated Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,
- 2] **Head of the Department, Department of Zoology,**
Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
- 3] **The Director, University Network & Information Centre, UNIC,**
with a request to upload this Circular on University Website.

Copy to :-

- 1] The Director, Board of Examinations & Evaluation, Dr. BAMU, A'bad.
- 2] The Section Officer, [M.Sc. Unit] Examination Branch, Dr. BAMU, A'bad.
- 3] The Programmer [Computer Unit-1] Examinations, Dr. BAMU, A'bad.
- 4] The Programmer [Computer Unit-2] Examinations, Dr. BAMU, A'bad.
- 5] The In-charge, [E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr. BAMU, A'bad.
- 6] The Public Relation Officer, Dr. BAMU, A'bad.
- 7] The Record Keeper, Dr. BAMU, A'bad.

Dr. Babasaheb Ambedkar Marathwada University
Aurangabad - 431 004

Choice Based Credit System [CBCS]



Curriculum of PG ZOOLOGY
For University Department and colleges.

M. S. Chavhan
28/12/21
chairman
BOS in zoology.

[Signature]
29/12/21
Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

Dr. Babasaheb Ambedkar Marathwada University,
Aurangabad Department of Zoology

M. Sc. First Year (Semester – I)

M. Sc. First Year (Semester – I)						
Course	Theory course					
	Paper code	Paper nomenclature	Credit	Work Load hrs		Max/Min Marks
				Per week	Per term	
Core Course	ZOO-101	Biosytematics and Animal Diversity	4	4	60	100/40
	ZOO-102	Biochemistry	4	4	60	100/40
	ZOO-103	Ecology : Principles and practices	4	4	60	100/40
Research component	ZOO-104	Research Methodology	2	2	30	50/20
Elective Courses (ANY ONE)	ZOO-105	Helminthology - I	4	4	60	100/40
	ZOO-106	Protozoology – I	4	4	60	100/40
	ZOO-107	Entomology – I	4	4	60	100/40
	ZOO-108	Endocrinology - I	4	4	60	100/40
Compulsory course		Constitution of India	2	2	30	50/20
		Total Credit	20	20	300	500/200
Practical course						
Paper code	Practical	Credit	Work Load hrs		Max./Min Mark	
			Per week	per Term		
ZOO -109	Practical based on ZOO-101	2	4	60	50/20	
ZOO-110	Practical based on ZOO-102	2	4	60	50/20	
ZOO-111	Practical based on ZOO-103	2	4	60	50/20	
ZOO-112	Practical based on ZOO- 105	2	4	60	50/20	
ZOO-113	Practical based on ZOO-106	2	4	60	50/20	
ZOO-114	Practical based on ZOO-107	2	4	60	50/20	
ZOO-115	Practical based on ZOO-108	2	4	60	50/20	
	Total Credit	8	16	240	200	

Mahesh
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Dean
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University, Aurangabad

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Department of Zoology

M. Sc. Ist Year Semester – II

Course	Theory course					
	Paper code	Paper nomenclature	Credit	Work Load hrs		Max/Min Marks
				Per week	Per term	
Core Course	ZOO-201	Genetics and Bioinformatics	4	4	60	100/40
	ZOO-202	Cell and Molecular Biology	4	4	60	100/40
	ZOO-203	Biophysics	4	4	60	100/40
Research Component	ZOO-204	Scientific Writing	2	2	30	50/20
Elective Courses (Any ONE)	ZOO-205	Helminthology – II	4	4	60	100/40
	ZOO-206	Protozoology – II	4	4	60	100/40
	ZOO-207	Entomology – II	4	4	60	100/40
	ZOO-208	Endocrinology - II	4	4	60	100/40
		Total Credit	18	18	270	450/180
Practical course						
Paper code	Practical	Credits	Work Load hrs		Max./Min Mark	
			Per week	Per Term		
ZOO-209	Practical based on ZOO-201	2	4	60	50/20	
ZOO-210	Practical based on ZOO-202	2	4	60	50/20	
ZOO-211	Practical based on ZOO-203	2	4	60	50/20	
ZOO-212	Practical based on ZOO- 205	2	4	60	50/20	
ZOO-213	Practical based on ZOO-206	2	4	60	50/20	
ZOO-214	Practical based on ZOO-207	2	4	60	50/20	
ZOO-215	Practical based on ZOO-208	2	4	60	50/20	
Total Credit		8	16	240	200/80	

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BIOSYSTEMATICS AND ANIMAL DIVERSITY- ZOO-101

60 Hours 4hrs/week
48Hours -L , 12h -T

Credit -4

Learning Objectives:

- To give a thorough understanding in the principles and practice of systematic
- To help students acquire an in-depth knowledge on the diversity and relationships in animal world
- To develop an holistic appreciation on the phylogeny and adaptations in animals

Learning Outcome:

- The students will learn the basic principle and practices used in systematics.
- The students will learn and understand the diversity in animal world and their adaptations.
- The students will learn about the phylogeny, the tools and salient features of taxonomic publications.

BIOSYSTEMATICS

20hrs

UNIT I: Concepts Biological Classification and techniques in systematic 10 hrs.

Hierarchy of categories and higher taxa. Taxonomic Procedures-collection, preservation, curation and process of identification.

Taxonomic characters of different kinds-quantitative and qualitative analysis of variation, Process of typification, different zoological types and their significance.

Three Domain Concept in Systematics, two, five and six kingdom classification. Concept of species-taxonomic diversity within species.

Molecular Phylogeny-use of Proteins, DNA and RNA. Phylogenetic trees.

UNIT II: Methods of Biosystematics and Taxonomic publication 10 hrs.

Classical and modern Methods-Typological, Phenetics, Evolutionary, Phylogenetic, Cladistics and Molecular Taxonomy. Phylocode, Tree of Life and Bar-coding of Life.

Keys, types, use of keys, merits and demerits. International Code of Zoological Nomenclature(ICZN), Rules and formation of Scientific names of different taxa. Homonymy and Synonymy.

Ethics in taxonomy- authorship, suppression of data, undesirable practices in taxonomy.

ANIMAL DIVERSITY

40hrs.

UNIT III: Protista, Multi-cellularity and lower Metazoans

Introduction- Protista, Multi-cellularity and lower Metazoans

10 Hrs.

Origin of Protista. Prokaryotes and Eukaryotes. Levels of organization in animal kingdom.

Edicaran and Burgess Shale fauna. Cambrian explosion-causes and consequences. Cropping and Red Queen principle. Possible theories of metazoan origin.

Symmetry, Coelom and Metamerism-evolutionary advantages.

Porifera, Cnidaria-Polymorphism, Ctenophora, Acoelomata, Placozoa, Mesozoa and Pseudo-coelomata-evolutionary relationships and adaptive modifications only.

UNIT IV:

1. Protostomes; Deuterostomes; Lesser Protostomes and Echinodermata

10hrs.

Phylogenetic position of Molluscs, Adaptive Radiation in Molluscs and Annelids. Phylogeny of Arthropod-Monophyly and Polyphyly, Reasons for the success of Arthropods. Major classes under Arthropoda and adaptive radiation. Sipuncula, Echiura, Phoronida, Brachipoda, Onychophora and Chaetognatha- Phylogeny only. Classification and adaptive radiation.

2. Hemichordates and Ancestry of Chordates

10hrs.

Position in the animal kingdom, phylogeny and evolutionary significance. Cephalo-chordates and Urochordates. Vertebrate Phylogeny-Agnatha, Ostracoderms and Gnathostomes-Placoderms, Acanthodians, Chondrichthyes and Osteichthyes. Structural and Functional adaptations of fishes.

UNIT V : Terrestrial Vertebrates - Birds and Mammals

10hrs.

Tetrapod phylogeny - modern Amphibians, diversity, distribution, status and threats. Reptiles—origin and adaptive radiation. Skull of reptiles and its importance in biosystematics. Mesozoic world of reptiles and extinction. Origin of birds and mammals. Structural and functional modifications for aerial life. Orders under class Aves. Class Mammalia: Prototheria, Metatheria and Eutheria. Phylogeny of Mammalian orders. Adaptive radiation in mammals.

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- Narendran, T.C. 2008. *An introduction to Taxonomy*. Zoological survey of India.
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- Romer, A.S. and T.S. Parsons. 1985. *The Vertebrate Body*. (6th edn.) Saunders, Philadelphia.

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- Young, J. Z. 1950. *Life of Vertebrates*. Clarendon Press, Oxford, UK.

BIOCHEMISTRY - ZOO-102

60 Hours (4hrs/week)

48 Hours -L, 12 Hours -T

Credit-4

Learning Objectives:

- To understand the chemical nature of life and life process
- To provide an idea on structure and functioning of biologically important molecules
- To generate an interest in the subject and help students explore the new developments in biochemistry

Learning Outcome:

- The students will learn the basic structure, reactions of the biomolecules.
- The students will learn the distribution of these biomolecules in animals and their role in life processes.
- The students will learn the general major metabolic pathways and lesser known pathways, in relation to metabolic diseases.

UNIT I – 1. Introduction

2hrs.

Atoms, molecules and chemical bonds, pH and acid-base balance. Buffers-biological importance. Water: structure, solvent properties, biological importance.

2. Carbohydrates

6hrs.

