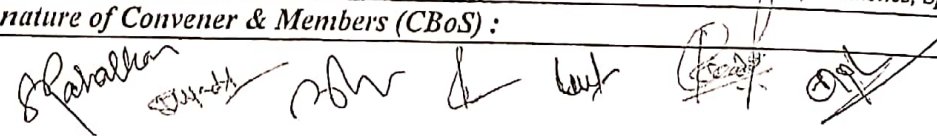


T Paper - I

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28) DEPARTMENT OF ZOOLOGY Course Curriculum

PART- A: Introduction			
Program: Bachelor in Life Science <i>(Honors / Honors With Research)</i>		Semester - VII	Session: 2024-25
1	Course Code	ZOSC-07T	
2	Course Title	Biosystematics and Taxonomy	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if, any)	<i>As per Program</i>	
5	Course Learning Outcomes (CLO)	<p>After successfully completing this course the students will be able to -</p> <ul style="list-style-type: none"> ➤ Comprehend the basic concepts of Biosystematics and Taxonomy. ➤ Understand and learn the Taxonomic Hierarchy in animal kingdom. ➤ Gain a basic knowledge and grasp the rules and philosophy of scientific nomenclature. ➤ Develop the critical understanding to identify the animals up to species level with the help of taxonomic keys. ➤ Learn the Newer trends in biosystematics and apply it in Research. 	
6	Credit Value	3 Credits	<i>Credit = 15 Hours - learning & Observation</i>
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Introduction to systematic and classification: Definition & basic concepts of Biosystematics and Taxonomy. Historical resume of systematic. Taxonomic Hierarchy: Definition, Linnean hierarchy and categories. Classification: Purpose, use and basis. Theories of classification: Biological, artificial and natural classification. Levels of taxonomy: alpha, beta and gamma taxonomy. Micro and macro taxonomy. Scope and applications of biosystematics in biology. The relevance of systematics in conservation programs.		11
II	Taxonomic Characters and Scientific Nomenclature: Different types of taxonomic characters (morphological, physiological, ecological, ethological and geographical characters). Zoological nomenclature: binominal and trinomial system, Principles and rules of International Code of Nomenclature (ICN), type material, author citation, criteria for publication, types of names, principle of priority and its limitations.		11
III	Taxonomic Keys, Taxonomic treatment and Phylogenetics: Types of taxonomic key their merits and demerits. Type concept: Process of typification and different Zoological types and their applications. Taxonomic treatment of Allopatric variation, homology and Reproductive and geographical isolating mechanisms and their role in speciation process. Evolutionary taxonomy: Cladistics. Constructing trees/dendrograms: Phenogram, phylogram and cladogram and turning them into classifications. Mechanism of speciation in panmictic and apomictic species. Species concept: different species concepts, Species category: sub-species and other infra species categories.		12
IV	Taxonomic procedure and Newer trends in biosystematics: Taxonomic Collection, curation, preservation, identification and classification. Newer trends in biosystematics: Morphological, Embryological, Behavioral, Ecological, Cytological and Biochemical approach. Numerical taxonomy. Differential systematic. Molecular taxonomy. DNA bar coding for identification of species.		11
Keywords	<i>Systematic, classification, Linnean hierarchy, dendrograms, Nomenclature, Cladistics, Species category</i>		
Signature of Convener & Members (CBoS) :			
			

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- R.C. Dalella & R.S. Sharma, (2017) Animal Taxonomy & Museology. Jai Prakashnath & Co., Meerut.
- V.C. Kapoor (2019). Theory and practice of animal taxonomy and biodiversity, 8th Edn.

Reference Books Recommended –

- E. Mayer, (1991). Principles of Systematic Zoology.
- G.G. Simpson (2012). Principles of animal taxonomy. Scientific Publisher, India
- E.O. Wilson, (1988). Biodiversity. John Wiley & Sons.
- Futuyama, D. J. (1986). Evolution, Systematics and Animal Behaviour. Evolutionary Biology. Sinauer Associates Inc.
- Mayr, E. & Ashlock, P. D. (1991) Principles of Systematic Zoology (2nd edition) McGraw Hill Int.

Online Resources–

- <http://ndl.iitkgp.ac.in/he document/swayamprabha/swayam prabha/qtrdnp2xfxe?e=0/species%20concept>
- <http://ndl.iitkgp.ac.in/he document/swayam ugc moocs/214 21777 self learning>

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10	
	Total Marks - 30	
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener & Members of CBoS:

Shahankar

nsr

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Practical - I

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28) DEPARTMENT OF ZOOLOGY COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science <i>(Honors / Honors with Research)</i>		Semester -VII	Session: 2024-2025
1	Course Code	ZOSC- 07P	
2	Course Title	Biosystematics and Taxonomy	
3	Course Type	Discipline Specific Lab Course	
4	Pre-requisite (if, any)	<i>As per Program</i>	
5	Course Learning Outcomes (CLO)	<p>After successfully completing this course the students will be able to</p> <ul style="list-style-type: none"> ➤ Comprehend the basic concepts of Biosystematics and Taxonomy. ➤ Understand and learn the Taxonomic Hierarchy in animal kingdom. ➤ Gain a basic grasp on the rules and philosophy of scientific nomenclature. ➤ Develop the critical understanding to identify the animals up to species level with the help of taxonomic keys. ➤ Learn the Newer trends in biosystematics and apply it in Research. 	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	<ul style="list-style-type: none"> • Study and sketch of museum specimens of Invertebrates and Vertebrates on the basis of systematic and Taxonomic Hierarchy • Preparation of identification keys for select specimens of non chordate (e.g., insects) and chordates (e.g., birds). • Make a record of biodiversity of college campus. • Construct the dendrograms, through Interactive software for exploring phylogeny and analyzing character • Use DNA bar coding for identification of species. • General discussion, distinguishing characters and classification of selected animals. • Generation of a character-state matrix by selecting and scoring diagnostic taxonomic characters. • Distance-based methods of phylogenetic reconstruction using manual and computer methods. • Group discussion/Viva or Seminar presentation on two related topics. • An “animal album or Practical Record” containing sketches, photographs, cut outs, with appropriate writes up about the above mentioned taxa. • Study of some videos to develop understanding on the animals of different taxa. 		30
Keywords	Museum specimens, dendrograms, bar coding, identification keys, phylogenetic		
Signature of Convener & Members (CBoS) :			

