



GOVT. COLLEGE FOR WOMEN, PARADE GROUND JAMMU (AN AUTONOMOUS COLLEGE)

Syllabus and Course of Study in Zoology -- B.SC. Semester-III For examinations to be held in 2021-22, 2022-23, 2023-24

- **Core Course No.:** UZOTC 301
- **Core Course Title:** PHYSIOLOGY AND BIOCHEMISTRY
- **CREDITS:** 4
- **Maximum Marks:** 100
 - I) **External:** 80
 - II) **Internal Assessment:** 20
- **Minimum Pass Marks**
 - I) **External:** 29
 - II) **Internal:** 07
- **Duration of external Exam.** 3 Hours.

Course learning Objective:

The core course will cover the essential aspects of physiology and biochemistry. Provide a glimpse of Aims and scopes to develop detailed understanding of mechanism of digestion, respiration and excretion, heart, blood composition and cardiac cycle. Impart knowledge regarding structure and functions of nerve and muscle to the students.

Provide knowledge about reproductive system and endocrine glands and their mechanism of action and give adequate information to the students regarding Metabolism of macromolecules such as carbohydrates, lipid and protein.

Course Learning Outcome:

Upon the completion of the syllabus, a student will be able to understand:

- The process of digestion and structure of digestive system.
- The different aspects of respiratory and excretory system.
- The composition of blood, structure and working of heart.
- The structure and function of Neurons.
- The mechanism of muscle contraction.
- The structure and function of different endocrine glands.
- The concept of metabolism of carbohydrates, proteins and fats.

Unit-I

1.1. Digestion

- 1.1.1. Histology and function of gastrointestinal tract (GIT).
- 1.1.2. Gastrointestinal juices, saliva, gastric juice, pancreatic juice, intestinal juice their secretion, composition and control.
- 1.1.3. Digestion of carbohydrates, lipids and proteins in the alimentary canal.
 - 1.1.3.1. Absorption of end products of digestion.
- 1.1.4. Symbiotic digestion (ruminants)

1.2. Respiration

- 1.2.1. Pulmonary ventilation, perfusion
- 1.2.2. Respiratory volumes and capacities.
- 1.2.3 Mechanism of respiration in Vertebrates.
- 1.2.4. Transport of oxygen and carbon dioxide in blood in mammals.
- 1.2.5. Transport of Co₂ in mammals.



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Unit- II

2. 1. Excretory and Neuronal Physiology.

- 2.1.1. Ultra-structure of Nephron
- 2.1.2. Mechanism of urine formation; counter-current mechanism.
- 2.1.3. Structure of neuron.
 - 2.1.3.1 Properties of Nerve fibers.
- 2.1.4. Donnan Equilibrium.
- 2.1.5. Resting membrane potential, graded potential.
- 2.1.6. Origin of action potential and its propagation in myelinated and non-myelinated nerve fibers.

Unit-III

3.1. Cardiovascular system.

- 3.1.1. Composition of blood and its function.
- 3.1.2. Coagulation of blood and haemostasis.
- 3.1.3. Structure of mammalian heart.
- 3.1.4. Systemic, pulmonary and coronary circulation.
- 3.1.5. Origin and conduction of cardiac impulse.
- 3.1.6. Function of AV and SA node.
- 3.1.7. Cardiac cycle in man.

Unit-IV

1.1. Reproduction and Endocrine gland.

- 1.1.1. Morphology of reproductive organs.
- 1.1.2. Spermatogenesis and Hormonal Control.
 - 1.1.2.1. Structure of Sperm.
- 1.1.3. Oogenesis and menstrual cycle and their hormonal control.
- 1.1.3. Structure and function of Endocrine glands pituitary, thyroid, adrenal and pancreas.
- 1.1.4. Hypo and Hypersecretion disorders of endocrine Glands.

Unit-V

5.1. Carbohydrate, Lipid and Protein metabolism.

- 5.1.1. Glycolysis
- 5.1.2. Krebs cycle.
- 5.1.3. Electron transport chain.
- 5.1.4. Beta-oxidation of fatty acids.
- 5.1.5. Transamination.
- 5.1.6. Deamination.
- 5.1.7. Urea cycle.

