UNIVERSITY OF JAMMU

(NAAC ACCREDITED 'A' GRADE' UNIVERSITY)
Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

Academic Section
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NOTIFICATION
(23/April/Adp./12)

In modification of this office Notification No. F.Acd/II/21/1863-1873 dated 06.08.2021, it is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Academic Council, is pleased to authorize the adoption of the revised Syllabi and Courses of Study in the subject of **Zoology** of Master Degree Programme for Semester **IIIrd and IVth** under the **Choice Based Credit System for** the examinations to be held in the years indicated against each semester as under:-

Subject	Semester	Course Code/Title	For the examinations to be held on
Zoology	Semester-III	PSZOTC-301 (Animal Physiology)	Dec. 2023, 2024 and 2025
	Semester-IV	PSZOTC-401 (Reproductive and Development Biology) PSZOTC-403 (Applied Microbiology)	May 2024, 2025 and 2026

The Syllabi of the courses is available on the University website: www.jammuuniversity.ac.in

Sd/-
DEAN ACADEMIC AFFAIRS

No. F. Acd/II/23/ 1568-1598
Dated: 03/5/23

Copy for information and necessary action to:

1. Dean, Faculty of Life- Science
2. HOD/Convener, Board of Studies in **Zoology** | S.A P.A to C.O.E
3. C.A to the Controller of Examinations
4. I/c Director, Computer Centre, University of Jammu
5. Asst. Registrar (Conf. /Exams. PG)
6. Incharge, University Website for necessary action please.

Sunita Sharma 2/5/23
Deputy Registrar (Academic)

1/5/23 1/5 7/28/4/23

ANNEXURE III A

Semester-III

Course No. PSZOTC-301
CREDITS: 4
Time Duration: 2Hrs and 30 Mins.

Title : Animal Physiology
MAXIMUM MARKS : 100
a) Minor Test I : 20
b) Minor Test II : 20
c) Major Test : 60

Syllabus for the examination to be held in December 2023, December, 2024 and December, 2025

Course Outcomes

Students would develop an understanding with respect to:

- **CO-1:** basic concepts of physiologyviz digestion,respiration,excretion,cardio-vascular,excretory,nervous and muscular systems.
- **CO-2:** gastrointestinal disorders, respiratory stresses **vs** environment.
- **CO-3:** the mechanisms that work to keep the human body alive and functioning.

SYLLABUS

UNIT I Animal Nutrition

1.1. Modes of animal nutrition
1.2. Digestion and its control
  1.2.1. Salivary digestion
  1.2.2. Gastric digestion
  1.2.3. Intestinal digestion and digestion enzymes
1.3. Absorption in Gastro-intestinal tract (GIT)
  1.3.1. Carbohydrates
  1.3.2. Amino acids
  1.3.3. Lipids and other substances
1.4. Physiology of gastrointestinal disorders

UNIT II Blood

2.1 Composition and Functions
  2.1.1 Blood coagulation
  2.1.2 Blood groups and transfusion
  2.1.3 Buffer system
2.2 Heart and its working
2.3 Heart Beats (in mammals)
    2.3.1 Origin, rhythmicity and conduction
    2.3.2 Nervous regulation
    2.3.3 Chemical regulation
    2.3.4 Electro-cardiogram
    2.3.5 Cardiac cycle in man
    2.3.6 The exchange vessels

UNIT III Respiratory and Excretory Physiology

3.1 Nervous regulation of respiration (in mammals)
3.2 Physiological adaptations to different environments
  3.2.1 Environmental influences over respiratory process (in mammals)
  3.2.2 Extreme temperature & limits to life
    3.2.2.1 Tolerance to cold and freezing
    3.2.2.2 Tolerance to high temperature

3.3 Excretory physiology (in mammals)
- 3.3.1 Detailed structure of nephron
- 3.3.2 Glomerular functions
- 3.3.3 Tubular functions
- 3.3.4 The rennin angiotensins
- 3.3.5 Aldosterone system

UNIT IV Neurophysiology

4.1 General neuroanatomy
- 4.1.2 Brain, brain regions, brain connections
- 4.1.2 Spinal Cord

4.2 Neurophysiology
- 4.2.1 Structure and function of neuron and its organization
- 4.2.2 Nerve impulse origin and propagation
- 4.2.3 Ion channels, structure of synapse and
- 4.2.4 Synaptic transmission and neurotransmitters

4.3 Neurological disorders
- 4.3.1 Neurodevelopmental disorders
- 4.3.2 Neuropsychological disorders
- 4.3.3 Neurodegenerative diseases

UNIT V Muscle Physiology

5.1 Muscle: Types, their gross structure
- 5.1.1 Hierarchy and skeletal muscle organization (vertebrates)
- 5.1.2 Myofibrils: Ultra- structure
- 5.1.3 Chemical composition of myofibril