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- R.C. Dalella & R.S. Sharma, (2017) Animal Taxonomy & Museology. Jai Prakashnath & Co., Meerut.
- V.C. Kapoor (2019). Theory and practice of animal taxonomy and biodiversity, 8th Edn.
- S.S. Lal, Practical Zoology, Invertebrate. 12th Edition Rastogi Publications, Meerut, New Delhi.
- A manual of practical Zoology. Dr. P.S Verma, S. Chand Publication, New Delhi

Reference Books Recommended –

- E. Mayer, (1991). Principles of Systematic Zoology.
- G.G. Simpson (2012). Principles of animal taxonomy. Scientific Publisher, India

Online Resources–

- <http://ndl.iitkgp.ac.in/he document/swayamprabha/swayam prabha/qtrdnp2xfxe?e=0|speci es%20concept|||>
- <http://ndl.iitkgp.ac.in/he document/swayam ugc moocs/214 21777 self learning>

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	50 Marks
Continuous Internal Assessment (CIA):	15 Marks
End Semester Exam (ESE):	35 Marks

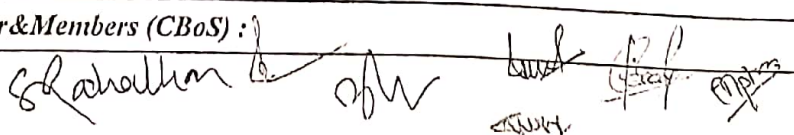
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05 Total Marks - 15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment	
	A. Performed the Task based on lab. work - 20 Marks	Managed by Course teacher as per lab. status
	B. Spotting based on tools & technology (written) – 10 Marks	
C. Viva-voce (based on principle/technology) - 05 Marks		

Name and Signature of Convener & Members of CBoS:

[Handwritten signatures of Convener and Members of CBoS]

T Paper - II

FOUR YEAR UNDERGRADUATE PROGRAM(2024 – 28) DEPARTMENT OF ZOOLOGY COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor in Life Science (Honors/ Honors with Research)		Semester - VII	Session: 2024-25
1	Course Code	ZOSE-05T	
2	Course Title	Endocrinology Paper - II	
3	Course Type	Discipline Specific Course	
4	Pre-requisite(if,any)	As per Program	
5	Course Learning Outcomes(CLO)	<p>After successfully completing this course, the students will be able to:</p> <ul style="list-style-type: none"> ➤ Understand characters of hormones, their biochemical origin, functions and their role in physiology. ➤ Learn about the organization of endocrine glands and mechanism of hormone action. ➤ The learners will understand the hormonal disorders, and diseases. ➤ Comprehend about the role of hormone in healthy lifestyle. ➤ Develop insights on advancements in endocrinology. 	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max.Marks: 100	Min Passing Marks:40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods(01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)	No. of Period	
I	Chemical Regulators and Gene action: General characters, chemical structure & properties of Hormones. Comparison between hormone and enzymes. Types of chemical regulators: Hormone, Neurotransmitters, Parahormones, Semiochemicals: Pheromones, Lumones & Chalone. Hormone Receptors: Mechanism of hormone action and cell signaling, Second messengers: types and features. Gene & Hormone Action, Hormone Responsive Element. Feedback system in Hormone action, hormone delivery. The Lesser Known Regulatory Substances (Somatomedins, Prostaglandin, Eicosanoids, Thromboxane etc.) Analytical techniques of Hormone Assay: Radioimmuno assay, Enzyme linked immune sorbent assay, Immune histochemistry. Hormone Replacement Therapy.	10	
II	Neuro-endocrine system: Hypothalamus: Origin, Location, Gross Anatomy, and Structure. The Endocrine Hypothalamus: Hypothalamic Hormones, Hypothalamic Nuclei, General Functions of Hypothalamus, Hypothalamo-hypophysial portal system, Hypothalamo-hypophysial-gonadal axis. Pituitary Gland: Origin, Location, Structure, Hormones, Control of secretion & disorders. Regulation of pigmentation by Pars Intermedia in vertebrate chromatophores. Pineal Gland: Origin, Location, Structure, Hormones & Control of secretion, Overview of Biological Rhythm. Role of Oxytocin, Endorphin, Serotonin and Dopamine in temperament stability (Happiness Hormones & Mental Health). Neuro-endocrine system in Insects and its physiology.	11	
III	Endocrine System & Physiology I: Thyroid Gland: Organization of Mammalian Thyroid Gland, Biosynthesis of Thyroid Hormones, Metabolism of Thyroid Hormones, Regulation of Thyroid hormone secretion, Physiological & Metabolic Roles of Thyroxine, disorders of Thyroid Functions. Parathyroid Gland and Calcium Regulation. Calcium and Phosphate homeostasis. Adrenal Gland: Organization of Mammalian Adrenal Gland. The Adrenal Steroid Hormones (Synthesis Pathway & Physiological Roles), The Renin Angiotensin System, The Adrenal Medulla & Catecholamines (Synthesis Pathway and Mechanism of action of Catecholamines). Disorders of Adrenal Gland.	12	
IV	Endocrine System & Physiology II: The Endocrine Pancreas: Origin, Islet Cell Structure & cell types, Hormones of the endocrine pancreas, Insulin: Biochemistry, Synthesis, Mechanism of action and physiological role, Glucose Transporters in Mammals & Diabetes mellitus. Insulin Resistance. Hormones of Gonads: Gonadal steroid hormones, Biosynthesis, transport, metabolism and physiological effects. Role of hormones in ovarian cycle & Menopause. Hormones in Birth Control. Role of hormones in sex determination. Hormones of Gastrointestinal Tract: Action of Gastrointestinal Peptides in mammals. Hormonal control of feeding behaviour. Hormones and lifestyle disorders: Chronic stress, Blood Pressure & Obesity.	12	
Keywords	Hormone, Pheromones, Biosynthesis, Thyroid Gland, Adrenal Gland, Pancreas, Catecholamines, Sex Determination, Diabetes, Obesity.		
Signature of Convener & Members (CBoS) :			
			