Note 1: There shall be one written theory paper of 100 marks. 20% mark shall be reserved for internal assessment. Theory paper will be set for 80 marks.

Internal Assessment Test.

One long answer type question of 10 marks and five short answer type questions of 02 marks each.



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Note 2: For paper setters

External End Semester Exam.

- **Section A:** 05 short answer type questions representing all units/syllabi i.e., at least one from each unit having 70-80 words and having 03 marks each. (All Compulsory).
- **Section B:** 05 medium answer type questions representing all units/syllabi i.e., at least one from each unit having 250-300 words and having 07 marks each. (All Compulsory).
- **Section C:** 05 long answer type questions representing all units/syllabi (02 to be attempted) with detailed analysis/ explanation to be stated within 500-600 words having 15 marks each.

Suggested Readings

- ❖ Tortora, G.J. and Derrickson, B.H. (2009). Principles of Anatomy and Physiology, XII Edition, John Wiley and Sons, Inc
- ❖ Widmaier, E.P., Raff, H. and Strang, K.t. (2008) Vander`s Human Physiology, XI Edition, Mc-Graw Hill
- ❖ Guyton, A.C. and Hall, J. E. (2011). Textbook of Medical Physiology, XII edition. Harcourt Asia Pvt. Lt/ W.B. Saunders Company
- ❖ Berg, J.M., Tymoczko, J.L. and Stryer, L. (2006). Biochemistry. VI Edition. W.H. Freeman and co.
- ❖ Nelson D.L., Cox, M.M. and Leininger, A.L. (2009). Principles of Biochemistry. IV Edition. W.J.H. Freeman and Co.
- ❖ Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009). Harper`s Illustrated Biochemistry XXVIII Edition. Lange Medical Books/Mc-Graw Hill.
- ❖ Wood, D.W principles of Animal Physiology
- ❖ Eckert-Animal physiology
- ❖ Nagabushanam-a text book of Animal Physiology.

Practical

- **Core Course No- UZOPC-301**
- **Core Course Title: PHYSIOLOGY AND BIOCHEMISTRY**
- **CREDITS: 2**
- **Max. Marks: 50**
- 1. Study of permanent histological sections of mammalian pituitary, thyroid, pancreas, adrenal gland, testes and ovary.
- 2. Study of permanent slides of spinal cord, duodenum, liver, lung, kidney, bone and cartilage.
- 3. Simple lab. Tests for detection of proteins, carbohydrates and fats.
- 4. Qualitative tests to identify functional groups of carbohydrates in given solutions (Glucose, Fructose, Sucrose, Lactose)
- 5. Estimation of total protein in given solutions by Lowry`s method.
- 6. Preparation of hemin and hemochromogen crystals.
- 7. Preparation of blood smear to study Erythrocytes and leucocytes.
- 8. Examination of human blood groups.
- 9. Measurement of blood pressure.
- 10. Determination of bleeding time and clotting of blood.
- 11. Viva voice.

Note: There will be one practical paper of 50 marks. 50% (25 marks) shall be reserved for internal assessment.



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Skill Enhancement Course

- Course No.: UZOTS 301
- Course Title: Aquarium Fish Keeping
- Semester: 3
- CREDITS: 4

Course learning Objective:

This course has been designed to enable the students to give a hands-on training in all aspects of Aquarium industry. This shall enable the students to set up their own Aquarium cottage industry and establish themselves as entrepreneurs instead of job seekers.

Course Learning Outcome:

1. After completion of the course the students will be able to:
2. Comprehend the importance of Fish keeping as a hobby
3. Understand the concept of Rainbow Revolution
4. Understand the role of Aquarium Industry in economic upliftment
5. Know about different types of Aquaria
6. Prepare a glass aquarium.