- 1.Recapitulation of classification and nomenclature of carbohydrate; monosaccharide Glucose,fructose, galactose, mannose and ribose, and Disaccharides: Sucrose , Lactose , Maltose, Isomaltose, Cellobiose, and Trehalose.Biologicalimportance.
- 2.Structural representations of sugars-Acetal and hemiacetal, ketal and hemi-ketal linkages,
- 3.Isomerism-structural isomerism and stereoisomerism, optical isomerism, epimerism and anomerism. Mutarotation and inversion of sugars.
4. Reactions of monosaccharides: Oxidation, reduction, ester formation, osazone formation. Glycosidic bond.
- 5.Polysaccharides: Homopolysaccharides- Starch, Glycogen, Cellulose, Chitin, Dextrans, Inulin, Pectin.
6. Heteropolysaccharides- Hyaluronic acid, Heparin, Chondroitin sulphate, Keratin sulphate, Dermatan sulphateand Agar-agar. Glycoproteins and Mucoproteins.

UNIT II - 1. Lipids

6hrs.

1. Recapitulation of Classification of lipids: simple, compound and derived lipids. Biological importance of lipids. Fatty acids: classification, nomenclature.
- 2.Simplefats:Triacylglycerol(Triglycerides)-Physicalproperties.Reactions-Hydrolysis,Saponification, Rancidity.Acidnumber,Saponificationnumber,Iodinenumbers,PolenskenumberandReichert-Meisslnumberoflipids.Waxes.
- 3.Compound lipids: Phospholipids- Lecithin, Phosphatidyl inositol, Cephalins, Plasmalogens. Glycolipids, Sphingolipids. Derived Lipids, Steroids: Biologically important steroids-cholesterol, Vitamin D,Bile acids, Ergosterol, Terpenes, Lipoproteins.
- 4.Prostaglandins- structure, types, synthesis and functions.

2. Proteins

6hrs.

1. Recapitulation of Structure, classification and Propertiesofaminoacids.Amphotericpropertiesofaminoacids.Peptidebondformationandpeptides.
2. Reactions(duetocarboxyl group,aminogroupandsidechains).Primary structure of protein (e.g. insulin).
3. Classification and properties of proteins. Conformation of proteins-chemical bonds involved,
- 4.Secondarystructure- alpha helix,Collagen helix, Beta

Pleated sheet, Ramachandran angles and Ramachandran map.

5. Fibrous proteins-examples (Keratin, Collagen, Elastin, Resilin, Fibrous muscle proteins). Chaperons.

6. Tertiary structure-e.g. Myoglobin. Quaternary structure-e.g. Haemoglobin.

UNIT III: 1. Nucleic Acids

6 hrs.

1. Recapitulation of Structure of nucleic acids and nucleotides: Structural organization of DNA (Watson-Crick model). Characteristic features of A, B, C and Z DNA.

2. Structural organization of tRNA; Protein-nucleic acid interaction.

DNA regulatory proteins, folding motifs, conformational flexibility, denaturation, renaturation.

3. Biological roles of nucleotides and nucleic acids.

2. Enzymes

8 hrs.

1. Classification- (I.U.B. system), Enzyme specificity. Mode of action of enzymes. Formation of enzyme substrate complex. Lowering of activation energy, Various theories, Active site, co-enzymes, iso-enzymes

2. Enzyme kinetics: Michaelis-Menten equation. K_m value and its significance. Enzyme velocity and factors influencing enzyme velocity. Kinetics of enzyme inhibition, suicide inhibition and feedback inhibition.

3. Enzyme regulation: Allosteric regulation- Key enzymes, Covalent modification. Enzyme engineering.

UNIT IV: 1. Carbohydrate Metabolism

6 hrs.

1. Major metabolic pathways-Glycolysis-Fate of pyruvate. Citric acid cycle and its significance; Central role of citric acid cycle. Oxidative and substrate level phosphorylation. Gluconeogenesis, Cori cycle.

2. Glycogen metabolism-Glycogenesis, Glycogenolysis, Adenylate cascade system, Ca^{+2} Calmodulin-sensitive phosphorylase kinase. Regulation of glycogen synthesis.

3. Minor metabolic pathways of carbohydrates: Pentose Phosphate pathway, Glucuronic acid metabolism, Galactose metabolism. Inborn errors associated with carbohydrate metabolism.

4. Glycogen storage diseases, Lactose intolerance, Galactosuria.

2. Metabolism of Proteins

8 hrs.

1. Amino acid Metabolism-Deamination, Transamination and Trans-deamination. Formation and disposal of ammonia.

2. Urea cycle. Fate of carbon skeletons of amino acids: glucogenic, ketogenic, partly glucogenic and ketogenic with examples.

3. Synthesis of biologically significant compounds from different amino acids with special reference to glycine, glutamic acid, phenylalanine, tyrosine and tryptophan.

UNIT V: 1. Metabolism of Lipids

6 hrs.

Beta oxidation. Metabolism of cholesterol, synthesis and its regulation. Biosynthesis of triglycerides. Metabolism of ketone bodies-Ketogenesis, Ketolysis, Ketosis.

2. Nucleic Acid and Mineral Metabolism

6 hrs.

Catabolism of purines and pyrimidines.

Major and minor nutrients. Role of Calcium, Phosphorus, Magnesium, Sodium, Potassium, Chloride, Sulphur and Iron.

Free radicals and antioxidants, Generation of free radicals. Reactive oxygen species. Free radical scavenger systems. Lipid peroxidation. Preventive antioxidants.

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- Zubay, G. 1989. *Biochemistry*. McMillan Publishing house Publishing Co., New York.

**60Hours(4hrs/week)
48Hours L, 12hours -T**

Credit-4

Learning Objectives:

- To provide an understanding on the basic theories and principles of ecology
- To help study various disciplines in ecology
- To learn current environmental issues based on ecological principles
- To gain critical understanding on human influence on environment

Learning outcome

- The students will learn the theories that governs the principles of ecology.
- The students will learn the various aspects of ecology, and their immediate practices in day to day life.
- The students will learn the environmental issues at local, national and global level.
- The students will understand the how the human influence and living deteriorate the environment and will understand about the sustainability.

UNIT I : Ecology and Environment & Ecosystem-Structure and Function

15hrs.

Physical Environment-biotic and abiotic interactions. Concept of Homeostasis; concepts of habitats- host as habitat, niche, niche width and overlap, fundamental and realized niche, resource partitioning, character displacement.

Ecosystem and Landscapes, pathways in ecosystem, energy in the environment-Laws of thermodynamics, Cybernetic nature of ecosystem, and Gaia hypothesis

Energy flow in the ecosystem. Primary productivity, Biomass and productivity measurement. Food chain, food web, trophic levels. Ecological efficiencies, Ecological pyramids, Biogeochemical cycles-patterns and types (CNP).

UNIT II : Population and Community Ecology

15hrs.

Population group properties, density and indices of relative abundance, Concept of rate. Natality and mortality. Population age structure, Growth forms and concept of carrying capacity.

Population fluctuations, density dependent and density independent controls. Life history strategies, r & K selection.

Population structure, aggregation, Allee's principle, isolation, dispersal and territoriality.

Population interactions-types, positive and negative, interspecific and intraspecific interactions. Ecological and evolutionary effects of competition.

Concept of community-community structure and attributes, ecotone and edge effect. Development and evolution of the ecosystem, concept of climax.

UNIT III

Resource Ecology 10hrs.

Natural Resources: Soil-soil formation, physical and chemical properties of soil. Significance of soil fertility. Mineral resources with reference to India. Impact of mining on environment; Forest resources- deforestation, forest scenario of India. Aquatic resources-Freshwater and water scarcity, water conservation measures-case studies from India; Wetlands and its importance, international

initiatives for wetland conservation-Ramsar sites. Sand mining and its impacts. Wetland reclamation-causes and consequences. Depletion of resources and impacts on quality of life.

Energy Resources-solar, fossil fuels, hydro, tidal, wind, geothermal and nuclear. Energy use pattern in different parts of the world, recent issues in energy production and utilization; Energy audit, Green technology and sustainable development.

Ecosystem monitoring- GIS, Physics of remote sensing, role of remote sensing in ecology, GPS and its application; EIA- tools and techniques, Ecosystem Modelling (Brief account only).

UNIT IV : Applied Ecology

10hrs.

Environmental Pollution mitigation at international level, International protocols, Concept of waste, types and sources of solid wastes including e-waste; Environmental biotechnology and solid waste management-aerobic and anaerobic systems. Concept of bioreactors in waste management. Liquid wastes and sewage. Bioremediation-need and scope of bioremediation in cleaning up of environment. Phytoremediation, bio-augmentation, biofilms, biofilters, bioscrubbers and trickling filters.

Radiation Biology-natural and man-made sources of radioactive pollution; radioisotopes of ecological importance; effects of radioactive pollution; nuclear disasters(two case studies), Disposal of radioactive wastes. Weak radiation LF-EMF.

UNIT V :

Biogeography and Conservation

10hrs.

Major terrestrial Biomes, theory of island biogeography, bio-geographical zones of India; Western Ghats and its significance, Hot- Spots in India

Restoration Ecology- need and policies, case studies and success stories - global and national;

Global environmental problems and debates-past and present; Participatory resource management, community reserves, sacred groves, bio villages.

REFERENCES

Abbasi, S.A. and Ramasami, E.V.1998. *Biotechnological Methods of Pollution Control*. Oxford University Press, Hyderabad.

Benton, A.H. and Werner, W.E. 1976. *Field Biology and Ecology*. Tata McGraw Hill, New Delhi.

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H.R., Berg, L.R., and Hassenzahl, D.M. 2008. *Environment*. (5th edn.). John Wiley Publishers.