5.2 Muscle contraction-striated muscles
- 5.2.1 Sliding, filament theory and cross bridge activity
  - 5.2.1.1 Contraction cycle
  - 5.2.1.2 Excitation- contraction coupling
  - 5.2.1.3 Length tension relationship
- 5.2.2 Cross-bridge attachment and muscle contraction
- 5.2.3 Energy cycle, role of ATP and phosphogen

Note for paper setting

Examination Theory	Syllabus to be covered in examination	Time allotted for Exam	% weightage (marks)
Minor Test I	upto 20%	1 hr.	20
Minor Test II	21% to 40%	1 hr.	20
Major Test	41% to 100%	2hrs.& 30 mins.	60

i. Major test will have two sections (A & B)
ii. Section A is compulsory comprising of 10 questions of 1.5 marks each and be spread over entire syllabus
iii. Section B comprises of 6 questions (2 from each unit) from the remaining 3 units and candidate has to attempt one question from each unit (15 marks each).

Books Recommended

1. Dennis, W. Wood .(1970). Principles of Animal Physiology. Arnold, Publ. Ltd., London.
2. Malcolin&Gorden. (1977). Animal Physiology: Principles and Adaptation. Macmillan Publ. Co. New York.
3. Nagabhushnam. (1993), Textbook of Animal Physiology. Oxford & IBH Publ. Co. Pvt. Ltd

4. Louw.(1993). Physiological Animal Ecology. Langman House, Burnt Mill, Harlow, England
5. Randall, Burggren and French.(2000). Eckert Animal Physiology Mechanisms and Adaptations. W.H.Freeman and Co. New York.
6. Guyton and Hall.(2013). Textbook of Medical Physiology.
7. K.Sembulingam and PremaSembulingam.(2016).Essentials of Medical Physiology, 7th edition.
8. Linda S. Costanzo (2018) Physiology 7th Edition Publisher: Wolters Kluwer
9. S. C Rastogi (2019) Essentials of Animal Physiology. Publisher: New Age Internationals.

List of Practicals

Course code: PSZOPC-305
(Based on Theory Course No. 301)

- Enumerate the total RBC count of your own blood.
- Enumerate the total WBC count of your own blood.
- Estimation of Haematocrit value in a blood sample.
- Examination of Human blood groups.
- Determination of Rh+ and Rh- blood groups.
- To determine the bleeding and clotting time of blood.
- Find out the Hemoglobin %age of your own blood.
- Preparation of Haemin crystal.
- To demonstrate action of salivary enzyme amylase.
- To demonstrate action of pepsin on Proteins
- To demonstrate action of Trypsin on protein.
- Emulsification of fats.
- To prepare blood smear and study the polymorph by Arneth's count of polymorph.
- To study the structure of haemocytometer.
- To determine Blood pressure of men.
- To demonstrate coagulation in blood.

ANNEXURE III B

Semester-IV

Course No. PSZOTC-401
CREDITS: 4
Time Duration: 2hrs and 30 mins.

Course Title: Reproductive & Developmental Biology

MAXIMUM MARKS		**:**	**100**
a)	**Minor Test I**	**:**	**20**
b)	**Minor Test II**	**:**	**20**
c)	**Major Test**	**:**	**60**

Syllabus for the examination to be held in
May, 2024, May, 2025 and May, 2026

Course Outcomes

Students would develop an understanding with respect to:

- **CO-1:** the gonads and their role in reproductive process.
- **CO-2:** the factors and breeding behavior in non mammalians and mammalians.
- **CO-3:** the mechanism, patterns and processes involved in cleavage, blastulation and gastrulation.
- **CO-4:** the key concepts of neural tube formation, organ formation in birds and mammals, metamorphosis in amphibians.

SYLLABUS

UNIT I Structure and Function of Mammalian Gonads

1.1 Histomorphology of mammalian Gonads **(12hrs)**

1.2 Hormones of reproduction
- 1.2.1 Gonadotropin: types and functions
- 1.2.2 Sex steroids : structure, Biosynthesis & Role in Reproduction

1.3 Corpora lutea, their structure and function

1.4 Atresia: formation and significance

UNIT-II Gametogenesis and Fertilization **(13hrs)**

2.1 Origin of primordial germ cell

2.2 Spermatogenesis: Process, Ultra structure of sperms, Spermiogenesis

2.3 Oogenesis: Process, Vitellogenesis, Types of eggs and Egg membranes

2.4 Fertilization process
- 2.4.1 Capacitation
- 2.4.2 Recognition between male and female gamete
- 2.4.3 Acrosome reaction of sperm
- 2.4.4 Cortical reaction of egg
- 2.4.5 Sperm penetration into egg
- 2.4.6 Amphimixes