Skill Theory Course

Credits = 2

Maximum marks 50
(Internal 10, External 40)

Unit I Aquaria: history, Significance, scope:

- 1.1 History and Importance of Aquarium fish Keeping
- 1.2 Global Aquarium industry and scenario in India
- 1.3 Concept of Rainbow Revolution in India
- 1.4 Capture and Culture Ornamental fishery
- 1.5 Scope of Aquaria and Aquarium fish as a Cottage Industry
- 1.6 Budget to set up an Aquarium Fish Farm
- 1.7 Various Government schemes for Ornamental fish Industry

Unit II Types of aquaria:

- 2.1 Types of Aquaria based on the material and size
- 2.2 Types of Aquaria based on water quality; kind of fishes stocked
- 2.3 Aquarium Stands
- 2.4 Tools and Materials required to make an Aquarium



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Skill Practical Course

Credits = 2

Maximum marks 50
(Internal 25, External 25)

1. To study the different types of Aquaria.
2. To make an all glass aquarium
3. To survey the market and prepare a report on potential of Aquaria in entrepreneurship
4. A visit to an Aquarium to study the types of Aquaria
5. Identification of a few common Aquarium Fish
6. Identification of a few local ornamental fish.
7. To visit a local water body and prepare a checklist of local ornamental fish.

Books Recommended:

1. John Ellor Taylor (2016). The Aquarium; Its Inhabitants, Structure & Management. Wentworth Press
2. V K Jagtap, H S & Mukherjee, S N & Garad(2009). Textbook of Pisciculture and Aquarium Keeping. Daya Publishing House
3. Mundy Jim. Aquarium Making- Fishkeeping Maintenance.
4. Dey, V K (1997) Hand Book on Aquafarming: Ornamental fishes. Manual. MPEDA, Cochin.
5. Francis Day. The Fishes of India. Volume I and II. London. William Dawson and Sons Ltd.
6. Gunther Sterna. Fresh Water Fishes of The World. Volume I and II A Falcon Book from Cosmo Publications.
7. Recommended online reads: <https://www.britannica.com/science/aquarium>
https://www.gutenberg.org/files/40701/40701-h/40701-h.htm#A_CHAPTER_I
<https://www.fisheriesjournal.com/archives/2015/vol2issue3/PartA/3.pdf>



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Evaluation strategy

Skill theory course

A) Internal assessment

1. Internal assessment (10 Marks) as per the adopted procedure for other courses.
2. No marks have been earmarked for attendance, however the eligibility criterion for appearing in the end semester examination shall remain the same as is followed in other courses.

B) External end semester Examination

1. Maximum Marks = 40.
2. Question paper shall have three (A, B and C) sections :-
 - Section A** shall comprise of 4 questions of 2 marks each.
 - i) 2 questions shall be set from each unit of the prescribed course content.
 - ii) All questions shall be compulsory.
 - Section B** shall comprise of 4 questions of 5 marks each
 - i) 2 questions shall be set from each unit of the prescribed course content.
 - ii) All questions shall be compulsory.
 - Section C** shall comprise of 3 questions of 12 marks each.
 - i) 1.5 questions shall be set from each unit of the prescribed course content.
 - ii) Students shall be asked to attempt only one question of 12 marks from this section.

Skill Practical course

A) Internal assessment

1. Internal assessment (25 Marks) as per the adopted procedure for other courses.
2. 5 marks have been earmarked for attendance, and the eligibility criterion for appearing in the end semester examination shall remain the same as is followed in other courses.

B) External end semester Examination

Maximum Marks =25.

Procedure of the external examination shall be same as is followed in other practical courses.



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Syllabus and Course of Study in Zoology -- B.SC. Semester-III For examinations to be held in 2021-22, 2022-23, 2023-24

- **Course Title: Apiculture (Theory)**
- **Credits: 02**
- **Course Code/No: UZOTS-302**
- **Max. Marks 50 (Internal 10, External 40)**

Course Learning Objective: Apiculture is the scientific method of rearing honeybees for the production of honey and its by-products. Honey bees are not only economically important but they are ecologically fascinating creature. Bee keeping is popular in rural areas as it provide a good source of income. The number of apiculturists is also increasing in urban areas keeping in view number of benefits of beekeeping. This course gives a framework for understanding different species, race and castes of honey bee. The aim of this course is to understand different aspects of this economically and ecologically important creature. This course has two units, first unit provides elaborate knowledge about biology of bees, rearing of honey bees, bee enemies and their management. Whereas second unit impart knowledge about importance of honey and other by-products of bee keeping industry and its economics. After completion of this course the learner will have understanding of all aspects of beekeeping and its marketing enabling them to earn a dignified livelihood and a source of self-employment.