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RESEARCH METHODOLOGY ZOO-104

30 Hrs (2 Hrs/Week)

Credit 2

15Hours L, 15 Hours - T

Learning Objectives:

- To understand some basic concepts of research and its methodologies
- Identify appropriate research problem and parameters
- Prepare a project proposal
- To organize and conduct research in a more appropriate manner
- Write a research report/ proposal and thesis.

Learning Outcome

- The students will learn about the concepts of research with reference to life sciences.
- The students will learn about the research problems and parameters involved.
- The students will learn to prepare a research project proposal.
- The student will learn to write a research report, dissertation and thesis.

UNIT I

I. Science and Life Sciences

4hrs.

Basic concepts-Knowledge, Information and Data-Science, Pseudoscience. Life Science- Definition, Laws, Characteristics.

Scientific temper, Empiricism, Rationalism and Units of measurements.

II. Concepts of Research

4hrs.

Basic concepts of research -Meaning, Objectives, Motivation and Approaches.

Types of Research (Descriptive/Analytical, Applied/Fundamental, Quantitative/Qualitative, Conceptual/ Empirical).

Research methods versus Methodology, Research and scientific method. Research Process.

UNIT II

III. Research Formulation

6hrs.

Research formulation -Observation and Facts, Prediction and explanation, Induction, Deduction. Defining and formulating the search problem, Selecting the problem and necessity of defining the problem.

Literature review-Importance of literature reviewing in defining a problem, Critical literature review, Identifying gap areas from literature review.

Hypothesis -Null and alternate hypothesis and testing of hypothesis -Theory, Principle, Law and Canon.

IV. Research Designs

4hrs.

Research Design-Basic principles, Meaning, Need and features of good design, Important concepts. Types of research designs.

Development of a search plan-Exploration, Description, Diagnosis, Experimentation, determining experimental and sample designs.

Data collection techniques.

UNIT III

V. Scientific Documentation and Communication

4hrs.

Project proposal writing, Research report writing (Thesis and dissertations, Research articles, Oral communications).

Presentation techniques - Assignment, Seminar, Debate, Workshop, Colloquium, Conference.

VI. Information Science, Extension and Ethics

8hrs.

Sources of Information - Primary and secondary sources.

Library-books, journals, periodicals, reference sources, abstracting and indexing sources, Reviews, Treatise, Monographs, Patents.

Internet-Search engines and software, Online libraries, e-Books, e-Encyclopedia, TEDTalk, Institutional Websites.

Intellectual Property Rights - Copy right, Designs, Patents, Trademarks, Geographical indications. Safety and precaution-ISO standards for safety, Lab protocols, Lab animal use, care and welfare, animal houses, radiation hazards.

Extension: Lab to Field, Extension communication, Extension tools.

Bioethics: Laws in India, Working with man and animals, Consent, Animal Ethical Committees and Constitution.

REFERENCES

- Ahuja, V.K. 2010. *Law of Copy Rights and Neighbouring Rights: National and International Perspectives*. LexisNexis- Butterworths Wadhwa, Nagpur
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- Anitha Goel. 2010. *Computer Fundamentals*. Pearson Education India.
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- Sudipto Das.2010. *A Complete Guide to Computer Fundamentals*. Lakshmi Publishers(P)Ltd.New Delhi
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Elective Courses

Paper No. ZOO-105

Helminthology- I

Total no. of credits- 4 No.

of Periods per credit- 15

Total No. of periods -60

Evaluation: External-80%, Internal-20%

Course Objectives

1. To impart basic knowledge of Helminthes, Cestodes & Trematodes.
2. To oriented to major types of important cestodes & Trematodes.
3. To develop the ability to collect, identify important cestodes and Trematodes, the regions .
4. To develop the experts in the field of Helminthology.

Learning Outcome:

- The students will learn about helminthes, cestodes and trematodes
- The student will be able to identify, these parasites and can develop an expertise.

Unit I Introduction, history and scope of Helminthology.

1. General organization and Classification of Platyhelminthes up to order level. Cestodes (Cestodarians and Eucestodes), Trematodes (Monogenea, Aspidobothria and Digenea)
2. Functional anatomy of Reproductive system
 - a. Trematodes (Digeneans)
 - b. Cestodes (Pseudophyllideans & Cyclophyllideans).
 - c. Egg shell formation, chemistry of egg shell formation, factor influencing embryonation & hatching.

Unit II :

1. Intramolluscan stages and their effect on molluscan hosts, Effect on foot, haepatopancreas, Reproductive system and general metabolism.
2. Various types of Cercaria.
3. Different types of larvae in cestodes and their pathogenicity.
4. Holdfast organs with its adaptations in cestodes.

Unit -III:

1. Life cycle patterns of Digenetic Trematodes
 - a. Single intermediate host life cycle.
 - b. Two intermediate host life cycles
2. Life cycle patterns in Cestodes
 - a) No intermediate host life cycle
 - b) Single intermediate host life cycle
 - c) Two intermediate host life cycles.

Unit -IV.: Geographical distribution, habitat, morphology (Structure) , life cycle, pathogenicity, diagnosis, treatment & prevention of the following types

- a) *Monogenea*: *Polystoma integririmum*
- b) *Aspidobothria*: *Aspidogastar conchicola*
- c) *Digenea* : 1. *Pragonimus westermani* 2. *Fasciolopsis buski* 3. *Gastrodiccoides hominis*.

**Unit-
V**

Geographical distribution, habitat, morphology (Structure) , life cycle, pathogenicity, diagnosis, treatment and prevention of the following type.

Cestode:-

- 1) *Amphilina*
- 2) *Diphyhidium canium*
- 3) *Diphyllobothrium latum*
- 4) *Echinococcus granulosus*
- 5) *Taenia saginata*

**LIST OF
BOOKS**

1. Medical Parasitology by Markell, Voge and John, 8th ed. W.B. Saunders Co.
2. The Biology of animal parasites, Cheng T.C. (1964)-Saunders International Student Edition.
3. The Invertebrates Vol II, McGraw Hill, New York.- Dawes B. (1946).
4. Text book Medical Parasitology Jaypee Brothers, - Medical Publishers, New York. - Panikar C.K.J(1988)
5. The Parasitology of Trematodes Oliver and Boyd Ltd. Edinburgh - Smyth J.D (1977)
6. Parasitology (Protozoology and Helminthology) -Sood Pamnik (1993) CBS Publication and Distribution, Delhi.
7. Human helminthology Manual for Clinical, Sanitarians Medical Zoologists - Faust, Emerest Carroll.
8. Systema Helminthum Vol. IV Monogenea and Aspidobothria - Yamaguti S.(1963) Inter- Science Publishers, London.
9. Synopsis of Digenetic Trematodes of Vertebrates - Yamaguti S. (1971) Vol. I & II Keigaku Publishing Co., Tokyo, Japan.

REFERENCE BOOKS.

- 1) The Invertebrates Vol.II - Hyman L. H.
- 2) The Trematode - Dausese B
- 3) Text book of medical Parasitology - Dey
- 4) Text book of medical Parasitology - Sawitz
- 5) Parasitology - Nobel and Nobel
- 6) Structure of Nematode - Allen bird
- 7) An introduction to Nematodology - Chitwood
- 8) Organization and Biology of nematodes -Crool
- 9) Physiology of nematodes - Lee
- 10) Plant parasitic nematode - Parmonove
- 11) Principal of Nematodology - Throne
- 12) Plant Nematodology - Jenkins and Taylor
- 13) General Parasitology - Cheng
- 14) Clinical Parasitology - Craig Faust
- 15) Applied Parasitology - Hiware, Jadhav and Mohekar
- 16) Biochemistry of parasitism - Von Brand
- 17) Physiology of nematode parasite - Smith
- 18) Helminth, Arthropod and Protozoa of domesticated animal -Solbsy E.J.W
- 19) Laboratory methods of work with plant and soil nematodes -Southey
- 20) Soil and fresh water Nematodes - Goodey.
- 21) Practical exercise in Parasitology - Halton, Behave, Marshall.
- 22) Animal Nematodes from Indian Mammals - Nama, Shinde and Jadhav.

- 23) Parasitology (Protozoology and Helminthology) –Chatterjee K. D. (1969)
- 24) The Zoology of Tapeworm. – Wardle and Mcleod (1952)
- 25) The advances in the Zoology of tapeworm from Wardle and Mcleod (1952)
- 26) Systema Helminthum Vol. II Cestoda. – Satyu Yamaguti (1959)
- 27) The Physiology of Cestodes. – J.D Smyth
- 28) Vertebrate Nematodes – York and Mapelston
- 29) Plant Parasitic Nematodes, bionomics & control – Christie
- 30) Modern Parasitology – Cox
- 31) Essential Parasitology –Schimdit
- 32) Parasitism – Cameron
- 33) Animal Parasitism – Read
- 34) Parasitism and Symbiology – Read
- 35) Physiology of nematode parasites – Bee
- 36) Nematodes Parasites of domestic animal – Levine
- 37) Structure of Nematodes –Allen Bird
- 38) Medical Parasitology (Protozoology and Helminthological) – Chatterjeei K. D
- 39) Laboratory Methods for work with plant and soil Nematodes.-Southey
- 40) An Introduction to Parasitology – Chandler and Read

Paper No. ZOO-106
Protozoology- I

Total no. of credits- 4

No. of periods per credit-

15

Total No. of periods -60

Evaluation: External-80%, Internal-20%

Course objective :

This course is designed to teach students-

1. The basic concepts of Protozoan systematic
2. To study systematic of Subkingdom Protozoa .
3. To study biological importance of free living Protozoa.
4. To study methodology of collection and identification of free living protozoa.
5. To study culture methods of free living protozoa.