UNIT-III Reproduction and Breeding in Vertebrates **(12hrs)**

3.1 Reproduction in non mammals
- 3.1.1 Environmental factors affecting breeding in fishes, amphibians, reptiles, birds
- 3.1.2 Secondary sex characters &Breeding Behaviour

3.2 Reproductive cycles in mammals
- 3.2.1 Estrous cycle
- 3.2.2 Menstrual cycle

UNIT-IV Embryonic Development

4.1 Cleavage and blastulation **(13hrs)**
- 4.1.1 Characteristics and Mechanism of cleavage
- 4.1.2 Patterns of cleavage
- 4.1.3 Types of blastula, factors involved in shaping the blastula (Blastulation in sea urchin, frog, chick, mammals)

4.2 Gastrulation
- 4.2.1 Presumptive fate maps in chordates
- 4.2.2 Process of gastrulation
- 4.2.3Kinds of mechanism of gastrulation with special reference to birds and mammals.

4.3 Neurulation in vertebrates
- 4.3.1 Mechanism of neural tube formation
- 4.3.2 Segregation of neural tube formation

UNIT-V Organogenesis

5.1. Development and Organogenesis in birds and mammals **(12hrs)**
- 5.1.1 Early development of chick.
- 5.1.2 Development of Excretory organs.
- 5.1.3 Development of eye.
- 5.1.4 Development of ear.

5.2 Extra embryonic membrane

5.3 Tissue interaction and induction in organogenesis.

5.4 Metamorphosis in Amphibians

Note for Paper Setting

Examination Theory	Syllabus to be covered in examination	Time allotted for Exam	% weightage (marks)
Minor Test I	upto 20%	1 Hr.	20
Minor Test II	21% to 40%	1 Hr.	20
Major Test	41% to 100%	2Hrs.& 30 mins.	60

i. Major test will have two sections (A & B)
ii. Section A is compulsory comprising of 10 questions of 1.5 marks each and be spread over entire syllabus
iii. Section B comprises of 6 questions (2 from each unit) from the remaining 3 units and candidate has to attempt one question from each unit (15 marks each).

Books Recommended

1. Pattern B.M. Carlson, B.M. (1977). Foundation of Embryology. T.M.M. edition
2. Blinsky, B.I. (1981): Introduction to Embryology, Saunders College Pub. Philadel
3. Saunders, J. W. (1982): Dev. Biology Patterns, Principles, Problems, Macmillan Pub. Co. Inc. New York
4. Berrill N.J: Developmental Biology. McGraw Hill, New Delhi.
5. McEwen, Vertebrate Embryology.
6. Alferd Kuhn: Lectures on Developmental Physiology. 18.J.W. Saunders, Jr.Animal Morphogenesis.
7. C.R. Martin: Endocrinology. Oxford University Press
8. R.H. Williams. Text book of Endocrinology. W.B. Saunders
9. Scott F, Gilbert: Developmental Biology (6th Ed.) NCBI Bookself
10. Bruce, M. Carlson (2013): Human Embryology and Developmental Biology.
11. Lewis Wolpert, Cheryll Tickle and Alfonso Martinez Arias 5th Ed. (2015) Principles of Development Oxford University Press
12. Michael J F Barresi and Scott F, Gilbert 12th Ed. (2019) Developmental Biology: Oxford University Press.

C. No. PSZOTC-401, Reproductive& Developmental Biology (2024-26)

List of Practicals

Course code: PSZOPC-409
(Based on Theory Course No. 401, 402 & 403)

- Comparative Anatomy of Vertebrate Gonads and their ducts.

I. Fish

II. Frog

III. Reptile

IV. Mammal

- To prepare the chick development stages upto 120 hrs
- To study different pattern of cleavage.
- To study different types of blastula (sea urchin, chick and mammal).
- To study the different stages of Frog embryo :Morula, Blastula and Gastrula.
- To study gastrulation of in case of chick development stages.
- To study the L.S. of Frog tadpole through prepared slide.
- To study the Corpus lutetium and corpus atreticum through prepared slides.
- Detailed study of graffian follicles.

ANNEXURE III C

Semester-IV

COURSE NO. PSZOTC-403
Credits: 2
Time Duration: 2hrs.

Course Title: Applied Microbiology
Maximum Marks: 50
a) Minor Test I : 10
b) Minor Test II : 10
c) Major Test : 30

Syllabus for the examination to be held in
May, 2024, May, 2025 and May, 2026

Course Outcomes

Students would develop an understanding with respect to

- **CO1:** Microorganisms and their application in health, industries and agriculture.
- **CO2:** Transmission mechanism and clinical presentations of common diseases.
- **CO3:** Agriculture / soil microbiology and bio remediation .