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Chandra S. Negi: Introduction to Endocrinology, 2009, PHI
- Shastri V.K., Endocrinology and Reproductive Biology, Rastogi Publicatio

Reference Books Recommended –

- Hadley: Endocrinology (6th ed. 2009, Prentice Hall)
- Lodish et al :Molecular Cell Biology, W.H.Freeman& Co Ltd.
- Turner &Bagnara: General Endocrinology, 6th ed.1984, Saunders)
- Norris: Vertebrate Endocrinology, Fourth Edition, 2007, Academic Press

Online Resources–

- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2rAs1Puvga4LW93zMc83aA==>
- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2rAs1Puvga4LW93zMc83aA==>

Online Resources–

- <http://ndl.iitkgp.ac.in/he document/ccc/ gFN1zyU718 PLNsppmbLKJ8KYPKieHeF3oC4jZYt8zBe4>
- <https://egyankosh.ac.in/bitstream/123456789/33320/1/Unit-4.pdf>
- <https://www.ncbi.nlm.nih.gov/books/NBK441576/>

PART -D:Assessment andEvaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment(CIA): 30 Marks

EndSemester Exam(ESE): 70 Marks

Continuous InternalAssessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10 Total Marks - 30	
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener & Members of CBoS:

(Handwritten signatures of Convener and Members of CBoS)

P. - Practical - II

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28) DEPARTMENT OF ZOOLOGY COURSE CURRICULUM

PART-A: Introduction		
Program: Bachelor in Life Science (Honors / Honors with Research)		Semester - VII
Session: 2024-25		
1	CourseCode	ZOSE-05P
2	CourseTitle	Endocrinology
3	CourseType	Discipline Specific Elective Lab Course
4	Pre-requisite(if,any)	<i>As per Program</i>
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> > Develop understanding of histological study of endocrine glands > Learn the role anatomical aspects of various endocrine glands. > Attain the fundamentals of applied endocrinology. > Explore the operation of basic medical kits of routine usga. > Create awareness towards lifestyle disorders related to hormones.
6	CreditValue	1 Credits Credit =30 Hours Laboratory or Field learning/Training
7	TotalMarks	Max.Marks:50 Min Passing Marks:20
PART -B: Content of the Course		
TotalNo.of learning-Training/performancePeriods:30 Periods (30 Hours)		
Module	Topics (Course contents)	No.ofPeriod
Lab./Field Training/ Experiment Contents of Course	<ul style="list-style-type: none"> • Study of histological slides of the endocrine glands. • Demonstration of Endocrine Glands of Cockroach. (Alternative Methods) • Demonstration of Endocrine Glands in Rat (Alternative Methods) • Study of Glucose Tolerance Test. • Principle of HbA1c Test. • General procedures and demonstration of glucometer operation. • Study of working principle / demonstration of Urine Pregnancy Tests (UPT). (Principle, Procedure, Interpretation and Limitations) • General Study of Normal Blood Parameters of different hormones (From Pathological Reports) • Group discussion/ Seminar/ Quiz/ Projects on Endocrinology • Preparation of Practical Record. 	30
Keywords	Endocrine Glands, Glucose Tolerance Test, HbA1c, Glucometer, Pregnancy	
Signature of Convener & Members (CBoS):		

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- > Lal S.S. Practical Zoology Vertebrates; Rastogi Publications
- > Islam Mofidul, Das Viblab Kumar : Endocrinology with Practicals; Mahaveer Publications
- > Verma P.S : A Manual of Practical Zoology Chordates; S.Chand Publications
- > Arumugam N : Practical Zoology; Saras Publications.

Reference Books Recommended –

- > Hadley: Endocrinology (6th ed. 2009, Prentice Hall)
- > Lodish et al :Molecular Cell Biology, W.H.Freeman& Co Ltd.

Online Resources–

- > <https://egyankosh.ac.in/bitstream/123456789/33320/1/Unit-4.pdf>

Online Resources–

- > <https://www.ncbi.nlm.nih.gov/books/NBK532915/>
- > <https://laboratorytests.org/urine-pregnancy-test/>

PART-D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

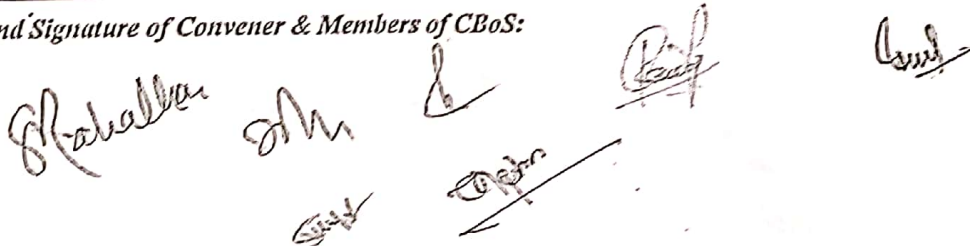
Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar + Attendance- 05 Total Marks -15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment A. Performed the Task based on lab. work - 20 Marks B. Spotting based on tools & technology (written) – 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	Managed by Course teacher as per lab. status

Name and Signature of Convener & Members of CBoS:



T Paper - III

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28) DEPARTMENT OF ZOOLOGY COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor in Life Sciences (Honors / Honors with Research)		Semester -VII	Session: 2024-2025
1	Course Code	ZOSE – 06T	
2	Course Title	Immunology	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite(if, any)	<i>As per Program</i>	
5	Course Learning Outcomes(CLO)	<p style="text-align: center;">After successfully completing this course, the students will be able to:</p> <ul style="list-style-type: none"> ➤ Understanding of fundamental concepts of immunology. ➤ Gain knowledge on various immune cells, antigens and cytokines. ➤ Understand the structure and functions of Immunoglobulins and antibodies. ➤ Students will be able to describe the processes involved in immune system. ➤ Students will analyse the pathogenesis, clinical manifestations, and therapeutic approaches of various immune disorders and diseases and experimental techniques in Immunology. 	
6	Credit Value	3 Credits	Credit = 15 Hours =learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks:40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods(01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Understanding of Immunological Concepts: Immune System: Brief history of Immunity, Concept & Types of Immunity (Innate and Acquired or Adaptive), Origin and Evolution of Immune System. Primary and Secondary lymphoid organs, lymphoid tissues. Thymic Selection: Self and non-self-recognition. Inflammation. Lymphocyte trafficking. Hematopoiesis.		10
II	Components of Immune System- I: Cells of Immune System: Structure and functions of macrophages, granulocytes, NK cells, T and B lymphocytes and Antigen presenting cells. T & B Cell receptors, maturation, activation and differentiation of T& B Cell. Antigen: Antigenicity v/s immunogenicity, Factors affecting Immunogenicity, immunogen, haptens, super antigen, epitope, paratope. Adjuvants: Freund's complete and incomplete. Processing and presentation of Ag. Major histocompatibility complex (MHC) and HLA. Cytokines.		12
III	Components of Immune System- II: Immunoglobulins: Nature, Primary structure of immunoglobulins. Enzymatic fragmentation of Ig. Domain structure of Ig and its significance. Types and subtypes of Ig and its characteristics. Membranous antibody. Antigenic determinants: isotype, allotype, idiotype. Abzymes. Theories of Antibody Formation: Instructive, selective, clonal selection theories and evidences; Immunological memory. Complement System. Hypersensitivity (Type I to IV with example) CMI & humoral immune response. Antigen-Antibody interaction: affinity & avidity.		13
IV	Immune disorders & Immuno-techniques: Auto-immunity: Auto-recognition, classes of auto-immune diseases. (Hashimoto disease, Thyrotoxicosis, Systemic lupus erythematosus, Rheumatoid arthritis).Transplantation: Autograft, Isograft, Allograft, Xenograft, Immunological basis of transplantation reactions. Immune Deficiencies: Primary and secondary immune deficiencies. T-cell, B-cell and SCID, AIDS. Vaccination and types of vaccines (First, Second & Third generation vaccines). Immunological techniques: Precipitin curve, Immuno-diffusion, one and two dimensional, single radial immuno-diffusion, Double (Ouchterlony) immuno-diffusion. Immuno-electrophoresis: Rocket immuno-electrophoresis; CIE, Graber and William technique.Radio-immunoassay: ELISA-Principle, Methodology and applications. Immuno-fluorescence: Direct, indirect and Sandwich, in situ localization by techniques:FISH and GISH. Hybridoma, Monoclonal antibodies.		10
Keywords	<i>Immunity, lymphocytes, Antigens, Immunoglobulins, Auto-immunity, Vaccination & Immuno-techniques.</i>		
Signature of Convener & Members (CBOs):			

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Pravash Sen. Gupta, Clinical Immunology. Oxford University Press. 2003.
- N Arumugam, Immunology, Saras Publication. 2014.
- Fatima D, Arumugam, Immunology, Saras Publication

Reference Books Recommended –

- Janis Kuby, Immunology, II edition. W. H. Freeman and Company, New York. 1993.
- Ivan M. Roitt, J. Brostoff and D. K. Male, Immunology, Gower Medical Publishing, London. 1993.

Online Resources–

- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2rAs1Puvga4LW93zMe83aA==>
- http://ndl.iitkgp.ac.in/he_document/swayamprabha/swayam_prabha/hdc5c5m6hkq?e=1|immunology|||
- <https://xvivo.com/examples/the-innate-immune-system/>
- <https://xvivo.com/examples/the-adaptive-immune-system/>

PART-D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

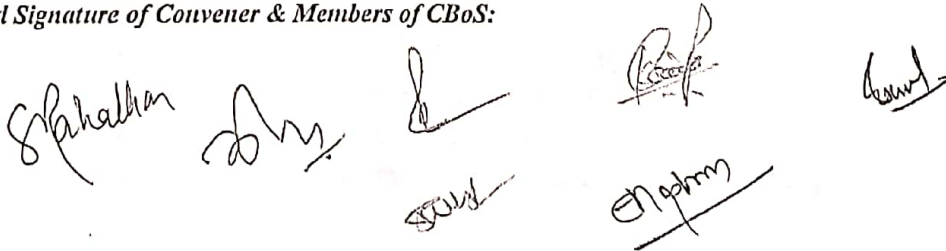
Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20 Assignment/Seminar- 10 Total Marks -30	Better marks out of the two Test / Quiz+ obtained marks in Assignment shall be considered against 30 Marks
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit-4x10=40Marks	

Name and Signature of Convener & Members of CBoS:



Practical - III

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28) DEPARTMENT OF LIFE SCIENCE COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Honors/ Honors with Research)		Semester - VII	Session: 2024-2025
1	Course Code	ZOSE-06P	
2	Course Title	Immunology	
3	Course Type	Discipline Specific Elective Lab Course	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes (CLO)	<p style="text-align: center;">At the end of this course, the students will be able -</p> <ul style="list-style-type: none"> ➤ Gain practical knowledge on various immune cells, antigens and antibodies. ➤ Identify the major cellular and tissue components which comprise the innate and adaptive immune system. ➤ Students will experimental techniques in Immunology. ➤ Understand how does the immune system distinguish self from non-self. ➤ Gain experience at reading and evaluating the scientific literature in the area. 	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)	No. of Period	
Lab./Field Training/ Experiment Contents of Course	<ul style="list-style-type: none"> • Study of permanent slides of organs of immune system • Enumeration of total leucocytes from human blood samples • Enumeration of differential leucocytes from human blood samples • Demonstration of agglutination reaction using human RBC • Demonstration of Ag-Ab precipitation by immunodiffusion technique • Antigen detection by radial immunodiffusion technique (RID) • Estimation of total serum protein • Estimation of serum gamma globulins/Separation of γ-globulin by salt precipitation. • Estimation of A/G ratio • Isolation of lymphocyte by using density gradient centrifugation • Paper and gel immuno-electrophoresis • Rocket immunoelectrophoresis • Counter current immunoelectrophoresis • ELISA • Group discussion/Quiz/ Seminar presentation on related topics. • Making of Practical record. 	30	
Keywords	Leucocytes, Rocket immunoelectrophoresis, ELISA, A/G ratio, RID		
Signature of Convener & Members (CBoS) :			

S. Palan

S. M. S.

S. M. S.

S. M. S.

S. M. S.



PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Talwar G.P. and Gupta S.K, A Handbook Of Practical And Clinical Immunology Volume 1, CBS Publication
- Zane, Immunology: Theoretical And Practical Concepts In Laboratory Medicine, ELSEVIER

Reference Books Recommended –

- Goldsby, R.A.; Kindt, T.J. and Kuby, J. (2006) Immunology (6th edition).
- Roitt, I.; Brostoff, J. and Male, D. (2012) Immunology (8th edition).

Online Resources–

- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2rAs1Puvga4LW93zMe83aA==>
- <http://ndl.iitkgp.ac.in/he document/swayamprabha/swayam prabha/hdc5c5m6hkq?e=1|jmmunology||>
- <https://xvivo.com/examples/the-innate-immune-system/>
- <https://xvivo.com/examples/the-adaptive-immune-system/>

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

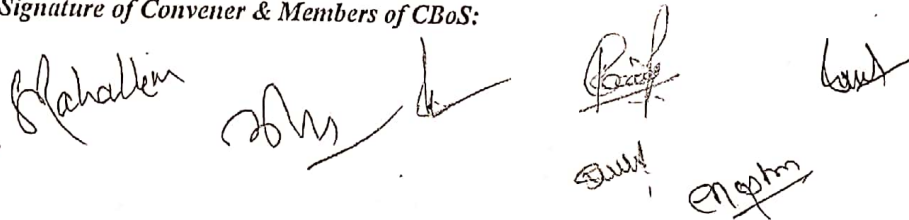
Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

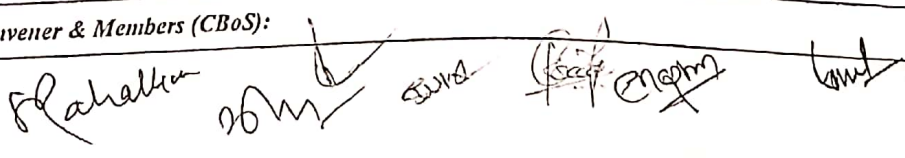
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05 Total Marks - 15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment	Managed by Course teacher as per lab. status
	A. Performed the Task based on lab. work - 20 Marks	
	B. Spotting based on tools & technology (written) - 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	

Name and Signature of Convener & Members of CBoS:



T Paper - IV

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28) DEPARTMENT OF ZOOLOGY COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor in Life Science (Honors/Honors with Research)		Semester - VII	Session: 2024-2025
1	CourseCode	ZOSE- 07T	
2	CourseTitle	Biotechnology & Genetic Engineering	
3	CourseType	Discipline Specific Elective	
4	Pre-requisite(if,any)	<i>As per Program</i>	
5	Course Learning Outcomes(CLO)	<p>After successfully completing this course, the students will be able to-</p> <ul style="list-style-type: none"> ➤ Define the concept of recombinant DNA and genetic engineering. ➤ Understand the molecular techniques and their proficiencies. ➤ Apply the knowledge of gene manipulation techniques. ➤ Analyze different prospects and applications of genetic engineering and bioinformatics. ➤ Develop understanding of ethical, social and legal implications of genetic engineering. 	
6	CreditValue	3 Credits	Credit = 15 Hours -learning & Observation
7	TotalMarks	Max.Marks: 100	Min Passing Marks:40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course Contents)		No. of Period
I	Introduction to Biotechnology: An overview of Biotechnology: History, Definition, scope, applications and ethical issues in biotechnology. Recombinant DNA, Restriction Enzymes, Application of different enzymes in Recombinant DNA technology, Restriction and modification system, Linkers & Adaptors, Restriction mapping. Vectors (Cloning and Expression Vectors). Gene Recombination and Gene transfer: Transfection, Transduction, Microinjection, Electroporation and Ultrasonication. Antibiotic Resistant Gene and their mode of action. Polymerase chain reaction (PCR): Principle and applications of different types of PCR. DNA and RNA Purification.		11
II	Elementary Genetic Engineering: Preparation and comparison of Genomic and cDNA library, screening of recombinants, Genome: organization, coding and non-coding sequences & genome mapping, Comparative genome hybridization. Whole genome shotgun sequencing, Chromosome Banding. Gene tagging, DNA Cloning, DNA Sequencing methods, DNA profiling. Genetic Markers, Molecular markers: Types & Features. Stem Cells: Embryonic Stem Cells, Adult Stem Cells and Induced Pluripotent Stem Cells, Formation and selection of recombinant ES cells, Role of ES cells in gene targeting in mice, Gene Probe, Colony Hybridization, Blotting Techniques (Southern, Northern, Western and Eastern Blotting), Animal Cell Culture (Primary Cultures, Cell line, Transformation characteristics, Culture Media & Growth Cycle).		11
III	Advancements in Genetic Engineering: Random and site-directed mutagenesis: Primer extension and PCR based methods of site directed mutagenesis, Random mutagenesis. Gene Editing, Gene shuffling, Genetic Manipulation of Animal Cells (Transgenesis and transgenic animals), Gene Knockout, Nuclear Transfer Technology and Animal Cloning, Gene Therapy, Gene Delivery System (Virus mediated transduction & non-viral transduction methods). Molecular Farming (Therapeutic products produced by genetic engineering-blood proteins, human hormones, immune modulators and vaccines), Microarrays and next generation sequencing technologies.		12
IV	Applications of Genetic Engineering & Bioinformatics: Cord blood banking, Genetically Modified Organism (GMO), Animals as bioreactors: Genetically engineered animals for research. Conditional knock outs using cre-loxP recombination; tissue specific promoters, CRISPR-Cas9 and its applications in treating genetic disorders. Genetic modification of livestock for improved productivity and disease resistance. Ethical, Legal, and Social Implications (ELSI) of genetic engineering. Bioinformatics: Overview and its relation with molecular biology. Biological Databases: Overview, Applications & Prospects. Examples of related tools (FASTA, BLAST, BLAT, RASMOL), databases (GENBANK, Pubmed, PDB) and software (RASMOL, Ligand Explorer), Data generation; Generation of large scale molecular biology data. (Through Genome sequencing) File Format (Genbank, DDBJ, FASTA, PDB, Swiss Prot). Sequence Alignments and Visualization, General Introduction of Biological Databases; Nucleic acid databases (NCBI, DDBJ, and EMBL). Protein databases (Primary, Composite, and Secondary). Specialized Genome databases: (SGD, TIGR, and ACeDB). Structure databases (CATH, SCOP, and PDBsum).		11
Keywords: Recombinant DNA, Genome, Gene, Mutagenesis, Microarray, Techniques, Biological Database.			
Signature of Convener & Members (CBoS):			
			