Learning Out come :

The students will learn the economic importance of protozoans, their systematics, and techniques to identify.

The students will learn the different culture methods.

Unit – I

1. Classification of Protozoa up to order level
2. Factors influencing Growth of Protozoa
 - i. Balanced growth.
 - ii. Non balanced growth

Unit – II

1. Ecology of free living Protozoa
 - i. Marine Protozoa
 - ii. Planktonic protozoa
 - iii. Soil protozoa
 - iv. Protozoan blooms

Unit – III

1. Nutrition in Protozoa
 - i. Methods of feeding
 - a. Filter feeding
 - b. Raptorial feeding
 - c. Diffusion feeding
 - ii. Digestion
 - iii. Nutritional requirements

Unit – IV

1. Metabolism in Protozoa
 - i. Carbohydrate and Respiratory metabolism
 - ii. Nitrogen metabolism
 - iii. Lipid metabolism
 - iv. Excretion and ionic regulation – Functioning of contractile vacuoles.

Unit – V

1. Heredity in Protozoa
 - i. Bi-parental reproduction
 - ii. Uni-parental reproduction
 - iii. Non-mendelian phenomena
 - iv. Mating types in ciliates

Text Books:

1. Aikawa and Sterling – Intracellular Parasitic Protzoa
2. Baker – Parasitic Protozoa
3. Chandler and Read – An introduction to Parasitology
4. Chatterjee – Parasitology
5. Thomas C. Cheng – General Parasitology
6. Corliss – The ciliate Protozoa
7. Dogiel – An Introduction to Protozoology
8. Faust, Russel and Jung – Clinical Parasitology
9. Hall – Protozoology
10. Hoare – Trypanosomes of mammals
11. Kudo – Protozoology
12. Levine – An introduction to Protzoan parasites of domestic animals and of man
13. Manwell – An Introduction to Protozoa
14. Richardson & Kendall – Veterinary Protozoology
15. Sleight – Biology of Protozoa
16. Vickerman – The Protozoa
17. Ward & Whipple – Fresh water Biology
18. Wenyon – Protozoology Vol. I & II

Reference Books:

1. Calkins – Protozoa in Biological Research
2. Thomas C. Cheng – Research in Protozoology I-IV
3. Florkin and Scheer – Chemical Zoology Vol. –I
4. Hammond and Long – The Coccidia
5. Hutner and Lwaff – Biochemistry and Physiology of Protozoa Vol. I, II & III
6. John & John – How to know the Protozoa
7. Tayler & Baker – Cultivation of Parasites in Vitro

Paper No.-ZOO-107
Entomology I

Total no. of credits- 4

No. of periods per credit-

15 Total No. of periods -

60

Evaluation: External-80%, Internal-

20% Course Objective:-

1. To develop a strong foundation in entomology, including understanding of the importance of insects to human society.
2. To familiarize the students with insects for their external and internal features,
3. To review important areas in insect biology such as morphology, physiology, ecology, behavior, genetics, phylogeny, ontogeny and population biology.
4. To develop a sufficient background for those students who wish to study more advanced entomological topics.

Learning Out come :

- The students will learn in depth the morphological and structure of Insects.
- The students will gain knowledge of different physiological adaptation , physiological processes in different orders of insect.

**Unit
I**

1. Introduction to Entomology,
2. Insect morphology segmentation and tagmosis, 3. Head – Structure of definitive insect head, 4. Structure and types of antennae,
5. Structure and types of mouth parts,
6. Thorax-Segmentation, Wings- origin, structure , venation, Modifications,
7. Leg – General structure , types of legs.
8. Abdomen – Segmentation, Appendages.

**Unit
II**

1. Integument, Cuticle- structure, molting, sclerotization,
2. Digestive system- Structure of alimentary canal and Associated digestive glands and physiology of digestion.
3. Respiratory system- Respiratory structures and mechanism of respiration in terrestrial and aquatic insects

Unit III

1. Circulatory system- Structure, Haemocoel, the dorsal vessel, accessory pulsatile organs, Haemolymph- chemical composition, Haemocytes- structure & types, mechanism of circulation
2. Excretory system- Structure of Malpighi tubules, Physiology of

Excretion and Osmoregulation

UNIT IV

1. Nervous system- Central nervous system, Physiology and neurobiochemistry
2. Sense organs- Compound eyes, Chemoreceptor, Mechanoreceptors,
3. Effector organs- Sound producing organs, Light producing organs,

UNIT V

- 1 Reproductive system- Male and female reproductive system, fertilization and Development,
- 2 Endocrine system- structure and mode of action of hormones in metamorphosis.
- 3 Ectohormones – Pheromones, sex pheromones, and defensive secretions

References Books:-

2. The insect structure and function, 4th Edition (2008). Chapman, R.F. Publisher- Cambridge University Press, London.
3. General Textbook Entomology, 10th Edn., (1977) Imms, A.D. Richard, O.W. & Davies, R.G. (Eds.) 1 : Chapman & Hall, London
4. General Entomology, 2nd edition (1973) Mani M.S. Oxford & IBH Publishing Company, Delhi.
5. Modern Entomology First edition: (1997) D.B. Tembhare, Himalay Publishing House Delhi
6. Principles of Insect Morphology, (1973). Snodgrass, R.E. Publisher – Tata McGraw Hill, Bombay.

Additional Reference Books:-

1. The Principles of Insect Physiology, 2nd edition (2007) Wigglesworth, V.B. Publisher – English Language Book Society and Methuen and Co. Ltd.
2. The Insects: Structure, Function and Biodiversity, (2004). Ambrose D.P. Publisher- Kalyani Publishers, New Delhi.
3. Introduction to Insect Biology & Diversity” Daly, H.V., J.T. Doyen & P.R. Ehrlich (1981): International Student Edn. McGraw- Hill, Kogakusha, Japan.
4. Insects: Textbook Entomology Evans. E. H. (1984) : Addison- Wesley. London.
5. Insects Physiology” Henning, W. (1981) : Wiley – Interscience Publ., John Wiley & Sons, Chichester, England.
6. Journals and Internet resources.

Paper No. ZOO-108
Endocrinology I

Total no. of credits- 4

No. of periods per credit-

15 Total No. of periods -60

Course objectives:

1. To learn the basic information of the various endocrine glands/ tissue, particularly in invertebrates.
2. To learn the neuroendocrine system and their hormones.
3. To learn the physiological interaction of endocrine hormones and their regulation by environmental factors in invertebrates.

Learning outcome

The student will understand the basic structure of endocrine glands in invertebrates.

The students will learn the structure of neuroendocrine gland and their hormones.

Unit – I Endocrine mechanisms in Annelida

1. Neuroendocrine system in Annelida.
2. Growth and regeneration in Polychaetes.
3. The control of epitoky and relationship between gametogenesis and epitoky.
4. Growth and reproduction in Oligochaetes.
5. Endocrine control of gametogenesis in Polychaetes.

Unit – II Endocrine mechanisms in Mollusca

1. Neurosecretion in Lamellibranches.
2. Hormones and reproduction in Gastropoda.
3. Hormones and reproduction in Cephalopoda.
4. Role of hormones in osmotic and ionic regulation in Gastropoda.

Unit – III Endocrine mechanisms in Insecta

1. Neuroendocrine system in Insecta.
2. Role of hormones in growth and metamorphosis in insects.
3. Moulting in adult insects and mode of action of developmental hormones in insects.
4. Reproductive system and endocrine control of oocyte development in insects

Unit – IV Endocrine mechanisms in Crustacea

1. Neuroendocrine system in Crustacea .
2. Moulting cycle and role of hormones in moulting in crustaceans.
3. Sexual differentiation and role of hormones in gonadal activity in crustaceans.
4. Colour change and its hormonal control in crustaceans.

Unit – V Neuroendocrine mechanisms in Echinodermata

1. Histomorphology of radial nerve neurosecretory system in starfish.
2. Neurosecretory hormones and control of reproduction in echinoderma .
3. Hormone types and their chemical nature in echinoderms.

Books:

1. Highnam K. C. and Hill L : The Comparative Endocrinology of Invertebrates.
2. Adiyodi and Adiyodi : Reproductive Biology of Invertebrates Vol I & II
3. Laufer H. and Downer R.C.H. Endocrinology of selected Invertebrates Type
4. Journals and Internet resources

5. Boolootian R : Physiology of Echinodermata

Reference books:

Patil Meena: Neurobiology and Electrophysiology of Decapod
Crustaceans Lockwood, A.P.M : Aspects of Physiology of Crustacea.
Novak, U.J.A. : Insect Hormones
Rock stein M. : The Physiology of Insect Vol. I.
Wilbur, K.M. and Young, C.M. : Physiology of Mollusca. Vol. I and
II Mill, P.J. Physiology of Annelida

Compulsory Course

Constitution of India (Centrally Conducted by University)

Total no. of credits- 02

No. of periods per credit-

15 Total No. of periods -

30

Evaluations: External-80%, Internal-

20% Course objectives:

The paper is designed to impart the basic information of the constitution of India.