Course Learning Outcome: On completion of the course student will be able to;

1. Understand the Biology of honey bees and selection criteria of bee species for apiculture.
2. Understand different steps of processing and extraction of honey and other bee products
3. Understand about construction and maintenance of bee hive and bee behaviour
4. Understand the socio-economical, medicinal and industrial value of honey and other by-products of apiculture.
5. Understand different types of diseases, their management and general enemies of honeybees
6. Understand about different aspects of bee economy and entrepreneurship development in apiculture.

Unit 1: Biology of Bees, Beekeeping, Bee enemies and Diseases (15 hrs.)

- 1.1- History and scope of beekeeping in India with special reference to J & K, Identification of different species of honey bees (*Apis indica*, *Apis dorsata*, *Apis florea*, *Apis mellifera*)
- 1.2- Morphology of honey bee, life cycle and social organization in bees.
- 1.3- Bee keeping: Traditional and modern bee hives (Newton and Langstroth bee hives), Bee keeping equipments.
- 1.4- Diseases: Bacterial, viral and fungal diseases and their control measures, Bee enemies: (Ants, wasps, wax moth) and their control measure

Unit 2: Bee economy and Entrepreneurship in Apiculture (15hrs.)

- 2.1- Bee keeping industry in India and J & K, and its prospects.
- 2.2- Products of apiculture industry and its uses (Honey, Bee wax, Propolis, Bee venom, royal jelly)
- 2.3- Honey extraction methods, composition and medicinal value of honey.
- 2.4- Preparing bankable bee keeping project and proposal for financial assistance from funding agencies.



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- **Course Title: Apiculture (Practical)**
- **Credits: 02**
- **Course Code/No: UZOTS-302**
- **Maximum Marks:50**
- **External Examination: 25 marks**
- **Internal Examination: 25marks**

1. Identification, classification and morphology of common species and castes of honey bee (*Apis indica*, *Apis dorsata*, *Apis florea*, *Apis mellifera*).
2. Study of life cycle of honeybee.
3. Study of mouth parts and appendages from permanent slides/ microphotographs.
4. Study of sting apparatus and venom sac from permanent slides/ microphotographs.
5. Study of different type of bee hives (Newton, Langstroth and some traditional hives).
6. Study of Queen cells, Drone cells and worker cells in a hive.
7. Study of different type of bee equipment.
8. Study of bee enemies and their control measures.
9. Inspection of bee hive in your vicinity and submission of report (Field visit report)
10. Identification of different apiculture by-products (Honey, wax, bee venom, bee propolis, bee pollen, royal jelly).
11. Study of bee pasturage (identify and enlist bee forage plants).
12. Prepare flowering calendar of local area as a source of bee pasturage.
13. Study of climatic requirements of different species of honeybees.
14. Preparation of budget proposal for establishing a new apiary (small and large)

NOTE: Scheme for internal assessment and external examination of apiculture **theory** course (02-credit)

- **Distribution of marks for theory examination**

Examination (Theory)	Syllabus to be covered in the examination	Time allotted	% Weightage (Marks)
Internal Assessment Test	On completion of 50% Syllabus	1/2Hour (30 min.)	20 % = (10 Marks)
External End Semester/ Examination	100 % Syllabus	02 Hour	80% = (40 Marks)
Total Theory Marks			50 Marks

- **Scheme for Internal assessment Test (Theory)** Internal assessment test of 10 marks to be based on questions from syllabus.
- **Scheme for End Semester Examination** External assessment of 40 marks will consist of three **sections A, B and C**. **Section A** will consist of 04 short answer type questions, two from each unit of 02 marks each, (**04x02=08, All compulsory**). **Section B** consists of 04 questions of 05 marks each, 02 from each unit, (**04x05=20, All compulsory**). **Section C** comprises of 03 questions of 12 marks each, (**01 question to be attempted, 01x12=12**) 1.5 questions shall be set from each unit of the prescribed course content.



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SCHEME FOR INTERNAL ASSESSMENT AND EXTERNAL EXAMINATION OF APICULTURE PRACTICAL (SEC) COURSE (02- CREDIT)

DISTRIBUTION OF MARKS FOR PRACTICAL EXAMINATION

S. No	Examination (Practical)	Syllabus to be covered	Time allotted	% weightage (Marks)
A	Internal Practical Assessment Test	Daily evaluation of practical records/viva-voce/ attendance, etc.	03 Hrs.	Attendance: 05 Marks
				Practical Test: 08 Marks
				Day to day performance:12 Marks
				Total: 25 Marks
B	External Practical Examination	External Examination (100% Practical syllabus)	03 Hrs.	Examination: 20 Marks
				Viva-voce: 05 Marks
				Total: 25 Marks

Teaching Learning Process (TLP): Teaching learning process will include delivery of lectures using boards, multimedia presentations, and short documentaries on apiculture, imparting practical based knowledge through slides, charts, models, specimen along with other TLE. Live demonstrations of bee hives and study of bee pasturage in surrounding is an important aspect of TLP.

Assessment method: Course examination methods includes

- Multiple choice questions quiz at the end of each lecture
- Case studies
- Oral presentations by students
- Project based activities and submission of report for the same
- Group discussions
- Unit tests/ internal assessment for theory and practical

Books Recommended:

1. Singh S., Beekeeping in India, Indian Council of Agriculture Research (ICAR) NewDelhi.
2. Prost, P.J.1962. Apiculture. Oxford and IBH, NewDelhi.
3. Bisht D.S., Apiculture ICAR Publication.
4. Dewey M. Caron, 2013. Honey Bee Biology and Beekeeping, Revised Edition. Wicwas Press, Kalamazoo.
5. Pradip V Jabde, 1993. Text Book of Applied Zoology: Vermiculture, Apiculture, Sericulture, Lac Culture, Agricultural Pests and their controls. Discovery Publishing House, NewDelhi.
6. Eva Crane, 1999. The World History of Beekeeping and Honey Hunting. Routledge,India
7. TedHooper,2010.GuidetoBeesandHoney:TheWorld'sBestSellingGuidetoBeekeepingNorth en Bee Books, Oxford.
8. Laidlaw, H.H., 1997. Contemporary queen rearing. Published by Dadant and Sons. R.A. Morse, Rearing queen honey bees. Wicwas Press,NY.
9. Alison Benjamin, By (author) Brian McCallum, 2008. Keeping Bees and Making Honey. David and Charles, NewtonAbbot.
10. Kim Pezza, 2013. Backyard Farming: Keeping Honey Bees: From Hive Management to Honey Harvesting and More. Hatherleigh Press,U.S.5



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11. Kim Flottum, 2014. The Backyard Beekeeper: An Absolute Beginner's Guide to Keeping Bees in Your Yard and Garden, Quarry Books.
12. Roger A. Morse, Kim Flottum, 1998. Honey Bee Pests, Predators and Diseases. Wicwas Pr; 3rd edition.
13. Alethea Morrison (Author), Mars Vilaubi (Photographer), 2013. Homegrown Honey Bees: An Absolute Beginner's Guide to Beekeeping Your First Year, from Hiving to Honey Harvest. Storey Publishing, LLC: 1 Edition
14. Hunt, G.J., 2000. Using honey bees in pollination Purdue University.
15. Craig Hughes, 2010. Urban Beekeeping: A Guide to keeping Bees in the City. E Good Life Press, Preston.
16. Ted Hooper, Clive De Bruyn, Margaret Thomas, 2014. The Beginner's Bee Book. Stenlake Publishing, Ayrshire.

• Reference for Practical

- David Cramp, 2012. The Complete step-by-step Book of Beekeeping: A Practical Guide to Beekeeping from setting up a colony to Hive Management and Harvesting the Honey. Lorenz Books. London
- David Cramp, 2009. A Practical Manual of Beekeeping: How to keep Bees and Develop Your Full Potential as Apiarist. Spring Hill London.
- Ted Hooper, 2010. Guide to Bees and Honey: The world's Bestselling Guide to Beekeeping. Northern Bee Books. Oxford. 8