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Lehninger – Principles of Biochemistry, WH Freeman.
- Satyanarayan U - Biotechnology, Saras Publication
- Gupta P.K. – Elements of Biotechnology, Rastogi Publications.
- Gupta P.K. – Biotechnology and Genomics, Rastogi Publications.
- Kumar Pranav, Verma Praveen, Meena Usha – Biotechnology: A problem approach- Pathfinder Publications.
- Rastogi S.C., Rastogi P., Mendiratta N :Bioinformatics: Methods and Applications: Genomics, Proteomics and Drug Discovery, PHI Learning.
- Bosu Orpita, Thukral S.K.- Bioinformatics: Experiments, Tools, Databases, and Algorithms – Oxford University Press

Reference Books Recommended –

- Lodish H et al., - Freeman
- Watson JD et al.-Macmillan - Recombinant DNA: Genes and Genomes, A Short Course.
- Alberts B et al., Molecular Biology of the Cell, - Garland
- Brown TA – Genomes, Garland

Online Resources–

- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=31BI+Y/JvQo+vflwaZoj+g==>
- http://ndl.iitkgp.ac.in/he document/swayamprabha/swayam_prabha/ksrdg67pyn8?e=1|bioinformatics|||
- http://ndl.iitkgp.ac.in/he document/nptel/nptel/courses_102_106_102106065_video lec66?e=3|bioinformatics|||
- [http://ndl.iitkgp.ac.in/he document/cec/cec/0F_oDrArwTU_PLNsppmbLKJ8K5HAWWhRVvE_HrBSIIXVO-oE?e=0|biotechnology%20:%20genome%20editing%20tools%20-%203%20\(crispr/cas9\)|||](http://ndl.iitkgp.ac.in/he document/cec/cec/0F_oDrArwTU_PLNsppmbLKJ8K5HAWWhRVvE_HrBSIIXVO-oE?e=0|biotechnology%20:%20genome%20editing%20tools%20-%203%20(crispr/cas9)|||)

Online Resources–

- <https://vlab.amrita.edu/?sub=3&brch=274&sim=1428&cnt=1>
- http://ndl.iitkgp.ac.in/he document/cec/PRwJGpzUSYM_PLNsppmbLKJ8K5HAWWhRVvE_HrBSIIXVO-oE

PART-D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20 Assignment/Seminar- 10 Total Marks -30	Better marks out of the two Test / Quiz+ obtained marks in Assignment shall be considered against 30 Marks
	End Semester Exam (ESE):	

Name and Signature of Convener & Members of CBoS:

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Practical - IV

FOUR YEAR UNDERGRADUATE PROGRAM(2024 – 28) DEPARTMENT OF ZOOLOGY COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor in Life Science (Honors/Honors with Research)		Semester - VII	Session: 2024-2025
1	CourseCode	ZOSE- 07P	
2	CourseTitle	Biotechnology & Genetic Engineering	
3	CourseType	Discipline Specific Elective Lab Course	
4	Pre-requisite(if,any)	<i>As per Program</i>	
5	Course Learning Outcomes(CLO)	<p>After successfully completing this course, the students will be able to:</p> <ul style="list-style-type: none"> ➤ Learn to prepare aseptic techniques in laboratory for biotechnology experiments. ➤ Understand the fundamental experiments & techniques of biotechnology & genetic engineering. ➤ Develop practical skills in genetic engineering techniques and laboratory procedures. ➤ Learn characteristics of genetic material. ➤ Analyze applications of diverse genetic engineering protocols. 	
6	CreditValue	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	TotalMarks	Max.Marks:50	Min Passing Marks:20
PART -B: Content of the Course			
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics(Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	<ul style="list-style-type: none"> • Sterilisation of glassware, media and laboratory. • Working principle and applications of- Hot Air Oven, Autoclave & Laminar flow hood. • Demonstration of cell culture techniques. • Demonstration of gene library and cDNA library. • Isolation of DNA from plant sample. • Isolation of plasmid DNA from E. coli cells. • Isolation of genomic DNA from whole blood. • Demonstration of Gel electrophoresis techniques. • Separation and visualization of DNA fragments using agarose gel electrophoresis. • Spectrophotometric estimation of isolated DNA. • Restriction digestion of plasmid DNA and genomic DNA. • Study related to working principle of PCR machine. • Preparation of Minimal Essential Growth medium. • Staining the cultured cells using dyes such as hematoxylin and eosin (H&E), and observe them under a light microscope to study cell morphology and structure. • Bioinformatics: Analyse DNA or protein sequences using online tools and databases. • Demonstration of online data bases for bioinformatics-based studies. • Demonstration of DNA band visualization techniques (e.g., Ethidium bromide staining, DNA intercalating dyes) • Group discussion/ Quiz/Project/Seminar presentation on related topics. • Practical Record <p style="text-align: center;"><i>Note: Virtual mode of demonstration can be opted if required.</i></p>		30
Keywords	Sterilization, Autoclave, Electrophoresis, Restriction, PCR, Plasmid, Genomic, Bioinformatics		
Signature of Convener & Members (CBoS):			