Practical Paper No. ZOO-109 Practical's based on ZOO-101

(Biosystematics and Animal Diversity)

1. Museum specimen study of different groups of Invertebrates and Vertebrates.
2. Terrestrial ecosystem (Vegetation studies)- Abundance , Frequency , Density, Relative Diversity, Dominance , Raunkars biological spectrum , Index of Dominance etc.
3. Method of plankton collection, plankton identification and quantification from river or stream or lake water.
4. Methods of collection, preservation and identification of zooplankton.
5. Composition assessment of taxonomical diversity or biodiversity in habitat from local Grassland , Terrestrial and Wetland.
6. Composition assessment of taxonomic diversity/Biodiversity from different ecosystems.
 - a. Species diversity indices.
 - b. Relative density, Relative frequency and relative abundance of species.
7. Methods of collection, preservation and identification with keys from different groups of organisms like, Parasites, hosts, insects, birds and fishes etc.
8. Construction of taxonomic Key from the character in an animal group.
9. Visit to any biodiversity center /spots and submission of report

Practical Paper No. ZOO-110 Practical's based on ZOO-102

(Biochemistry)

1. Preparation of Acid and Alkali solutions and acid base titration
2. Preparation of Buffers of known pH, buffering capacity.
3. Identification of Carbohydrates by Chemical tests.
4. Estimation of Amino acid (Tyrosine)
5. Estimation of Protein by Lowry's method.
6. Estimation of Carbohydrates by Anthrone reagent method. (Glycogen)
7. Separation of amino acids by paper chromatography.
8. Study of factors affecting enzyme activity (Substrate concentration, pH, Temperature and Inhibitors)
9. Isolation of Casein protein from the milk.
10. Determination of isoelectric pH of Caesin.

Practical Paper No. ZOO- 111 Practical's based on ZOO-103

(Ecology : Principles and Practices)

1. Study of ecosystem biodiversity of local area.
2. Estimation of DO/ BOD
3. Estimation of hardness of water sample. (Total, Sodium and Potassium hardness.)
4. Estimation of Salinity /Nitrates and phosphates from a given water sample.
5. Biomass analysis in a given ecosystem.
6. Species diversity in community and its measurement- Alpha diversity- Simpsons diversity index, Shannon index, Fisher alpha. Beta diversity- Sorensen's similarity index, Whittaker's index, Evenness, Gamma diversity, Guild and its functioning in the community.
7. Productivity estimation in given ecosystem (Primary and Secondary)
8. Study of efficiency of sampling method.
9. Study of air quality and aerobiology in given area.
10. Toxicology- Principles, toxicants- types, dose and effects, toxicity of heavy metals
11. Measuring ecotoxicity using a lettuce seed assay.
12. Estimation of various physical parameters of water (SSP, Turbidity, TDS etc).
13. Visit to any biodiversity centre /National park/Sanctuary and submission of report.

**Practical Paper No. ZOO-112 Practicals based on ZOO-105
(Helminthology I)**

- 1) Collection of trematodes and cestodes from various hosts
 - 2) Preservation, staining and identification of collected trematode & cestodes, and preparation of their permanent slides (At least , 10 from cestodes & 10 from trematodes).
 - 3) Study of different trematodes and cestodes from permanent slides (At least, 10 from cestodes & 10 from trematodes).
 - 4) Examination of fecal samples for ova.
 - 5) Collection and examination of molluscan hosts for larvae of trematodes.
 - 6) Study the effect of helminth parasites (histopathology) on their host's tissue by microtechnique.
- Submission:** At least five permanent slides to be submitted at the time of practical examination

**Practical Paper No. ZOO-113 Practical based on ZOO-106
(Protozoology-I)**

1. Collection, observation in living condition-fixation, staining and identification of protozoa from different habitats.
 - a. Marine Protozoa
 - b. Planktonic protozoa
 - c. Soil protozoa
2. Study of population density of ciliates in fresh water.
3. Study of ecological factors in relation to freshwater ciliates.
 - a. Oxygen
 - b. Carbon dioxide
 - c. pH
 - d. Oxidized organic matter
4. Study of cyclosis in *Paramecium*.
5. Study of contractile vacuole to observe excretion and osmoregulation.

**Practical Paper No. ZOO-114 Practical based on ZOO-107
(Entomology I)**

1. Study, mounting and sketching of types of mouth parts, antennae, wings, legs and genitalia of various insects. (2 in two insects)
2. Dissections of Digestive system / Reproduction system / Nervous system of five available at least 3 insects.
3. The study and preparation of permanent slides of any five organs of at least 2 insects
4. Estimation of enzyme activities of Amylase, Invertase, Lipase & Protease in the alimentary canal/ midgut of cockroach.
5. Detection of uric acid as an end product of excretion in any terrestrial insect.
6. Study of types and Total count of haemocytes in haemolymph of any one insect.
7. Determination of role of insect hormones in the pupation of insect larvae by ligature technique.
8. Study of eggs, larvae and pupae/ nymph of any one insect.

Practical Paper No. ZOO-115 Practical based on ZOO-108

(Endocrinology-I)

1. Histomorphological study of neuroendocrine system in various invertebrates (Annelida, Mollusca Arthropoda etc.) (at least 10 Slides)
2. Dissection of nervous systems in different invertebrates (Leech, crab, cockroach, slug, snail).
3. Histological preparation of slides of neuroendocrine centers (at least 5)
4. Effect of brain removal on oxygen consumption in leech.
5. Effect of background on integument chromatophores of the freshwater prawn, *Caridina* / *Macrobrachium*.
6. Effect of eyestalk removal on oxygen consumption of freshwater crab / prawn.
7. Effect of eyestalk removal on blood glucose level in crab / prawn.
8. Effect of eyestalk removal on chromatophores in relation to background adaptation in *Caridina*/*Macrobrachium*

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
Board of Studies in Zoology
Regulations of Choice Based Credit System for PG Programme in the Jurisdiction of The University

Preamble

The University Grants Commission (UGC) has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of country. Also, the UGC has formulated various regulations and guidelines from time to time to improve the higher education system and maintain minimum standards and quality across the Higher Educational Institutions (HEIs) in India. The Action Plan proposed by UGC outlines the enhancement of academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process, examination and evaluation systems, through Semester system, Choice Based Credit System (CBCS), Comprehensive continuous internal assessment and Grading system among other reforms.

The semester system accelerates the teaching-learning process and enables vertical and horizontal mobility in learning. The credit based semester system provides a 'cafeteria' type approach and the flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The Choice Based Credit System (CBCS) adopts an interdisciplinary approach in learning and enables students to learn at their own pace to complete a programme of study, choose electives from a wide range of courses across departments/ centres, undergo additional courses and acquire more than required number of credits. The CBCS facilitates transfer of credits earned in different Departments of other recognized / accredited universities or institutions of higher education in India and abroad. The CBCS also allows to complete a part of programme in the parent university and get enrolled in another recognized university.

Through the Choice Based Credit System a student obtains a degree in a particular programme of study by accumulating the required number of credits prescribed for that degree. Each course is assigned with a fixed number of credits based on the contents to be learned. The number of credits earned by the student reflects the knowledge or skill acquired by him / her. Comprehensive continuous internal assessment reduces the weightage on the semester-end examination so that students enjoy a de-stressed learning environment. CBCS also provides enhanced learning opportunities, ability to match students' scholastic need and aspirations and responds to the educational and occupational aspirations of students. The grade points earned for each course reflects the student's proficiency in that course. The assessment, including projects and examinations, is continuous and internal.

1. Definitions of Key Words

- 1.1. **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year.
- 1.2. **Semester:** Each semester will consist of 15-16 weeks of academic work equivalent to 90 actual teaching days. In a bi-semester system, an academic year consists of two semesters. The odd semesters may be scheduled from June/July to November/ December, and even semester from November/ December to April/May.
- 1.3. **Programme:** An educational programme leading to award of a Degree, diploma or certificate in a discipline.
- 1.4. **Course:** Usually referred to, as 'papers' is a component of a programme or in other words "Course" refers to a subject offered under the degree programme. Each course is identified by a unique course code and course title. All courses need not carry the same weight. The courses should define learning objectives and students learning outcomes. A course may be designed to comprise lectures/ tutorials/laboratory work/

field work/ outreach activities/ project work/ vocational training/viva/ seminars/term papers/assignments/ presentations/ self-study etc. or a combination of some of these.

- 1.5. **Choice Based Credit System (CBCS):** The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).
- 1.6. **Credit:** Credit defines the quantum of content/syllabus prescribed for the course. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or 1.5 hours of practical work/field work per week.
- 1.7. **Credit Point:** It is the product of grade point and number of credits for a course.
- 1.8. **Credit Based Semester System (CBSS):** Under the CBSS, the requirement for awarding a degree or diploma or certificate is prescribed in terms of number of credits to be completed by the students.
- 1.9. **Grade Point:** It is a numerical weight allotted to each letter grade on a 10-point scale.
- 1.10. **Letter Grade:** It is an index of the performance of students in a said course. Grades are denoted by letters O, A+, A, B+, B, F, FA, AE and AU.
- 1.11. **Semester Grade Point Average (SGPA):** It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.
- 1.12. **Cumulative Grade Point Average (CGPA):** It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.
- 1.13. **Transcript or Grade Card or Certificate:** Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester.