SYLLABUS

UNIT I Medical Microbiology **(10hrs)**

1.1 Classification
1.2 Causative Agents, Etiology, Pathogenisis and Prophylaxis of Air borne diseases.
- 1.2.1 Tuberculosis
- 1.2.2 Pneumonia
- 1.2.3 Diptheria

1.3 Food/ water/ Soil borne diseases
- 1.3.1 Typhoid fever
- 1.3.2 Cholera
- 1.3.3 Tetanus

1.4 Viral diseases
- 1.4.1 Hepatitis
- 1.4.2 H1N1 infection
- 1.4.3 Rabies
- 1.4.4 Japanese Encephalitis
- 1.4.5 HIV AIDS

UNIT-II Industrial Microbiology **(10hrs)**

2.1 Microbial Fermentation
2.2 Products of microbial fermentation
- 2.2.1 Milk products – cheese, yogurt
- 2.2.2 Beverages – wine and beer

2.3 Other microbial products
- 2.3.1 Antibiotics
- 2.3.2 Organic acids
- 2.3.3 Enzymes
- 2.3.4 Probiotics
- 2.3.5 Microbiome

UNIT-III Agricultural Microbiology **(10hrs)**

3.1 Agricultural microbiology: Introduction

3.2 Soil microbiology – Microbes in soil – rhizosphere, phyllosphere and mycorrhiza
3.3 Biological nitrogen fixation: symbiotic and non symbiotic micro organisms
3.4 Bioremediation: the pollution solution

3.4.1 Bacteria as excellent players in reducing water pollution
3.4.2 Super bug: a tool to treat oil spills

3.5 Impact of microbes on the environment

Note for Paper Setting

Examination Theory	Syllabus to be covered in examination	Time allotted for Exam	% weightage (marks)
Minor Test I	upto 20%	1 hr.	10
Minor Test II	21% to 40%	1 hr.	10
Major Test	41% to 100%	2hrs.	30

i. Major test will have two sections (A & B)
ii. Section A is compulsory comprising of 10 questions of 1 mark each and be spread over entire syllabus
iii. Section B comprises of 4 questions from remaining 2 units and candidate has to attempt one question fromeach unit of 10 marks each.

Books Recommended:

1. Wood, J. B. (1985). *Microbiology of fermented foods*. Volumes I and II. .Elsevie Applied SciencePublishers. London, England
2. Mitchell R. (1992). *Environmental Microbiology.* John Wiley & Sons.
3. Tauro P, Kapoor KK & Yadav KS.(1996). *Introduction to Microbiology.* Wiley Eastern.
4. Pelczar MJ, Chan ECS &Kreig NR. (1997). *Microbiology: Concepts and Application.* Tata McGraw Hill.
5. Joshi, V.K. and Pandey, A. Ed. (1999). *Biotechnology. Food Fermentation*, (2 Vol. set). Education Publ.New Delhi
6. Levine MM, Kaper JB, Rappuoli R, Liu MA & Good MF. (2004). *New Generation Vaccines.* 3rd Ed.Informa Healthcare.
7. Rajeshwari, S. Sethi and Sreekrishna, V. (2004). *Biotechnology-2* New Age International Publ. Delhi
8. M.P. Arora. (2005). *Microbiology*. Himalaya Publ. House. Mumbai
9. WulfCrueger and AnnelieseCrueger. (2005). *Biotechnology: A text book of Industrial Microbiology 2nd Ed.*Panima Publ. Corporation, New Delhi.
10. Male D, Brostoff J, Roth DB &Roitt . (2006). *Immunology.* Elsevier.
11. Jay, J.M. (2008) *Modem Food Microbiology* (Sixth Edition).Aspen Publishers, Inc, Gaithersburg,Maryland.
12. Gerard, J. Tortora, Berdell R. Funke& Christine L. Case. (2011). *Microbiology: An Introduction9th Ed*, Pearson Education.
13. Pedro Escoll (2017). Bacterial evasion of the host immune system. Caister Academic Press.
14. Luke Moore (2019) Infectious diseases, Microbiology and Virol:Cambridge University Press.

C. No. PSZOTC-403,
Applied Microbiology (2024-26)

List of Practicals

Course code: PSZOPC-409
(Based on Theory Course No. 401, 402 & 403)

- To study the various bio-safety levels to be used in laboratory.
- To study the working principle of autoclave.
- To study the working principle of laminar air flow.
- To carry out gram staining of bacteria present in given material (Curd).
- To study gram staining of bacteria from human throat.
- To isolate and study bacteria from given sample of soil using serial dilution, pour plate andspread plate method.
- To study different techniques of streaking.