PART-C: Learning Resources

Text Books Recommended -

- Aneja K.R.; Laboratory manual of microbiology and biotechnology; Medtech.
- Ramdass P; Practical Biotechnology; JaypeeBrothers Medical Publishers; First Edition.

Reference Books Recommended -

- Wilson, K., & Walker, J. Principles and Techniques of Biochemistry and Molecular Biology (8th ed.). Cambridge University Press.
- Kurian K. Noble; A complete lab manual for Biotechnology; Notion Press.
- Borah Debajit; Biotechnology Lab Practices; Global Vision Publishing House.
- Portner Ralph; Animal Cell Biotechnology: Methods and Protocols: Humana Press Springer Protocols

Online Resources-

- <https://indiabioscience.org/media/articles/DBT-Life-Science-Protocol-Manual.pdf>
- https://webstor.srmist.edu.in/web_assets/downloads/2021/20BTC502J-lab-manual.pdf

Online Resources-

- <https://learn.genetics.utah.edu/content/labs/>

PART-D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar + Attendance- 05 Total Marks -15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment A. Performed the Task based on lab. work - 20 Marks B. Spotting based on tools & technology (written) - 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	Managed by Course teacher as per lab. status

Name and Signature of Convener & Members of CBoS:



T Paper - V

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

PART- A: Introduction		
Program: Bachelor in Life Science (Honors/ Honors with Research Degree)		Semester -VII
Session: 2024-2025		
1	Course Code	ZOSE- 08T
2	Course Title	Applied Zoology
3	Course Type	Discipline Specific Elective
4	Pre-requisite (if, any)	As per Program
5	Course Learning Outcomes (CLO)	<p>After successfully completing this course, the students will be able to:</p> <ul style="list-style-type: none"> ➤ Understand the culture techniques of prawn, pearl and fish, Lac culture. ➤ Understand silkworms rearing and their products. ➤ Understand the Bee keeping equipments and apiary management. ➤ Understand dairy animal's management. ➤ Learn the testing of egg and milk quality. ➤ Apply this knowledge for Setting up a self-employment venture in the field.
6	Credit Value	3 Credits
7	Total Marks	Max. Marks: 100
		Credit = 15 Hours - learning & Observation
		Min Passing Marks: 40
PART -B: Content of the Course		
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)		
Unit	Topics (Course contents)	No. of Period
I	Aquaculture: Prawn culture: Culture of fresh water prawn and marine prawn. Preparation of farm for Prawn culture. Preservation and processing of prawn. Export of prawn. Pearl Culture: pearl formation, protocol followed, Fresh Water Fish Culture: Qualities or Characters of Cultivable Fishes, Construction of Fish Farm. Fish Breeding: bundh and induced. Fish Seed: Types, Seed collection: Benchi jal (Shooting net), hatching Hapa. Transport of Seed: Open and closed system, Causes of mortality in transport. Use of chemicals in live fish transport: Anesthetic drugs. Antiseptics and Antibiotics. Harvesting of fish: By hooks and nets (Triangular net, Dip net and Cast net). Fish preservation. Fish diseases and their control.	12
II	Apiculture and Sericulture: Apiculture: Species of honey bees. Morphology and life cycle of <i>Apis indica</i> . Social behaviour of honey bees: Colony organization, division of labour and communication. Methods of Bee keeping: Indigenous and Modern method, appliances used for bee keeping, management of honey bees and their hives, Extraction of honey from the comb and processing, bee Products and their economic importance. Natural enemies & diseases of Bee and their management. Sericulture: Types of silk, Silkworms and their host plants, Life history of <i>Bombyx mori</i> Rearing of <i>Bombyx mori</i> : Rearing racks and trays, disinfectants, rearing appliances, black boxing, Chawki rearing, bed cleaning, mountages. Harvesting of cocoons, Silkworm diseases and their control: Pebrine, Flacherie, Grasserie, Muscardine and Aspergillosis. Silkworm pests and parasites and their management: Uzi fly, Dermestid beetles. Silk reeling techniques. Quality assessment of silk fibre.	11
III	Lac Culture and Vermiculture: Lac Culture History of lac. Cultivation of lac: Host plants, Lac insect and its life cycle. Control of lac insect pests processing and collection of lac. Lac composition, products and uses. Vermiculture: Biology of <i>Eisenia foetida</i> . Rearing of earthworms. Equipments, devices used in vermiculture. Vermicompost Technology: Methods and products, Vermiwash Collection, Composition and use.	11
IV	Dairy management and Poultry farming: Dairy: Introduction to common dairy animals. Techniques of dairy management: System of housing. Milk and milk products. Cattle Diseases and control measures. Poultry: Types of breeds. Methods of brooding and Rearing. Housing and Equipment, Deep litter System, Laying cages, Debeaking, Incubation and hatching of eggs. Management of growers, Layers, Broilers. Feed formulations for chicks, Diseases and control measures. Nutritive value of egg and meet.	11
Keywords	Aquaculture, Apiculture, Sericulture, Poultry farming, Dairy Farming, Vermiculture	
Signature of Convener & Members (CBoS) :		