2. General instructions

Students are advised to follow the instructions given below:

- 2.1 Every student is expected to attend the orientation programme/ bridge /induction programme of CBCS organized by the University/ department and understand the system thoroughly before selecting the elective courses.
- 2.2 Schedule of orientation modules conducted for fresher's will be intimated by the University/ department at the time of commencement of the classes.
- 2.3 Each student, on admission shall be assigned to a mentor who will a permanent faculty member of the respective department. The mentor shall advise the student about the academic programmes and counsel on the choice of courses considering the academic background and student's career objectives.
- 2.4 It is mandatory for every student to register the courses, in a Registration form, which (s)he plans to take up for the semester. The card is prepared in triplicate: student copy; department copy and section copy. The students shall submit the department copy and section copy to their parent department and retain the student copy for their records. The departments shall forward the section copy to the administration.
- 2.5 Registration cards form the basis for a student to undergo Comprehensive continuous internal assessment and end-semester examination.
- 2.6 Credits are assigned based on the structured distribution shown for every courses and programmes.
- 2.7 There will be a co-ordinator for CBCS and the overall co-ordination in successfully conducting these courses with proper inter-departmental linkages will be ensured by the CBCS implementation committee. Circulars and notices will be issued by the committee, whenever needed. In addition, they may also be scrolled in the University web-site.

3. Scope and Coverage

- 3.1 The CBCS is applicable to all full-time two years courses for Post Graduate programme of study approved by the Academic Council.
- 3.2 It is also applicable to any other Programme of study approved by the Academic Council that has been prescribed to follow the CBCS pattern.
- 3.3 The learning and evaluation is on semester pattern.
- 3.4 Eligibility, qualifications and admission procedure for each Programme of study is as approved by the Academic Council and specified in the University Information Brochure.

4. Programmes of Study

The list of programmes offered by the University Department are,

4.1 Two Years M.Sc. Programmes

4.1.1 M.Sc.Zoology

4.2 Research Programme

4.2.1 Ph.D in Zoology

5. Types of Courses

The courses offered under a Programme of Study will be;

5.1 Core Course:-

- 5.1.1 There will be a Core Course in every semester. This is the course which should compulsorily be studied by a candidate as a core requirement to complete the requirement of a degree in a said programme/ discipline of study. The Core Course cannot be substituted by any other course.
- 5.1.2 A core course offered in a discipline/subject may be treated as an elective by other discipline/subject/vice versa and such electives may also be referred to as Generic Elective.
- 5.1.3 Dissertation/Project: A core course designed to acquire special/advanced knowledge, such as Project work/ Dissertation work is carried out by a candidate on his/her own with an advisory support from the faculty member. The Project work/ Dissertation work involving application of knowledge in solving/analyzing/ exploring a real life situation/difficult problem.
- 5.1.4 Major Project work (10-12 credits)

5.2 Elective Course:-

An Elective course is generally a course that can be chosen from a pool of courses and are;

- Very specific or specialized or advanced to the discipline/ subject of study
- Supportive to the discipline/ subject of study
- Providing an expended scope
- Enabling an exposure to some other discipline/subject/domain
- Nurturing candidate's proficiency/skill.

An elective course may be;

- 5.2.1 **Discipline Specific Elective (DSE) Course:** Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective.
- 5.2.2 **Generic Elective (GE) Course:** An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure/ add generic proficiency is called a Generic Elective.
P.S.: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.
- 5.2.3 The students will choose any course offered by a Department under CBCS as

- Elective Course with the advice of his/her Faculty Mentor and the course instructor.
- 5.2.4 In the event of failure in DSE the student can substitute it by an equivalent course offered by the parent department/centre only.
- 5.2.5 In the event of failure in a generic elective course the student can substitute it by an equivalent course offered by the parent or other department within or outside the department with the advice of his/her Faculty Mentor and the course instructor.

5.3 Extension Activity

- 5.3.1 It is compulsory for PG student to participate in any one of the following programmes for a period of not less than 1 years (2 semesters) and acquire additional credits.
- 5.3.1.1 NSS
 - 5.3.1.2 NCC
 - 5.3.1.3 Sports Club
 - 5.3.1.4 Youth Red cross (YRC)
 - 5.3.1.5 Community development
 - 5.3.1.6 Other service organizations in the University/ in the department level.
- 5.3.2 The above activities shall be conducted outside the regular working hours of the University
- 5.3.3 All students have to put in a minimum attendance of 40 hours per year in the extension activity which shall be duly certified by the head/ head(i/c)/co-ordinator / chairperson of the concerned department / activity. If a student lacks 40 hours of attendance in the first year, he/she shall have to compensate the same during the subsequent years. Students those who complete minimum attendance of 40 hours in One year will get A CREDIT.
- 5.3.4 The student's performance shall be examined by the faculty in-charge of extension activities along with the head/ co-ordinator/ activity and any one faculty member of outside the concerned department / activity on the following parameters.
- 5.3.4.1 15% of marks for Regularity of attendance
 - 5.3.4.2 55% of marks for Active Participation in classes/camps/games/special Camps/programmes in the Department /District/ State/ University activities.
 - 5.3.4.3 10% of marks for Exemplary awards/Certificates/Prizes.
 - 5.3.4.4 20% of marks for Other Social components such as Blood Donations, Fine Arts, etc.
- 5.3.5 The grade obtained by the student shall be incorporated in the grade sheet to be issued at the end of the semester.
- 5.3.6 Physically challenged students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above activity and be graded and certified accordingly.

6. Types of Courses

Types of Courses	Short Form
Core Course	CC
Discipline Specific Elective Course	DSE
Extension Activity	EA

7. Credits

- 7.1 Credit defines the quantum of content/syllabus prescribed for the course. It may be a unit prescribed for a course and is determined by the number of hours of instruction required per week. Thus, in each course credits will be assigned on the basis of the number of hours required per week for lectures/tutorials/lab work/field work to complete the course in a single semester.

1 credit = 1 hour of direct teaching per week

1 credit = 2 hours of lab work/field work/project work per week

Thus, 1 credit course requires 1 hour per week during a 15 week semester and accordingly a 3 credit or 4 credit courses requires 3 or 4 hours per week during a 15week semester.

7.2 A course of study may have only lecture (L) component or only practical/practice (P) component or combination of any two or all the three components. The third being Tutorial (T) component.

7.3 The total credits earned by a student at the end of semester upon successfully completing the course is L+T+P.

7.4 Course Components (LTP)

Each level of certification for a given duration has a typical structure of courses of study with well-defined name for each course/paper, instruction hours per week translated into credits, marks for comprehensive continuous assessment and term end examination as percentage of total marks/grades.

7.4.1 Lecture Sessions are the current mode of delivering the content

7.4.2 But here course offered is delivered through three components of teaching learning process:

Lecture Session-L

Tutorial Session-T

Practical/Practice Session-P

However, Tutorial Session Consists of participatory discussion/desk work/ problem solving/ brief seminar on a topic or any such other novel method that makes learners absorb and assimilate more effectively the contents delivered in a lecture session.

Normally, the tutorial sheets prepared by the teacher are distributed in advance to help learner prepare for interaction systematically.

Practical/Practice session consists of hands on experience/ laboratory experiments/ Field Studies/Case studies that equip students to acquire the much required skill component

7.4.3 The credit pattern of the course shall be indicated as L: T: P format.

For example, a 4 credit course format could be:

4:0:0 1:2:1 1:1:2 1:0:3 1:3:0

2:1:1 2:2:0 2:0:2 3:1:0 3:0:1

0:2:2 0:4:0 0:0:4 0:1:3 0:3:1

7.4.4 The Concerned Board of Studies shall choose the convenient credit pattern for every course based on the requirement. However, generally a full course shall be 3 or 4 credits. Of 60hrs 48hrs for Theory and 12 Hours of Tutorials. Each credit being 15/16 hours of contact teaching.

7.4.5 Teaching duration for Lab courses for core courses shall be 4 hours and for elective shall be 6hours per week per batch.

7.4.6 For lab course 8 students constitute a batch and for specialization and research project 5 students constitute a batch.

7.5 The PG programmes carry 2, 3, 4 or 5 credits. Normally no theory course shall have more than 5 credits. Typically a course will comprise of 5 (five) units.

7.6 PG programmes wherein project work is included may carry 4 to 8 credits. Up to 12 credits can be assigned if an entire semester is assigned for Project work. The Project includes submission of a written Project Report and a Viva-voce examination (one credit is assigned for the Viva-voce).

7.7 The total number of minimum credits for any M.Sc. Zoology (inclusive of Core, Elective(s) and Project work) shall be in the range specified in **Table 8.1** given below.

7.8 A candidate who has successfully completed all the Core courses and a Project work, if any, and accumulated not less than minimum number of Credits prescribed shall be

eligible to receive the Degree.

- 7.9 The minimum credits required for the award of degree in various PG zoology Programme is given in the **Table 8.1**.

8. Programme wise Distribution of Credits

8.1. Scheme for Choice Based Credit System for PG Programs

Programme	Core course credits	Elective course Credits	Research methodology	Service course+ Constitution of India	Total
ZOOLOGY	60	24	24	4+2	114

9. Student Counselling

To help the students in planning their course of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a member of the faculty who shall function as faculty mentor for those students throughout their period of study. Such faculty mentor shall advise the students, give suggestions for the courses to be taken by the students during each semester.

10. Duration

- 10.1. The minimum duration for completion of any PG Programme shall be 4 semesters (2 academic years) and the maximum duration shall be 8 semesters (4 academic years).
- 10.2. In respect of candidates who had discontinued for a valid reason (with the permission of competent authority) and are readmitted to the programme by the Department, the period for which such candidates had discontinued shall not be counted while calculating the maximum period prescribed in **clause 10.1**.
- 10.3. A semester(s) may be declared a zero semester(s) in case of a student who could not continue with the programme during that period due to illness and hospitalization or due to accepting a foreign scholarship/fellowship or any other valid reason accepted by the Vice-Chancellor subject to the fulfilment of requirements as laid down by the relevant rules. Such zero semester(s) shall not be counted for calculation of the duration of the programme in case of such a student.

11. Registration

- 11.1. Each student, on admission shall be assigned to a mentor who shall be a permanent faculty member of the respective department. The faculty mentor shall advise her/him about the academic programmes and counsel on the choice of courses considering the academic background and student's career objectives.
- 11.2. With the advice and consent of the Faculty Mentor the student shall register for a set of courses he/she plans to take up for the Semester.
- 11.3. The student has to seek the consent of each teacher offering the courses in a Registration Card. The student should meet the criteria for prerequisites to become eligible to register for that course.
- 11.4. No student shall be permitted to register for courses exceeding 30 credits per semester. However, registration for **Repeat/Redo** courses is allowed in excess of this limit.
- 11.5. If a student finds that he/she has registered for more courses than possible to study in a semester, he/she can drop one or more of courses before the end of 3rd week of the semester.
- 11.6. A student, to retain his/ her status, should register for at least a minimum of **12** credits in a semester.

- 11.7. Students shall have to register for the courses for the semester within the deadline as in the academic calendar.
- 11.8. The maximum number of students to be registered in each course shall depend upon the physical facilities available.
- 11.9. The information on list of all the courses offered in every department specifying the course code, course title, credits, the prerequisites, a brief description of syllabus or list of topics, the instructor who is offering the course and the time slot may be made available in the University website.
- 11.10. Students shall refer to the course hand out provided by the respective department in the university website before registering for the courses.
P.S.: All departments shall provide a brief write-up about each paper (Course Hand Out), outlining the salient features, learning objectives, course outcome, pre-requisites.
- 11.11. In any department preference for registration shall be given to those students of that department for whom the course is a Core course.
- 11.12. The registration for the Elective course shall be on first come first served basis, provided the student fulfils prerequisites for that course, if any. The number of students to be registered shall be based on the class room and laboratory capacity. Every effort shall be made by the Department to accommodate as many students as possible.
- 11.13. Normally, every Lecture-based course shall, normally be given by one teacher.
- 11.14. No course shall be offered unless a minimum of 3 students are registered, except for contact courses offered to PhD students.

12. Attendance

- 12.1. Students are required to attend at least 75% of the classes actually held, seminars, sessionals and practical in each courses of study as may be prescribed and at least 60% in the redo course. Attendance shall not be mandatory for students repeating only the end semester examination.
- 12.2. Students absenting from classes continuously for 10 days and more will be liable to have his name removed from the rolls of the University. Absence on medical reasons should be supported by a certificate which has to be submitted with 5 working days after recovery/ re-joining after illness.
(P.S: All Medical certificates obtained from physicians outside Dr BAMU, Aurangabad should be validated by the medical officer or equivalent of Dr BAMU, Aurangabad. The Validated Medical certificate(s) submitted after 5 working dates shall not be considered by University.)
- 12.3. No student who has less than 75% attendance in any course shall be permitted to attend the end-semester examination and (S)he shall be given grade of FA-failure due to lack of attendance.
- 12.4. (S)he shall be asked to redo that course by enrolling for it the next time it is offered.
- 12.5. Papers set for each examination will follow the regulations and syllabi in force at the time.
- 12.6. Condonation of shortage of attendance below 75% may be considered by the Vice Chancellor on valid medical reasons and other reasons such as personal calamities on case to case basis.

13. Assessment and Examination

The Continuous Internal Assessment and End Semester Examination, will form the basis for Evaluating/ grading the student performance in each paper/ course.

Breakup of Continuous Internal Assessment (CIA)/ End Semester Examination

- 13.1 All theory subjects in PG programme shall carry a Continuous Internal Assessment (CIA) component to the extent of 40 marks reduced to 20 and End Semester for 80 marks.
- 13.2 In case of Core Laboratory course, the Continuous Internal Assessment (CIA) will be the only component. Appropriate distribution of marks for Practical Record/ Report/ Observation, Attendance, experiment proficiency, Viva, if any by the respective BoS.

14. Continuous Assessment

- 14.1. Continuous Internal assessment shall be done by the faculty member responsible for the courses.
- 14.2. There shall at least be two tests of different forms including tutorials; periodic class test as objective/ essay/ viva-voce; quiz type; class/ home assignment; term paper; class seminar; group discussion etc. per course in addition to the examination at the end of each semester.
- 14.3. The tests shall be spread throughout the semester but 15 days before the commencement of End semester examination.
- 14.4. At least 50% weight shall be on written form of tests.
- 14.5. The schedule of Internal Assessment tests shall be prepared at the very beginning of the semester.
- 14.6. It is mandatory for all students to participate in all the Internal Assessment tests and in various course-work related activities for the award of the marks.
- 14.7. The result of the continuous assessment of the students shall be communicated to students immediately after the assessment.
- 14.8. If a student remains absent or scores low or nil marks in CIA, he/she shall not be permitted to reappear for internal assessment after the semester is over.
- 14.9. In case of the student who fails to appear in the End semester examination but secure a pass mark in Internal Assessment (continuous evaluation) of the course, marks of CIA of the student will remain valid for that course until he/she obtains a pass mark in the end semester examination.
- 14.10. A record of such assessment procedure will be maintained by the department and shall be open for clarification by the students. Students will have the right to appeal to the Head of the Department/ Dean of the faculty in case of glaring disparities in marking.
- 14.11. The final result in each semester shall be calculated on the basis of this continuous assessment and performance in the end semester examination.

15. End Semester Examination

- 15.1. An End Semester examination shall be conducted for all courses offered in the department. The duration of the end semester examination shall be for 3 hours.
- 15.2. A schedule of End Semester examinations be prepared and displayed by the Department at least one- month ahead of the conduct of the examination.
- 15.3. Each faculty offering courses to first two years (first 4 semester) of PG programme shall prepare a model question paper, a panel of external examiners and submit the same to The Director, Board of Examination and Evaluation of Dr.Bamu, through the Department's End-Semester Examination Committee (DESEC) chaired by a department faculty member by 8th week of the Semester. The question paper should cover all the units of syllabus. *(P.S: All 4 to 5 members of the committee including the chairperson can be decided by the respective departments. The position of chairperson of the DESEC is on rotation and chairperson will hold the position for a maximum period of three years).*
- 15.4. The Chairperson, DESEC shall coordinate the conduct of exams/ consolidation of marks and Grades and with the approval of the concerned Head of the Department or equivalent send and the consolidated marks and grades to the Director, Board of Examination and Evaluation to provisionally publish the Results.
- 15.5. The end of semester examination shall have assessment from following perspective with respect to all courses:
 - (a) Evaluation with respect to knowledge.
 - (b) Evaluation with respect to Understanding.
 - (c) Evaluation with respect to skill.
 - (d) Evaluation with respect to Applications.

(e) Higher Order Thinking Skills

With respect to all above components, the types of questions can be:

- i. Multiple Choice Questions
- ii. Short Questions
- iii. Long Answer Questions
- iv. Very Long Answer Questions

16. Conduct of End-Semester Exams and Practical External Evaluation.

- 16.1. End-Semester Examination for all programmes shall be conducted by the controller of examination by inviting Question Papers from potential examiner(s) and in coordination with the respective Department's End Semester Examination Committee (DESEC).
- 16.2. Question Papers shall be moderated for the coverage of syllabus and pattern of Questions.
- 16.3. An alternative Question paper should also be made available for any contingency.
- 16.4. The Examiner(s) shall prepare a detailed scheme of valuation.
- 16.5. External Practical examination shall be conducted at the end of the each semester. There will be one external examiner and one internal examiner for the conduct of the examination. Records will also be evaluated by the examiners. Each practical course will be of 50 marks.

17. Evaluation

- 17.1. The performance of each student enrolled in a PG programme, will be assessed at the end of each semester. Evaluation of each student enrolled in all programmes will be done under the Grading System.
- 17.2. The final result in each course will be determined on the basis of continuous internal assessment and performance in the end-semester examination.
- 17.3. The answers papers of end-semester examination should be evaluated by the examiner(s) immediately after the completion of the exam.
- 17.4. For practical courses, no end semester examinations will be conducted. The final marks for practical courses will be only through Continuous Internal Assessment.
- 17.5. The Students pursuing Post Graduate Programmes should pass separately in both the internal and external examinations with a minimum of 50% of marks i.e. the students need to secure 40 out of 80 marks in the external examinations and 10 out of 20 marks in the internal tests for theory courses.
- 17.6. Students failing to secure the minimum pass percentage marks in internals will not be allowed to take the end semester exam of that particular subject in that semester. (S)he has to **Redo** the course by attend the classes for a semester to gain the pass percentage in the internal tests in order to take the end semester examinations.
- 17.7. Students failing a course due to lack of attendance have to **redo** the course.
- 17.8. 'Unsatisfactory' will be mentioned against the course in which the student lacks attendance. However, (s)he can redo the course, when is offered, to get the minimum attendance and obtain 'satisfactory'.
- 17.9. The student may redo a course to improve his/her internal marks by re-attending classes for the given course. However, the freshly secured internal marks only will be considered for computing the final marks.
- 17.10. Students failing only in the end semester examination can retain their internal marks and reappear for only the end semester examination, when it is conducted. This would be termed as a **"Repeat"** course.
- 17.11. Students failing a course due their absence in the end Semester examination can reappear only for the end semester examination, when it is conducted. This would be termed as a **"Repeat"** course.
- 17.12. A student failing in a course/ paper shall register for that course only when it is offered by the concerned faculty/ department.
- 17.13. The answer scripts of the semester examinations shall not be returned to the candidates but may be shown by the instructor at the specific request of the student

concerned. The result of the continuous assessment of the students will, however, be communicated to students immediately after the assessment.

17.14. At the end of semester examination, wherever required, the teacher concerned along with the Dean / Head of the Department/Centre or equivalent and the chairperson, DESEC may moderate the evaluation.

17.15. Students, who obtain 'F'/'FA'/'AE' Grade or 'Unsatisfactory' in any course, may be permitted to take the Repeat/ Redo the course depending upon their attendance and marks obtained in C.I.A.

17.16. Students who have passed in a course of a semester even with a "C" (or "B") grade shall not be allowed to repeat the end-semester examination or redo the course for improving their grades.

17.17. Re-evaluation is applicable only for theory papers and shall not be entertained for other components such as practical/ Thesis/ Dissertation etc.

17.18. Separate application for every course to be revaluated should be submitted by the candidate in the prescribed form along with the prescribed fee so as to be received by the Controller of Examinations within TWO WEEKS of obtaining the photocopy of the answer-script.

17.19. Re-evaluation of answer-scripts can be sought only with at least one affirmation by a teacher relevant to the subject as mentioned below and that any of the criteria below are satisfied:

- Finds that any answer(s) to question(s) that has/ have not been evaluated
- Finds that the answer-script valuation in full or part is not justified and there is reasonable ground for re-evaluation.

17.20. The application for revaluation shall be submitted to the Controller of Examinations through the Grievance Committee of the concerned Department of study.

18. Evaluation of Project Work

18.1. The Project work of M.Sc students will be evaluated in two phases viz., mid-term and final. The percentage of marks for the Mid-term and final evaluation shall be decided by the concerned Board of Study (BoS).

18.2. The midterm and final evaluation shall be undertaken by the Department Research Committee (DRC) or Board of examiners and the students shall have to present the work done by them.

18.3. The Board of Studies of the concerned Department shall decide the percentage of mark given by the guide and the other members of the DRC.

18.4. A record of decisions by the concerned BoS on the percentage of marks shall be maintained by the department for clarification by the students.

18.5. The qualifying grade for the dissertation/project report/monograph/research paper in all programs offered in University Brouchure Students who obtain less than the said grade in the dissertation/project work/monograph/ research paper will be required to rewrite it within such further period as may be allowed by the Board of Studies concerned on the recommendation of the Supervisor(s).

19. Consolidation of Marks

19.1. The results/ statement of marks after moderation, if any, shall be submitted by examiner(s) to the chairperson, DESEC in a sealed cover.

19.2. If there are more than one evaluator for reasons what so ever, then the statement of marks shall be prepared by taking the average of the marks given by the each Evaluator.

19.3. The chairperson, DESEC will consolidate all mark statements of that semester and forward the same to the Director, BEand E through the concerned Head of the

department or equivalent.

20. Grading System

- 20.1. Grading constitutes the core of CBCS, as it tries to reduce the subjective element in Assessment/evaluation and thereby prevents any disadvantage to the student. Grade is an index of the performance of a student in a particular course. It is the transformation of scaled marks secured by a student in a course. Grade point is the weightage allotted to each grade depending on the range of marks awarded in a course.
- 20.2. The Department End-Semester Examination Committee shall prepare two copies of the results, one with marks to be sent to the office of Director, BE&E and another for the Department.
- 20.3. Grades shall be awarded as indicated below in a meeting of the Committee to be held at the earliest, not later than 15 days after the last day of semester examinations.
- 20.4. A student in order to be eligible for the award of the degree in Post Graduate programs must obtain a minimum of 'B' grade in each of the courses as well as in the dissertation / project report/ monograph.
- 20.5.1. The results of the successful candidates will be classified as below:
- 20.5.1.1. CGPA of 8.0 and above and up to 10.0 I Division with Distinction
- 20.5.1.2. CGPA of 6.5 and above and up to 7.9 I Division
- 20.5.1.3. CGPA of 5.5 and above and up to 6.4 II Division
- 20.5.1.4. No III Division in these programmes
- 20.5.2. To satisfactorily complete the programme and qualify for the degree in Post Graduate a student must obtain a minimum CGPA of 5.5. No student with "F"/ "FA"/ "EA" grades on record shall be eligible for award of a degree.
- 20.5. The division obtained by a student will be entered in his/her provisional cum consolidated marks sheet and the degree certificate

21. Grades and Grade Points

Absolute grading system is followed by Dr BAMU. Under this system, the marks are converted to letter grades based on pre-determined mark intervals. The marks in fractions shall be rounded off to the nearest integer. The performances of students in each course is expressed in terms of marks as well as in Letter Grades

The grades may be awarded as given in the following tables, 20.1

For Post-Graduate

Range of Marks in %	Letter Grade	Grade Point	Description
90 to 100	O	10	Outstanding
80 to 89	A+	9	Excellent
70 to 79	A	8	Good
60 to 69	B+	7	Above Average
50 to 59	B	6	Average
Below 50	F	0	Fail
	FA	0	Failure due to lack of attendance
	AE	0	Absent in the End Semester Examination

The Director, BE&E will publish the provisional grades. Re-evaluation of marks by the student can be done as per the regulations of Dr BAMU.

22. Computation of Semester Grade Point Average (SGPA)

SGPA indicates the performance of a student in a given semester. SGPA is based on the total credit points earned by the student in all the courses and the total numbers of credits assigned to the courses in a semester. The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student

and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \sum(C_i \times G_i) / \sum C_i$$

where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

22.1 Illustration for SGPA:

Course Title	Course Type	Credit assigned	Marks obtained by student (in %)	Grade letter	Grade point (GP)	Credits assigned x (GP) = Credit Point
Course 1	Core	4	78	A	8	32
Course 2	Core	4	67	B+	7	28
Course 3	Core	4	77	A	8	32
Course 4	Core	4	96	O	10	40
Course 5	Elective	3	86	A+	9	27
Course 6	Core	2	66	B+	7	14
Course 7	Core (Lab)	2	50	B	6	12
		23				185

$$SGPA = 185/23 = 8.04$$

23. Computation of Cumulative Grade Point Average (CGPA)

CGPA is obtained by dividing the total number of credit points earned in all the semester by the total number of credits in all the semester of a programme, i.e.,

$$CGPA = \sum(C_i \times S_i) / \sum C_i$$

where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the Grade card/ sheet or transcripts.

22.1 Illustration for CGPA:

Semester 1	Semester 2	Semester 3	Semester 4	
Credit: 22 SGPA: 6.9	Credit: 22 SGPA:	Credit: 23 SGPA:	Credit: 23 SGPA:	

Thus,

$$CGPA = \frac{22 \times 6.9 + 22 \times 7.8 + 23 \times 5.6 + 23 \times 6.0}{22 + 22 + 23 + 23}$$

$$= \frac{589.4}{90} = 6.54$$

24. Grade Card/ Sheet

The Director, B E&E shall issue a Grade card/ sheet to the students, containing the marks and grades obtained by the student in the previous semester and Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA).

The grade card/ sheet shall list:

- The title of the courses taken by the student.
- The credits associated with the course.

- (c) Type of Course
- (d) The marks and grade secured by the student.
- (e) The total credits earned by the student in that semester
- (f) The SGPA of the student.
- (g) The total credits earned by the students till that semester.
- (h) The CPGA of the student.

25. Provision to appeal

- 25.1. There shall be a provision for Appeal for a candidate who may be dissatisfied with the marks/ Grade (s)he has been awarded.
- 25.2. The appeal may be made for C.I.A marks as well as the End of Semester examination. Such appeals will be referred to an Appeals Committee whose decision shall be final.

25.3. Continuous internal assessment

- 25.3.1. In the case of dissatisfaction with C.I.A marks, the students shall approach the concerned department head or equivalent with separate written submission for every course within 3 working days from the declaration of C.I.A marks by the course instructor/ faculty member offering the course.
- 25.3.2. The student shall not pay any fee for the Appeal on C.I.A marks.

25.4. End Semester Examination

- 25.4.1. (S)he shall approach the Grievance Cell with the written submission within 15 days of the publication of the end semester results.
- 25.4.2. Appeal for each paper should be made separately.
- 25.4.3. Fee as prescribed by the University for each course under appeal should be paid.
- 25.5. The Grievance Committee is empowered to revise the grades if the case is genuine and is also empowered to penalize the candidate if his/her submission is found to be baseless and unduly motivated.

26. Grievance Committee

- 26.1. Every School shall constitute a Grievance Committee every semester to examine the complaints received from the students regarding their assessment, both C.I.A and End-Semester Examination.
- 26.2. The committee shall consist of 3 or 4 faculty members from the department with representation from every department of the school.
- 26.3. The requests for review from the students concerned should reach the Dean through the Head of the Department/Centre within 15 days of the announcement of the results of that assessment.
- 26.4. If a student is not satisfied with the decision of Department level Grievance Committee on his / her grievance, the Dean, on a request from the student may refer the matter to the Director, B, E&E for getting the paper evaluated by an external examiner, whose evaluation will be final. The fees for external evaluation in all such cases shall be decided by the University.

27. Transitory Regulations

- 27.1. Wherever there had been change of syllabi, examinations based on the existing syllabus will be conducted for three consecutive times after implementation of the new syllabus in order to enable the students to clear the arrears. Beyond that the students will have to take up their examinations in equivalent subjects, as per the new syllabus, on the recommendations of the Head of the Department concerned.