(Handwritten signatures of Convener and Members)

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Srivastava, C. B. L. (1999). *Fishery Science and Indian Fisheries*. Kitab Mahal publications, India.
- Sardar Singh, *Beekeeping in India*, Indian council of Agricultural Research, New Delhi.
- Dhyan Singh Bisht, *Apiculture*, ICAR Publication.
- Shukla G.S., Upadhyay V.B. *Economic Zoology*, Rastogi Publication
- Ahasan J, Sinha, S.P. (2010) *Handbook of Economic Zoology*, S Chand Publication
- Jabde, P. *Text book of Applied Zoology* (2008), Discovery Publishing Pvt. Ltd

Reference Books Recommended –

- Prost, P. J. (1962). *Apiculture*. Oxford and IBH, New Delhi.
- Sericulture, *FAO Manual of Sericulture*.
- Hafez, E. S. E. (1962). *Reproduction in Farm Animals*, Lea and Fabiger Publishers.
- Knobil, E. and Neill, J. D. (2006). *The Physiology of Reproduction*, Vol. 2, Elsevier Publishers.

Online Resources–

- https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SBT1608.pdf
- <https://egov.uok.edu.in/elearning/tutorials/1011020512BR15103CR15Apiculture%20Lac%20culture%20and%20%20sericultureapiculture%20lac%20culture%20and%20%20sericulture%20upload.pdf>
- https://kvk.icar.gov.in/API/Content/PPupload/k0160_11.pdf
- <https://dahd.nic.in/sites/default/files/Excerpts%20of%20Poultry%20Farmn%20Manual.pdf>

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

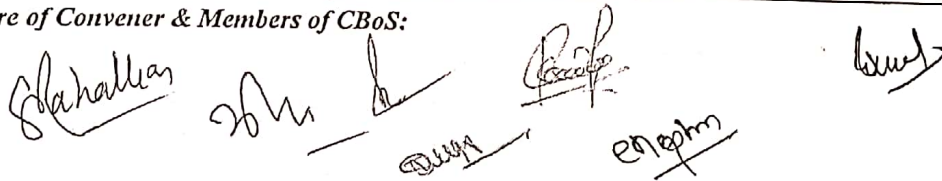
Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10	
	Total Marks - 30	
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener & Members of CBoS:



Practical - V

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28) DEPARTMENT OF ZOOLOGY COURSE CURRICULUM

PART- A: Introduction		
Program: Bachelor in Life Science (Honors/ Honors with Research)		Semester - VII
		Session: 2024-2025
1	Course Code	ZOSE-08P
2	Course Title	Applied Zoology
3	Course Type	Discipline Specific Elective Lab Course
4	Pre-requisite (if, any)	As per Program
5	Course Learning Outcomes (CLO)	<p>After successfully completing this course, the students will be able to:</p> <ul style="list-style-type: none"> ➤ Know common species of carps, prawn, oyster. ➤ Understand and learn the culture techniques of prawn, pearl, fish, honey bee, silkworm, lac, vermicompost. ➤ Understand and Learn division of labor and Identification of Honey bees ➤ Identify Lac insect, male female morphology,. ➤ Understand dairy management, breeds of Cow & diseases and learn to analyze to good quality of milk, egg and vermicompost.
6	Credit Value	1 Credits
7	Total Marks	Credit = 30 Hours Laboratory or Field learning/Training
		Max. Marks: 50
		Min Passing Marks: 20
PART -B: Content of the Course		
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)		
Module	Topics (Course contents)	No. of Period
Lab./Field Training/ Experiment Contents of Course	<ul style="list-style-type: none"> ➤ Morphological characterization of common edible fish species. ➤ Identification of major carps. ➤ Morphology of Freshwater and Marine Prawn ➤ Pearl oyster, pearl forming species ➤ Identification of castes of Honey bee and life cycle (through charts/specimens). ➤ Mounting of the sting apparatus. ➤ Worker honey bee with emphasis on leg modifications (through specimens/charts) and whole mount preparation of the 3 pairs of legs, Mouth parts. ➤ Life cycle of mulberry silkworm, <i>Bombyx mori</i> (model/chart/specimens) and life cycle of tasar silkworm, <i>Antheraea mylitta</i>. ➤ Identification of dairy animals ((model/chart/Photographs). ➤ Milk testing: Qualitative test of milk, Determination of the specific gravity of milk by using a mercury lactometer. ➤ External morphology of poultry birds (model). ➤ Test for good quality eggs (Floating test, cracking test) and for fertilized and unfertilized eggs (Light test, Cracking test). ➤ Project report on visit to Fish farm/dairy farm/ Poultry farm./etc ➤ Group discussion/quiz/seminar on related topics. ➤ Preparation of practical record or Album. 	30
Keywords	Aquaculture, Apiculture, Sericulture, Poultry farming, Dairy Farming	
Signature of Convener & Members (CBOS) :		

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Upadhyay, Economic Zoology
- Salvamani B R, & Mahadevan R K, Aquaculture Trends and Issues
- Jabde V, Applied Zoology Pradeep
- Shukla Prasad Economic Zoology, Biostatistics and Animal Behaviour

Online Resources–

- https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SBT1608.pdf
- <https://egov.uok.edu.in/elearning/tutorials/1011020512BR15103CR15Apiculture%20Lac%20culture%20and%20%20sericultureapiculture%20lac%20culture%20and%20%20sericulture%20upload.pdf>

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05 Total Marks - 15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment	Managed by Course teacher as per lab. status
	A. Performed the Task based on lab. work - 20 Marks	
	B. Spotting based on tools & technology (written) – 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	

Name and Signature of Convener & Members of CBoS:

