# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)
## SEMESTER PATTERN


# SYLLABUS

# MASTER OF SCIENCE (M. Sc.)

# ZOOLOGY

# (THIRD AND FOURTH SEMESTER)

w. e. f. June 2015

# SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED VISHNUPURI, NANDED (M. S.)

## Board of Studies in Zoology

| Sr. No. | Name | Designation and Address |
|---|---|---|
| 1. | **Dr. Mali Rajendra Prabhakar** | **Chairman-BOS**<br>Professor & Head,<br>Department of Zoology,<br>Yeshwant Mahavidyalaya,<br>Nanded<br>Ph. No.: 09823546255<br>E-mail Id: rpmali62@gmail.com |
| 2. | **Dr. Barde Ravi Dhondiraj** | **Member,**<br>Head & Associate Professor,<br>Department of Zoology,<br>Shri Guru Buddhi Swami Mahavidyalaya,<br>Purna, Dist. Parbhani<br>Ph. No.: 09923830592<br>E-mail Id: ravibarde4u@rediffmail.com |
| 3. | **Dr. Shaikh Isakh Maheboob** | **Member,**<br>Head & Associate Professor,<br>Department of Zoology,<br>D. S. M. Mahavidyalaya,<br>Jintur Dist. Parbhani<br>Ph. No.: 09421353657 |
| 4. | **Dr. Kolpuke Madhav Nivarti** | **Member,**<br>Head &Associate Professor,<br>Department of Zoology,<br>Maharashtra Mahavidyalaya,<br>Nilanga Dist. Latur<br>Ph. No.: 09423349792<br>E-mail Id: mnkolpuke@gmail.com |
| 5. | **Dr. Gore Ghansham Dharbaji** | **Member,**<br>Head &Associate Professor,<br>Department of Zoology,<br>Shri Sant Gadge Maharaj Mahavidyalaya,<br>Loha Dist. Nanded<br>Ph. No.: 09960707490 |
| 6. | **Dr. Bhalerao Sudam Sakharam** | **Member,**<br>Head &Associate Professor,<br>Department of Zoology,<br>Bahirji Smarak Mahavidyalaya,<br>Basmat Dist. Hingoli,<br>Ph. No.: 07798001331<br>E-mail Id: sudambhalerao@yahoo.com |

| | | |
|---|---|---|
| 7. | **Dr. G. Gyananath** | **Member,**<br>Professor,<br>Department of Zoology,<br>School of Life Science, S. R. T. M. University,<br>Nanded<br>Ph. No.: 09850486910 |
| 8. | **Dr. Mane Anil Mahadev** | **Member,**<br>Associate Professor,<br>Department of Zoology,<br>Arts, Commerce & Science College,<br>Shankarnagar, Tq. Biloli, Dist. Nanded<br>Ph. No.: 09404464462<br>E-mail Id: anilmane531@gmail.com |
| 9. | **Dr. Patil Meena Umakant** | **Member,**<br>Professor,<br>Department of Zoology,<br>Dr. Babasaheb Ambedkar Marathwada University,<br>Aurangabad<br>Ph. No.: 09822879080<br>E-mail Id: patil4590@yahoo.co.in |
| 10. | **Dr. Mirza Mumtaz Baig** | **Member,**<br>Associate Professor,<br>Department of Zoology,<br>Govt. Vidharba Science Institute,<br>Amravati<br>Ph. No.: 09420721907<br>E-mail Id: mumtazbaig@gmail.com |
| 11. | **Dr. Dhonde Satish Gurunath** | **Member,**<br>Scientist C,<br>Cadila Healthcare Ltd. Moraiya,<br>Tq. Sanad, Dist. Ahmedabad<br>Ph. No.: 08120699585<br>E-mail Id: satishgdhonde@zydusca |

# INTRODUCTION - ZOOLOGY CURRICULA

Revising and updating of the curricula is the continuous process to provide an updated education to the students at large. To ensure and have uniform curricula at U.G. and P.G Levels in different Indian Universities, U.G.C developed a model curriculum and forwarded the same all the universities in the country to serve as a base in updating their respective curricula.

The curriculum designing committee of SRTMU Nanded was constituted for zoology at UG and PG levels which consists all the members of B.O.S. The members are specialist and experts in different areas of zoology.

For developing the final draft of curriculum, the committee took into account the U.G.C Suggestions regarding model curriculum, total number of teaching days available in the year and guidelines given by faculty of science of SRTMU Nanded. The curriculum designing committee held a couple of meetings in which there were through and critical suggestions on the concern syllabi. After making appropriate corrections and changes, the committee accepted the final draft of syllabus.

The SRTMU Nanded is having B.Sc. and M.Sc. Zoology courses designed with semester system pattern. The course content of each theory paper is divided into four units, each having number of topics and subtopics with appropriate titles and subtitles. For each topic, total number of periods required and weight age of marks is mentioned. At the end of each theory paper the list of selected reading material is provided. A list of practical exercise to be completed in the academic year is also given, paper wise question paper models are provided in the syllabus.

It may be noted that as per the UGC Notification No.- F.14-6/2014(CPP-II) dated 14 Aug. 2014, and circular of SRTM University, Nanded, dated 11 Feb. 2012, there is "complete ban on use of animals for dissection/experimentation in the Pharmacy/Life Sciences at the UG & PG levels."

Hence, it is unanimously suggested that, if required some animal material for practical/project work may be procured from slaughter houses or such sources. Dissections should be demonstrated using models, charts or audio-visual aids.

## Objectives

1. To update curricula by introducing recent advances in the subject and enable the students to face NET, SET and other competitive examination successfully.
2. To create awareness among students about the latest streams of life sciences including biotechnology, tissue culture, genetic engineering.
3. To improve the quality of laboratory and field work for which zoological study tours and excursions have been made compulsory so that the students can become familiar with reality of ecosystem and surrounding study.
4. To prepare students to attract and develop interest in physiology , genetics , cell biology, fisheries science, toxicology so that the students can select zoology as their carrier.

**Board of Studies**

**Zoology**

**S.R.T.M.U NANDED**

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

# PAPER NUMBER AND TITLE OF PAPER

## M.Sc. Zoology-II Year Third Semester

| Paper No. / Title of the Paper | Credit (Marks) | | | Periods |
|---|---|---|---|---|
| | External : ESE | Internal : CA | Total Credits (Marks) | |
| **Theory Paper - I:** ZOOL-301 Vertebrates: Structure and Function | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) (2 Test: 15 Marks; Assignments: 10 Marks) | Credit: 04 (Marks: 100) | 60 |
| **Theory Paper - II:** ZOOL-302 Molecular Cell Biology | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) (2 Test: 15 Marks; Assignments: 10 Marks) | Credit: 04 (Marks: 100) | 60 |
| *Students should opt. any one following specialization* | | | | |
| **Theory Paper III :** ZOOL-303**A** Entomology-I Insect : structure & function | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) (2 Test: 15 Marks; Assignments: 10 Marks) | Credit: 04 (Marks: 100) | 60 |
| **Theory Paper IV :** ZOOL-304**A** Entomology-II Insect taxonomy, Insect development and ecology | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) (2 Test: 15 Marks; Assignments: 10 Marks) | Credit: 04 (Marks: 100) | 60 |
| **Theory Paper III :** ZOOL-303**B** Fishery Science – I Fish morphology, Anatomy and Physiology – I | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) (2 Test: 15 Marks; Assignments: 10 Marks) | Credit: 04 (Marks: 100) | 60 |
| **Theory Paper IV :** ZOOL-304**B** Fishery Science – II Fish morphology, Anatomy and Physiology – II | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) (2 Test: 15 Marks; Assignments: 10 Marks) | Credit: 04 (Marks: 100) | 60 |
| **Theory Paper III :** ZOOL-303**C** Applied Parasitology – I Microbes and Arthropods of Medical Importance | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) (2 Test: 15 Marks; Assignments: 10 Marks) | Credit: 04 (Marks: 100) | 60 |
| **Theory Paper IV :** ZOOL-304**C** Applied Parasitology – II Protozoans and Arthropods of Medical Importance | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) (2 Test: 15 Marks; Assignments: 10 Marks) | Credit: 04 (Marks: 100) | 60 |
| **Theory Paper III :** ZOOL-303**D** Animal Physiology- I General Physiology-I | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) (2 Test: 15 Marks; Assignments: 10 Marks) | Credit: 04 (Marks: 100) | 60 |
| **Theory Paper IV :** ZOOL-304**D** Animal Physiology- II General Physiology-II | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) (2 Test: 15 Marks; Assignments: 10 Marks) | Credit: 04 (Marks: 100) | 60 |
| **Theory Paper - V**: Seminar | --- | Credit: 01 (Marks: 25) | Credit: 01 (Marks: 25) | --- |
| **TOTAL** | **Credit: 12 (Marks: 300)** | **Credit: 05 (Marks: 125)** | **Credit: 17 (Marks: 425)** | **600** |

(**ESE:** End of Semester Examination; **CA:** Continuous Assessment; ***:** Elective Paper)

## M.Sc. Zoology-II Year (III Semester) Laboratory Course Work
## (Annual Pattern)

| Paper No. / Title of the Paper | Credit (Marks) | | | Practicals per paper |
|---|---|---|---|---|
| | External : ESE | Internal : CA | Total Credits (Marks) | |
| **Laboratory Course Work-I:** Based on Theory Paper- I & II (I-Vertebrates: Structure and Function; II- Molecular Cell Biology) | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) | Credit: 04 (Marks: 100) | 15 |
| *Students should opt. any one following specialization* | | | | |
| ***Laboratory Course Work-II:** Based on Theory Paper- 303 A & 304 A (LC 303 A-Entomology – I: Insect : structure & function; LC 304 A - Entomology – II: Insect taxonomy, Insect development and ecology) | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) | Credit: 04 (Marks: 100) | 15 |
| ***Laboratory Course Work-II:** Based on Theory Paper- 303 B & 304 B (LC 303 B- Fishery Science – I: Fish Morphology, Anatomy and Physiology – I; LC 304 B - Fishery Science – II Fish Morphology, Anatomy and Physiology – II) | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) | Credit: 04 (Marks: 100) | 15 |
| ***Laboratory Course Work-II:** Based on Theory Paper- 303 C & 304 C (LC 303 C- Applied Parasitology – I Microbes and Arthropods of Medical Importance; LC 304 C - Applied Parasitology – II Protozoans and Arthropodes of Medical Importance) | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) | Credit: 04 (Marks: 100) | 15 |
| ***Laboratory Course Work-II:** Based on Theory Paper- 303 D & 304 D (LC 303 D- Animal Physiology – I General Physiology – I; LC 304 D - Animal Physiology – II General Physiology – II) | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) | Credit: 04 (Marks: 100) | 15 |
| **TOTAL** | **Credit: 15 (Marks: 375)** | **Credit: 05 (Marks: 125)** | **Credit: 20 (Marks: 500)** | **75** |

(**ESE:** End of Semester Examination; **CA:** Continuous Assessment; ***:** Elective Paper)

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

# PAPER NUMBER AND TITLE OF PAPER

## M.Sc. Zoology-II Year Fourth Semester

| Paper No. / Title of the Paper | Credit (Marks) | | | Periods |
|---|---|---|---|---|
| | External : ESE | Internal : CA | Total Credits (Marks) | |
| Theory Paper - I: ZOOL-401<br>Genetics and Genetic Engineering | Credit: 03<br>(Marks: 75) | Credit: 01<br>(Marks: 25)<br>(2 Test: 15 Marks;<br>Assignments: 10 Marks) | Credit: 04<br>(Marks: 100) | 60 |
| Theory Paper - II: ZOOL-402<br>Endocrinology | Credit: 03<br>(Marks: 75) | Credit: 01<br>(Marks: 25)<br>(2 Test: 15 Marks;<br>Assignments: 10 Marks) | Credit: 04<br>(Marks: 100) | 60 |
| *Students should opt. any one following specialization* | | | | |
| Theory Paper III : ZOOL-403A<br>Entamology-I<br>Economic Entomology | Credit: 03<br>(Marks: 75) | Credit: 01<br>(Marks: 25)<br>(2 Test: 15 Marks;<br>Assignments: 10 Marks) | Credit: 04<br>(Marks: 100) | 60 |
| Theory Paper IV : ZOOL-404A<br>Entamology-II<br>Agriculture Entomology and Pest Management | Credit: 03<br>(Marks: 75) | Credit: 01<br>(Marks: 25)<br>(2 Test: 15 Marks;<br>Assignments: 10 Marks) | Credit: 04<br>(Marks: 100) | 60 |
| Theory Paper III : ZOOL-403B<br>Fishery Science – I<br>Fisheries and Fish Culture - I | Credit: 03<br>(Marks: 75) | Credit: 01<br>(Marks: 25)<br>(2 Test: 15 Marks;<br>Assignments: 10 Marks) | Credit: 04<br>(Marks: 100) | 60 |
| Theory Paper IV : ZOOL-404B<br>Fishery Science – II<br>Fisheries and Fish Culture – II | Credit: 03<br>(Marks: 75) | Credit: 01<br>(Marks: 25)<br>(2 Test: 15 Marks;<br>Assignments: 10 Marks) | Credit: 04<br>(Marks: 100) | 60 |
| Theory Paper III : ZOOL-403C<br>Applied Parasitology – I<br>Trematodes and Cestodes | Credit: 03<br>(Marks: 75) | Credit: 01<br>(Marks: 25)<br>(2 Test: 15 Marks;<br>Assignments: 10 Marks) | Credit: 04<br>(Marks: 100) | 60 |
| Theory Paper IV : ZOOL-404C<br>Applied Parasitology – II<br>Animal Nematodes and Plant Nematodes | Credit: 03<br>(Marks: 75) | Credit: 01<br>(Marks: 25)<br>(2 Test: 15 Marks;<br>Assignments: 10 Marks) | Credit: 04<br>(Marks: 100) | 60 |
| Theory Paper III : ZOOL-403D<br>Animal Physiology- I<br>Mammalian Physiology – I | Credit: 03<br>(Marks: 75) | Credit: 01<br>(Marks: 25)<br>(2 Test: 15 Marks;<br>Assignments: 10 Marks) | Credit: 04<br>(Marks: 100) | 60 |
| Theory Paper IV : ZOOL-404D<br>Animal Physiology- II<br>Mammalian Physiology – II | Credit: 03<br>(Marks: 75) | Credit: 01<br>(Marks: 25)<br>(2 Test: 15 Marks;<br>Assignments: 10 Marks) | Credit: 04<br>(Marks: 100) | 60 |
| **Theory Paper - V**: Seminar<br>**(Project Work)** | --- | Credit: 01<br>(Marks: 25) | Credit: 01<br>(Marks: 25) | --- |
| **TOTAL** | **Credit: 12<br>(Marks: 300)** | **Credit: 05<br>(Marks: 125)** | **Credit: 17<br>(Marks: 425)** | **600** |

(**ESE:** End of Semester Examination; **CA:** Continuous Assessment; ***:** Elective Paper)

## M.Sc. Zoology-II Year (Fourth Semester) Laboratory Course Work
## (Annual Pattern)

| Paper No. / Title of the Paper | Credit (Marks) | | | Practicals per paper |
|---|---|---|---|---|
| | External : ESE | Internal : CA | Total Credits (Marks) | |
| **Laboratory Course Work-I:** Based on Theory Paper- I & II (I- Genetics and Genetic Engineering; II- Endocrinology) | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) | Credit: 04 (Marks: 100) | 15 |
| *Students should opt. any one following specialization & 1 Credit for* Project | | | | |
| ***Laboratory Course Work-II:** Based on Theory Paper- 403 A & 404 A (LC 403 A-Entomology – I: Economic Entomology; LC 404 A - Entomology – II: Agriculture Entomology and Pest Management) | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) | Credit: 04 (Marks: 100) | 15 |
| ***Laboratory Course Work-II:** Based on Theory Paper- 403 B & 404 B (LC 403 B- Fishery Science – I: Fisheries and Fish Culture - I; LC 404 B - Fishery Science – II Fisheries and Fish Culture - II) | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) | Credit: 04 (Marks: 100) | 15 |
| ***Laboratory Course Work-II:** Based on Theory Paper- 403 C & 404 C (LC 403 C- Applied Parasitology – I Trematodes and Cestodes; LC 404 C - Applied Parasitology – II Animal Nematodes and Plant Nematodes) | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) | Credit: 04 (Marks: 100) | 15 |
| ***Laboratory Course Work-II:** Based on Theory Paper- 403 D & 404 D (LC 403 D- Animal Physiology – I Mammalian Physiology – I; LC 404 D - Animal Physiology – II Mammalian Physiology – II) | Credit: 03 (Marks: 75) | Credit: 01 (Marks: 25) | Credit: 04 (Marks: 100) | 15 |
| **TOTAL** | **Credit: 15 (Marks: 375)** | **Credit: 05 (Marks: 125)** | **Credit: 20 (Marks: 500)** | **75** |

(**ESE:** End of Semester Examination; **CA:** Continuous Assessment; ***:** Elective Paper)

**Note: 01 Credit should be used for Project work from Laboratory course work -II**

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

# Detailed Syllabus

Third Semester

Course Code: ZOOL-301

## Theory Paper-I

## Title of the Paper: VERTEBRATES: STRUCTURE AND FUNCTION

Periods: 60 Credit: 04

**Unit-I**

**1** Origin **and concept of Protochordates**

1.1 Affinities of Protochordates

**2 Origin and classification of vertebrates up to order level.**

2.1 Origin of vertebrates.

2.2 Classification of vertebrates

**Unit-II**

**3 Vertebrate integument and its derivatives**

3.1 Development, General structure and function of skin and its derivatives

3.2 Glands, Scales, horns, claws, Nails, Hoofs, feathers and hairs

**4 General plan of circulation in various Groups**

4.1 Blood-composition and function

4.2 Evolution of heart

4.3 Evolution of aortic arches

4.4 Blood circulation in various vertebrate groups: Single circulation and Double circulation.

**Unit-III**

**5 Respiratory system**

5.1 Characters of respiratory tissue

5.2 Internal and External respiration

5.3 Comparative account of respiratory organs.

**6 Skeletal system**

6.1 Comparative account of jaw suspensorium, vertebral column

6.2 Comparative account of Limbs and girdles.

**Unit-IV**

**7 Urinogential system**

7.1 Evolution of urinogenital system in vertebrates.

**8 Nervous system**

8.1 Comparative anatomy of the Brain and spinal cord, Central nervous system.

8.2 Peripheral and autonomic nervous system.

**9 Sense Organs**

9.1 Mechanoreceptors

9.2 Photoreceptors

9.3 Phonoreceptors

## Suggested Reading for Vertebrate: Structure and Function:

1. R.L. Kotpal, Modern text Book of Zoology vertebrates, Rastogi publications Meerut 10th revised edition.
2. Boume, G.H., The Structure and functions of nervious tissue academic Press, New York.
3. Carter, G.S., Structure and habit in vertebrate evolution, Sedgwick and Jackson, London.
4. Eecles, J.C., The understanding of the brain, McGraw Hill CO., New York and London.
5. Kent, C.G., Comparative anatom of vertebrates.
6. Malcom Jollie, Chordata morphology, East-West press Ltd., New Delhi.
7. Milton Hilderbrand, Analysis of vertebratestructure-IV, Ed. Johan Wily and Sons Ine., New York.
8. Smith, H.S., Evolution of chordara structure, Hold Rinehart and Winstoin Inc, New York.
9. Sedgwick, A.A., students Text Book of Zoology, Vol.II
10. Torrey, T.W., Morphogenesis of erthates, John Wiley & Sons Inc., New York.
11. Walters, H.E. and Sayles, L.D., Ecology of vertebrates, Machillan and Co., New York.
12. Eolstenhoint, E.W. and Knight J. (Ed), Taste and smell in vertebrates, J & A, Churchill, London.
13. Romer, A.S., Vertebrate Body, IInd Edition, W.B. Saunders CO., Philadelphia.
14. Young, J.Z., Life of mammals, Oxford University press, London.
15. Colbert, E.H., Evolution of the vertebrates, Johan Wiley and Sons Inc., New York.

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – III)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-I:**

Laboratory course: 301

**VERTEBRATES: STRUCTURE AND FUNCTION**

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Practicals: 15 Credit: 04

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**1 Dissection of scoliodon**

i) Afferent and efferent arteries
ii) Cranial nerves
iii) Membranous labyrinth.
iv) Brain of Scoliodon.

**2 Dissection of Rat**

i) Arterial system
ii) Venous system
iii) Neck nerves
iv) Urinogenital system

**3 Museum Study:**

**i) Protochordates:** Balanoglossus, salpa, Doliolum, Herdmania, Amphioxus
**ii) Pisces:** Zygaena, pristis, ophiocephalus, Mastacembalus, Catla-catla, Exocoetus, Hippocampus, Syngnathus, Diodon, Notopterus.
**iii) Amphibia:** Icthyophis, Rhacophorus, Rana, Necturus, Ambystoma.
**iv) Reptilia** Chameleon, phrynosoma, varanus,crocodilus, cobra.
**v) Aves:** Bubo, Duck, Vulture, Psittacula, Pigeon.
**vi) Mammalia:** Loris, Bat, Pangolin, Funambulus, Shrew.

**4 Osteology/Skeleton:**

i) Skull of fowl, Dog,/Rabbit.
ii) Vertebral column: Atlas vertebra, Axis vertebra, Trunk, lumbar, caudal.
iii) Pelvic Girdle
iv) Pectoral girdle

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

## Detailed Syllabus

Third Semester :

**Course Code – ZOOL-302**

## Theory Paper-II

## Title of the Paper: MOLECULAR CELL BIOLOGY

Periods : 60 Credit : 04

**UNIT – I: Introduction to Molecular Biology**

1.1 Structure of Pro and Eukaryotic cells, Plasma membrane- structure and composition, Fluid Mosaic Model, Functions of cell membrane- Active and Passive Transport, Osmosis.

1.2 Intracellular compartments, protein sorting – secretary and endocytic pathways.

1.3 Cytoskeleton:

a) Microtubule – structure and composition, Microtubule-associated proteins (MAPs), Microtubule Organizing Centers (MTOCs), Functions of microtubules,

b) Intermediate Filaments – Types and Functions, Microfilaments – Myosin, Actin, Muscle contraction – Sliding Filament Model.

1.4 Nucleus, structure and functions, cell cycle, structure and organization of chromatin.

**Unit –II: Structure of gene and nature of genome**

2.1 Fine structure of gene- eukaryotic genome organization (structure of chromatin, coding and non-coding sequences, satellite DNA), DNA damage and repair, DNA amplification and rearrangenments.

2.2 Regulation of gene expression in eukaryotes, Attenuation and anti-termination

2.3 Oparon concept, DNA methylation, Heterochromatization Transposition

**Unit – III: Organization of transcriptional units**

3.1 Mechanism of transcription of prokaryotes and eukaryotic, RNA processing (capping, polyadenylation, splicing, introns and exons)

3.2 Ribonucleoproteins, structure of mRNA, genetics code and protein synthesis

3.3 The law of DNA constancy, C-value and C-value paradox.

3.4 Molecular basis of spontaneous and induced mutations and their role in evolution. Environmental mutagenesis and toxicity testing, population genetics

**Unit – IV: Biochemistry and molecular biology of cancer**

4.1 Definition, Types, Characteristics and Mechanism of cancer.

4.2 Oncogenes, chemical carcinogenesis, genetic and metabolic disorders

4.3 Signal Transduction – Extra cellular messengers, coupled receptors and their second messengers.

4.4 Second messengers and their role in signal transduction

a) Cyclic Adenosine Monophosphate (CAMP)

b) Cyclic Adenosine Diphosphate (CGMP)

c) Di-Acyl Glycerol (DAG)

d) Calcium ($Ca^{2+}$), Signaling by insulin receptor.

4.5 Convergence, Divergence – Crosstalk among different and signaling pathways, Role of (Nitric Oxide) NO and Carbon Monoxide (CO) cellular messengers.

4.6 Apoptosis (Programmed cell death).

## Suggested Readings for Molecular Cell Biology


1) Molecular Biology of the Cell - Bruce Albats, Dennis Bray, Julian Lewis, Martin Raff, Keith Roberts and James D. Watson, Garland Publishing Inc.,New York, London, 4th Edi. 2002.
2) Molecular Biology of the Gene – James D. Watson, Lania A. Raker, Stephen P. Bell, Alexander Gann, Michael evine and Richard Logic, Pearson Education, 5th Edi. 2004.
3) Molecular Cell Biology – Harvey Lodish, Arnold Berk, Paul Mastudaria, Chris A. Kaiser, Monty Krieger, Mathew P. Scott, S. Lawrence Zipursky and James Darnell, W.H. Freeman & Company, New York, 5th Edition 2004.
4) Genes IX – Benjamin Lewin, Oxford University Press, 2008.
5) Cell Molecular Biology – Gerald Karp, 5th Edi., John Wiley and Sons Inc., 2008.
6) Cell and Molecular Biology – DeRobertes
7) Cell Biology – David E. Sadava, Jones and Bartlett Publishers, London, 1993.

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – III)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-II:**

Laboratory course: 302

**MOLECULAR CELL BIOLOGY**

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Practicals: 15 Credit: 04

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1) Extraction of DNA from suitable tissue.
2) Extraction of RNA from suitable tissue.
3) Estimation of DNA from sample.
4) Estimation of RNA from sample.
5) Preparation of slide for different mitotic stages in onion root tips.
6) Preparation of meiotic stages and study of meiosis using suitable material.
7) Detection of Proteins, Carbohydrates and lipids in animal tissues sections using Histochemical staining techniques.
8) Dissection of salivary glands from chironomous larvae and observation of giant chromosomes.
9) Study of sex chromatin from mammalian buccal epithelium or hair root cells or lymphocytes.
10) Study of cancer cell histology (observation of slides of different cancer types).
11) Separation of DNA fragments by agarose gel electrophoresis.
12) Separation of cell proteins by electrophoresis.
13) Study of effect of pH on protein solubility in water.
14) Study of globular and filamentous proteins by electrophoresis.
15) Northern blotting , Western blotting. (Demonstration only)

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marthwada University, Nanded

**CHOICE BASED CREDIT SYSTEM (CBCS)**

**SEMESTER PATTERN**

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

## Detailed Syllabus

Third Semester :

**Course Code – Zoo - 303 (A)**

**Theory Paper-III**

**Title of the Paper: INSECT: STRUCTURE & FUNCTION**

Periods: 60 Credit : 04

**UNIT: I**

1) Insect: General morphology and exoskeleton in insect.
2) Integument: Structure, composition & function.
3) The Head: - Segmentation, exo and endo skeleton; head appendages.
4) Different types of mouth parts and mechanism of feeding in insects. a) The chewing mouth parts.
b) The piercing-sucking mouth parts. c) The sponging mouth parts.
d) The siphoning mouth parts.

**UNIT: II**

i) (a) The thorax : structure, exo and endo skeleton.
(b) Wings: structure, modification, wing venation and coupling apparatus.
ii) The legs: general structure, types of legs, modification for locomotion on land and in water.
iii) Abdomen: structure, external genetalia of male and female insects.

**UNIT: III**

i) The digestive system: the alimentary canal: its morphology, histology and modification; digestive glands and enzymes, microfouna, digestion of organic compounds, keratin and wax.
ii) Circulatory system and circulation: structure of circulatory system, structure of heart, haemolymph: composition; course of circulation.
iii) Excretory system and osmoregulation: structure of malphigian tubules; nitrogenous excretion; water and ionic regulation.

**UNIT: IV**

i) Respiratory system and respiration: tracheal system; spiracles, trachea, traecheols and air sacs; respiration in aquatic insects and endoparasatic insects: mechanism of ventilation.
ii) Nervous system and nerve co-ordination: central nervous system: Brain, ganglia, nerve cord and nervous integration
ii) Reproductive system and reproduction: Reproductive organs of male and female in Honey bee.

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – III)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-III:**

Laboratory course: 303 A

**ENTOMOLOGY- I**

**INSECT: STRUCTURE & FUNCTION**

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Practicals: 15 Credit: 04

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1) Study external morphology of locally available insect (any five).
2) Study and mounting of antennae, mouth parts, wings and legs of insects.
3) Study of wing venation and modification of wings in insects.
4) Study of genetalia and ovipositor in insects.
5) Dissection of-
    (a) digestive system
    (b) Nervous system
    (c) Reproductive system of one of the following insect
        (i) Grasshopper
        (ii) Honey bee
        (iii) Nepa.
6) Mounting of sting apparatus of honey bee.
7) Physiological experiments:
    (a) Qualitative survey of digestive enzymes present in salivary glands and gut.
    (b) Detection of uric acid as end product of excretion in terrestrial insects.
8) Study of microtomy of 5 insect organs.
9) Students should submit at least 10 slides of mounting and microtomy at the time of examination.

**[Note-Demonstration of Dissections by Charts / Models/ Audio Visual Aids]**

**(Essential animal material should collected from slaughter house)**

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

## Detailed Syllabus

Third Semester :

**Course Code – Zoo - 304 (A)**

### Theory Paper-III

**Title of the Paper: INSECT TAXONOMY, INSECT DEVELOPMENT AND ECOLOGY**

Periods: 60 Credit : 04

**UNIT: I**

i) Collection, preservation, curation and study of insects.
General principles of insect classification, taxonomic procedures, newer trends in insect taxanomy.

iii) Classification of Apteryogte insect: Thysanura.
Pterygota: Exopterygota groups: (diagnostic characters & examples of)
Order: Odonata, Order: Orthoptera
Order: Isoptera, Order: Hemiptera

**UNIT II**:

Endopterygota groups: (diagnostic characters & examples of)
Order: Lepiodeptera, Order: Coleoptera
Order: Diptera, Order: Hymenoptera

**UNIT III**:

Insect development:

i) Spermatogenesis and oogenesis; structure of insect eggs.
Cleavage and early development.

ii) Post embryonic development and metamorphosis, types of
Metamorphosis, significance of metamorphosis, endocrinal control of metamorphosis.

iv) Insect larvae and pupae.

**UNIT IV**

Ecology

i) Effect of temperature on insect life.

ii) Effect of humidity on insect life.

iii) Insect migration; locust migration.

iv) Social life in insects.

v) Communication in insects.

vi) Diapause
Host pest interaction
Insect galls - formation structure and ecology.

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – III)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-III:**

Laboratory course: 304 A

**ENTOMOLOGY- II**

**INSECT TAXONOMY, INSECT DEVELOPMENT AND ECOLOGY**

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Practicals: 15 Credit: 04

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1) Insect collection, preservation, curation and identification of insects belonging to different insect orders (any five).
2) Study of eggs larvae and pupae insects.
3) Rearing and study of metamorphosis steps of insects (Rearing of at least one insects to be studied).
4) Collection and study of insect induced.
5) Study of different castes of honey bee and termite.
6) Study of effect of factors like temperature and moisture on egg laying and egg hatching of insect.
7) Study of insect host plant relationship, host range.
8) Candidates should submit at least 25 locally available insects at the time of examination.

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – III)**

## Suggested Reading for Entomology I (INSECT: STRUCTURE & FUNCTION) and Entomology II (INSECT TAXONOMY, INSECT DEVELOPMENT AND ECOLOGY)


1) K. K. Nayar, T. Anant Krishnan and B.W. David : General and applied Entomology.
2) G. L. Metcalf and W. P. Fling : Destructive and useful inset.
3) Hemsingh Pruthi : A text book of Agricultural Entomology.
4) Wigglesworth : Principles of insect physiology.
5) ESSIG : College entomology.
6) M. S. Mani : A text book of General Entomology.
7) Government of Maharashtra publ : Crop pests and how to fight them.
8) Oldoyd, N : Collection, Preserving and Studying insects.
9) Roger P. and Anderson : Forest and shade tree entomology.
10) D. B. Tembhare : Modem Entomology.
11) RE. Fradt : Fundamentals of applied entomology.
12) K.G.V. Smith : Insects and other Arthropods of Medical importance.
13) D.N. ray and A.W.A. Brown : Entomology medical& veterinary.
14) Chandler. A.C. and Read C.P. : Introduction to Parasitology.
15) R. Debatch : Biological control of natural Enemies.
16) Apple J.L. and Smith R.F. : Integrated pest management.
17) Cheny : General Parasitology.
18) Corbet J.R. : The biochemical mode of action Pesticides.
19) Champman RF : Insects-structure and function O.W. Richards .
20) R.G.Davies; Imms : Text book of Entomology.
21) BursellE : An introduction to insect physiology.
22) Rockstein M. Vol. (1-VI) : The physiology of Insects.
23) Shrivastave K.P.Vol (I-H) : A text book of applied Entomology.
24) Johanson O. A. : Embryology of insects & Myriopods.
25) Ross, H. A. : Text book of Entomology.
26) Roddick : Insect physiology.

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

## Detailed Syllabus

Third Semester :

**Course Code – Zoo - 303 (B)**

**Theory Paper-III**

**Fishery Science- I**

**Title of the Paper: FISH MORPHOLOGY, ANATOMY AND PHYSIOLOGY - I**

Periods: 60 Credit : 04

**Unit-I**

1.1. Scope and Significance of Fishery Science.
1.2. Classification of fishes.
1.3. General characters of:
    1.2.1 Elasmobranchii
    1.2.2 Teleostomi: Actinoptergii, Crossopterygii.
1.4. Integument and Exoskeleton:
    1.4.1 Fish skin and functions
    1.4.2 Exoskeleton - Different types of scales

**Unit-II**

2.1. Endoskeleton of typical cartilaginous and Bony fishes
    2.1.1. Skull
    2.1.2. Vertebral column
    2.1.3. Appendicular skeleton
2.2. Colouration in fishes
    2.2.1 Chromatophores
    2.2.2 Morphological Colour changes
    2.2.3 Physiological Colour changes
    2.2.4 Biological Significance of colouration
2.3. Food, feeding habits and digestion
    2.3.1. Feeding habit of Teleosts
    2.3.2. Alimentary canal and its modification
    2.3.3. Physiology of digestion

**Unit-III**

3.1. Respiration
    3.1.1 Organs of respiration in fishes
    3.1.2 Types and structure of gills
    3.1.3 Mechanism of gaseous exchange
    3.1.4 Accessory respiratory organs

3.2. Circulation

3.2.1 Structure and working of teleostean heart

3.2.2 Afferent and efferent branchial vessels in Teleosts

**Unit - IV**

4.1. Excretion and Osmoregulation in fish

4.1.1 Structure of kidney

4.1.2 Nitrogenous waste excretion

4.1.3 Osmoregulation: Water and Salt balance in Freshwater and Marine fish.

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – III)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-III:**

Laboratory course: 303 B

**FISHERY SCIENCE- I**

**FISH MORPHOLOGY, ANATOMY AND PHYSIOLOGY – I**

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Practicals: 15 Credit: 04

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1) Identification of any two specimens from following groups-
   i) Elasmobranchs.
   ii) Placoderms.
   iii) Holocephali.
   iv) Dipnoi.
   v) Actinopterygii.
   vi) Crosspterygii.
2) Identification of Caudal fins in Fishes.
3) Mounting of Placoid, Cycloid and Ctenoide scales.
4) Identification of Skull, Vertebrae and Girdles in Bony and Cartilagenous Fishes.
5) Aggregation and Dispersion phenomena of Chromatophores in Fishes.
6) Dissections:
   i) Digestive system of Herbivorous and Carnivorous Fishes; Study of Gut contents.
   ii) Heart, Ventral aorta and Afferents arteries of Cartilagenous and bony Fishes.
   iii) Accessory respiratory organs in Clarius, Channa, Anabas, Heteropneustus fossils.

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

## Detailed Syllabus

Third Semester :

**Course Code – Zoo - 304 (B)**

**Theory Paper-III**

**Title of the Paper: FISH MORPHOLOGY, ANATOMY AND PHYSIOLOGY – II**

Periods: 60 Credit : 04

**Unit-I**

1.1 Nervous System
- 1.1.1 Structure and function of Brain
- 1.1.2 Lateral Line Canal System

1.2 Reproduction
- 1.2.1 Organs of reproduction
- 1.2.2 Maturation and spawning
- 1.2.3 Seasonal changes in gonads
- 1.2.4 Fecundity & Spawning periodicity

**Unit-II**

2.1. Migration of Fishes
- 2.1.1 Types of migration
- 2.1.2 Patterns of migration
- 2.1.3 Causes of migration
- 2.1.4 Advantages of migration
- 2.1.5 Factors influencing migration

2.2. Age and growth in Fishes
- 2.2.1 Methods for determining age and growth- Tagging, marking, scale and otolith method
- 2.2.2 Factors influencing growth of fish

**Unit-III**

3.1 Swim bladder and its modifications
- 3.1.1 Structure of the swim bladder
- 3.1.2 Structural modifications
- 3.1.3 Function of the swim bladder

3.2 Electric Organs
- 3.2.1 Structure of the electric organs in various fishes
- 3.2.3 Mechanism of electric discharge
- 3.2.4 Function of electric organs

3.3 Bioluminescence and Sound Production

3.3.1 Luminiscent organs in fishes

3.3.2 Physiology of light production

3.3.3 Sound producing organs in fishes

3.3.4 Significance of Sound production

**Unit-IV**

4.1 Endocrine glands

4.1.1 Pituitary gland : Structure and Histophysiology of pituitary gland

4.1.2 Thyroid gland: Structure and functions of Thyroid gland

4.1.3 Adrenal gland: Structure and functions of Adrenal gland

4.2 Parental Care in Fishes

4.3 Fish Venoms and poisons

4.3.1 Venom apparatus in Stingray, Scorpion Fishes and Weavers

4.3.2 Dangerous Fishes – Puffer fish, Lion fish (Pterois spp.), Candiru, (*Vandellia cirrhosa*), Stonefish (*Synanceja spp.*).

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – III)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-III:**

Laboratory course: 304 B

**FISHERY SCIENCE- II**

**FISH MORPHOLOGY, ANATOMY AND PHYSIOLOGY – II**

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Practicals: 15 Credit: 04

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1. Estimation of Fecundity
2. Determination of Age of given Fish by Scale method
3. Dissection:
    i. Brain, Membranous Labyrinth, Cranial nerves in Bony and Cartilagenous Fishes.
    ii. Reproductive system in Bony and Cartilagenous Fishes.
    iii. Weberian ossicles, Air bladder in Fishes.
4. Identification of Migratory Fishes, Electric Fishes and Poisonous Fishes.
5. Identification of Parental Care observing Fishes.
6. Identification of Pituitary, Thyroid, Adrenal gland in Fishes (Permanent slide)
7. Study of relationship between length and weight of fishes.

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – III)**

## Suggested Reading for Fishery Science -I & II

### (FISH MORPHOLOGY, ANATOMY AND PHYSIOLOGY – I & II)


1. Fish and fisheries of India - V. J. Jhingran.
2. A manual of freshwater fish culture - R. Santharmma N. Sakuran and Natrajan.
3. A Text Book of Fishery Science in Indian - C. B. L. Srivasta
4. An Introduction to Indian Fisheries. - Sharma and Grover
5. Introduction of Fishes by - S. S. Khanna
6. Bal D.V. and Rao K.V. 1989 - Marine Fisheries
7. Hand Book Breeding of Indian Major carps by Chondar S.Z.
8. Huet M. 1972 Text Book of Fish culture Breeding and cultivation of fish fishing New (Books) Ltd. Surrey England.
9. Jayaram K.C. 1978 Fresh Water Fishes of India, Pakistan, Bangladesh, Burma and Srilanka - Hand Book Zoological survey of India Calcutta.
10. C.V. and Sebastian V.O. 1986 Prawns and Fisheries of India Hindustan Publishing corop - Delhi.
11. Moyle P.B. and Cech. J.J. Jr 1988 - Fishes an Introduction to Ichthyology - Prentice all, Englewood cliffs N.J.
12. Norman J.R. 1975 A History of Fishes Third Edn by PH.
13. Balkrishnan N.N. and Thampy D.M. 1980 A Text Book of Marine Ecology, Macmillan India.
14. A Text Book of Fish Biology and Fisheries - by S.S. Khanna and H.R. Singh.
15. Anatomy and Physiology of Fishes - by Santosh Kumar and Manju Tembhre
16. Practical Manual on Fish Biology by Ashok Kumar, Jaiswal, S.K. Chakraverthy, CIFE Publication
17. An Introduction to Fishes - by S.S. Khanna.
18. Ichthyology - by Lagler

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

## Detailed Syllabus

Third Semester :

**Course Code – Zoo - 303 (C)**

## Theory Paper-III

**Applied Parasitology-I**

**Title of the Paper: FISH MICROBES AND ARTHROPODS OF MEDICAL IMPORTANCE**

Periods: 60 Credit : 04

**Unit I**

1 Introduction to parasitology pertaining to various terminology used

2 Study of pathogen microbes with reference to the following diseases: (Emphasis be given to causative organism, pathogenesis, symptoms, transmission, prevention and control) Dengue, plague, Encephalitis, AIDS, Hepatitis, Small pox, Typhoid and Cholera, Leprosy

**Unit II**

3 Basic principles of immunity in relation to T and B cells.

4 Human defense mechanism, Antigen and Antibody reactions and its role in clinical parasitology, common methods like GDP, CIEP, ELISA, Immunoblot.

5 General account of drug therapy and Drug resistance, Antibiotics.

6 Microbial culture techniques and media enrichment techniques.

**Unit III**

7 Introduction to Arthropods of medical importance

8 General account of Acarina, Ticks and Mites, their morphology, disease relationship, life history and control.

**Unit IV**

9 General account of morphology, life-cycle, disease relationship and control of parasitic arthropod groups: 1) Anopleura 2) Siphonoptera

10 Parasitic Hymenoptera & role in biological control.

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – III)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-III:**

Laboratory course: 303 C

### Applied Parastiology-I

**FISH MICROBES AND ARTHROPODS OF MEDICAL IMPORTANCE**

Practicals: 15 Credit : 04

1 : Microbial culture techniques and media enrichment techniques.

2 : Observation of temporary and permanently mounted specimens of microbes as per the theory syllabus

3 : Mounting technique, potassium hydroxide method for clearing arthropods

4 : Preparation of permanent mounts of adult, larvae, and mouth parts of different arthropod parasites and pests (Atleast 10 slides)

5 : Study of permanent mounts of arthropod parasites and pests.

6 : Study of permanent mounts of Insect vectors-Housefly, Mosquito, Lice, Bed-bug, Flea

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – III)**

## Suggested Reading for Applied Parastiology-I

### FISH MICROBES AND ARTHROPODS OF MEDICAL IMPORTANCE


1. R.K. Nayr, T.N. AnAnthakrishnan; B.V. David General & Applied Entomology Tata McGra hill, Publishers.
2. K.P. Srivastava A Text Book of Applied Entomology Vol.1, Kalyani Publishers New Delhi.
3. Askew R.R. Parsitic insects Londan, Heinemam Education Book.
4. Pedigo Larry P. Entomology & Pest Management America, Prentice Hall upper Saddle river, 1996.

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

## Detailed Syllabus

Third Semester :

**Course Code – Zoo - 304 (C)**

### Theory Paper-III

Applied Parasitology-II

**Title of the Paper: PROTOZOANS AND ARTHROPODS OF MEDICAL IMPORTANCE**

Periods: 60 Credit : 04

**Unit I**

1 : Classification of parasitic protozoa as proposed by Levine et al, 1980

2 : Study of geographical distribution, habit, morphology, life cycle, Pathogenicity and prophylaxis of the following parasites.

1 *Giardia lamblia*

2 *Entamoeba histolytica*

3 *Balantidium coli*

4 *Trypanosoma gambiense and Trypanosoma Cruzi*

5 *Leishmania donovani*

6 *Plasmodium vivax and Plasmodium falciparum.*

7 *Trichomonas vaginalis*

**Unit II**

3 : Different methods of feeding, digestion, nutritional requirements and cultivation of parasitic protozoa.

4 : Growth and methods of multiplication in the protozoan parasites.

**Unit III**

5 : Parasitic flies and their role as vectors.

6 : Chemical and biological control of insets.

7 : Household and human pests and their control

**Unit IV**

8 : Insecticides-classification, methods of applications, insect resistance, residue and environmental pollution.

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – III)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-III:**

Laboratory course: 304 C

Applied Parasitology-II

**Title of the Paper: PROTOZOANS AND ARTHROPODS OF MEDICAL IMPORTANCE**

Practicals: 15 Credit : 04

1 : Host autopsy and recovery of Protozoan parasites from suitable hosts.
2 : Zine sulphate floatation technique for protozoan cyst
3 : Preparation of specimens for the study of
1. Fecal smear
2. Alimentary tract
3. Blood smear (At least 5 slides)
4 : Study of permanent mount-specimens of protozoan parasites- *Trypansoma, Trichomonas, Giarida, Opalina, Nyctotherus, Entamoeba, Plasmodium, Leishmania.*
5 : Study of Arthropod parasites and pests as per theory syllabus (Adult, Larvae and mouth parts)
6 : Visit and report of clinic and or pharmaceutical industry manufacturing drugs/vaccines/antibiotics etc.

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – III)**

## **Suggested Reading for** Applied Parasitology-II

**(PROTOZOANS AND ARTHROPODS OF MEDICAL IMPORTANCE)**


1. N.C. Dey, T.K. Dey "Medical Parasitology" Published by ALLIED AGENCY 36, Dr. Sundari Mohan Avenue Calcutta-7000014.
2. K.D. Chatterjee Medial Parasitology
3. G.D. Smith Parasitology
4. Coble Raymand Parasitoogy, Bombay Allied Pacific Pvt. Ltd.
5. Nofel E.R. Parasitology The Biology of Animal Parasites, Philadelophia, Lea & Febiger.
6. Baker J.R. Parasitic protozoa London, Hutchinson U'ty, Library.
7. Chameron Thanas W.A.M. : Parasites & Parasitism Londan, the English Language Book Society.

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

# Detailed Syllabus

Third Semester :

**Course Code – Zoo - 303 (D)**

## Theory Paper-III

**Animal Physiology-I**

## Title of the Paper: GENERAL PHYSIOLOGY – I

Periods: 60 Credit : 04

**UNIT – I: Homeostasis and Thermoregulation**

1.1 Definition and concept of homeostasis
1.2 Characteristics of homeostasis
1.3 Factors destabilizing homeostasis mechanism (Fever and Diabetes Millitus)
1.4 Physiology of homeostatic mechanism with suitable examples
1.5 Temperature compensation in poikilotherms and their regulatory mechanism
1.6 Temperature compensation in homeotherms and their regulatory mechanism

**UNIT – II: Nerve Physiology**

2.1 Types and structure of neurons; Glial cells
2.2 Functional properties of the nerve fiber
2.3 Physiology of the transmission of nerve impulse
2.4 Ultrastructure of synapse and synaptic transmission
2.5 Biosynthesis, storage and release of neurotransmitter – Acetyl choline, Acetylcholine esterase
2.6 The reflex and the reflex arc
2.7 Properties and types of reflexes

**UNIT – III: Physiology of High Altitude**

3.1 Atmospheric Layers
3.2 Effects of acute exposure to high altitude
3.3 Acclimatization of high altitude
3.4 Physiological disorders at high altitude- Dyspnoea and Asphyxia
3.5 Physiological polycythemia
3.6 Underwater Physiology- Introduction, effects of gases on body
3.7 Underwater Respiration, SCUBA Diving.

**UNIT – IV: Work Physiology**

4.1 Varieties of exercise- Severe and Moderate Exercise
4.1 Circulatory and cardiovascular changes in muscular exercise
4.2 Blood pressure during exercise
4.3 Respiratory responses to exercise
4.4 Endocrine response to exercise
4.7 Muscle Fatigue
4.8 Meditation, Yoga and their effects

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – III)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-III:**

Laboratory course: 303 D

**Animal Physiology-I**

**Title of the Paper: GENERAL PHYSIOLOGY – I**

Practicals: 15 Credit : 04

1) To study the rate of oxygen consumption by aquatic animals under environmental stress.
2) To study the changes of blood glucose level under environmental stresses in a vertebrate species.
3) Estimation of acetylcholine from blood sample provided.
4) Study of Nerve Cells and Neurosecretory cells of cockroach (Permanent Slide).
5) Demonstration of Reflex action in frog.
6) Study of heart beat and respiration on man at high altitude by internet survey.
7) Study of Physiological Polycythemia in man.
8) Study of blood pressure during normal and exercise.
9) Effect of exercise on breathing rate, pulse rate and blood lactate of man.
10) Visit to Yoga Centre / Demonstration by expert.

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

# Detailed Syllabus

Third Semester :

**Course Code – Zoo - 304 (D)**

## Theory Paper-III

**Animal Physiology-II**

## Title of the Paper: GENERAL PHYSIOLOGY – II

Periods: 60 Credit : 04

**UNIT – I: Nature of Prokaryotic and Eukaryotic cells**

1.1 Origin, structure and composition of Prokaryotic cells
1.2 Origin, structure, organisation and composition of Eukaryotic cells
1.3 Permeability of plasma membrane to water
1.4 Methods of studying permeability of cell membrane
1.5 Osmosis, Osmotic and solute requirements of living tissues

**UNIT – II: Metabolism**

2.1 Introduction and Definition
2.2 Energy Metabolism
2.3 Methods for determination of energy output
2.4 Respiratory Quotient (R. Q.)
2.5 Basal Metabolism – Factors affecting B.M.R.
2.6 Mineral Metabolism – Calcium, Phosphorous and Sodium

**UNIT – III: Enzymology**

3.1 Units of enzyme activity; Co-enzymes and metal cofactors; enzyme of activation, enzyme specification
3.2 Kinetics of enzymes: Catalysed reactions – Michaelis – Menten Equation and Lineweaver – Burk equation
3.3 Enzyme inhibition, enzyme isoforms – structural basis and functional significance, LDH, hexokinase
3.4 Application of enzymes: Clinical, industrial, therapeutic, enzyme in recombinant DNA technology.

**UNIT – IV: Bioenergetics**

4.1 Redox potential and free energy changes, high energy compounds
4.2 Electron transport chain
4.3 Oxidative phosphorelation: Sites, Energetics and Mechanism of Oxidative phosphorelation
4.4 Inhibitors of Oxidative phosphorelation
4.5 Enzymes involved in Biological Oxidation.

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – III)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-III:**

Laboratory course: 304 D

**Animal Physiology-II**

**Title of the Paper: GENERAL PHYSIOLOGY – II**

Practicals: 15 Credit : 04

1) Study of osmosis by using RBCs of vertebrate animals.
2) Active transport of glucose through intestinal wall of vertebrates (Collection of fresh intestine from slaughter house).
3) Determination of respiratory quotient (R.Q.) of any aquatic animal.
4) To study effect of hormone on Respiratory Metabolism in any aquatic animal.
5) Estimation of blood glucose in man.
6) Estimation of haemoglobin in man.
7) Study of effect of pH and temperature on enzyme activity (Salivary amylase).
8) Study of effect of inhibitors on enzyme activity.
9) Estimation of ATPase.
10) Quantitative estimation of Calcium, Sodium and Potassium in blood serum / plasma.
11) Estimation of Succinic Dehydrogenase (SDH) (Fresh tissue from slaughter house).

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – III)**

## Suggested Reading for

**Animal Physiology- I & II**

**Title of the Paper: GENERAL PHYSIOLOGY – I & II**

## Suggested Reading


1) Bell & Davidson, Text Book of Physiology and Biochemistry
2) Bolander F.F., Molecular Endocrinology
3) Cole S.W., The Practical Physiological Chemistry
4) Eckert, Marsall, Animal Physiology Mechanism and Adaptations
5) Eckert & Ranadak, Animal Physiology (CBS), 2nd Ed. (1978)
6) Garden M.S., Animal Physiology, Principal and Adaptations
7) Hill R.W., Comparative Physiology of Animals
8) Hoar W.S., General and Comparative Physiology
9) Houssay, Human Physiology, McGraw Hill Books Company
10) Hunter & Bornford, Hutchinson's Clinical Methods
11) Heil E. Joets N., Physiology, Oxford University Press (1982)
12) Chatterjee C.C., Human Physiology, Vol. 1 & 2
13) Mill Peter J., Comparative Neurobiology (Ed. Hrbord London)
14) Mitchell P.H., Text Book of General Physiology
15) Norman A.W., Hormones
16) Philips G., Environmental Physiology
17) Prosser C.L., Comparative Animal Physiology
18) Smith, Patterson, Text Book of Physiology (ELBS) Read & Scratched (1988) 11th Ed.
19) West, Best & Taylor's, Physiological Basis of Medical Practice
20) Wilson J.A., Principles of Animal Physiology
21) Wod Dennus W., Principles of Animal Physiology (Ed. Arbod) Lond.

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

# Detailed Syllabus

Fourth Semester

Course Code: ZOOL-401

## Theory Paper-I

## Title of the Paper: GENETICS AND GENETIC ENGINEERING

Periods: 60 Credit: 04

**UNIT – I**

1. Mendel's law of inheritance
   - 1.1. Law of Dominance
   - 1.2. Law of Segregation
   - 1.3. Law of independent assortment
2. Interaction of genes and modifying genes
   - 2.1. Complementary gene factors
   - 2.2. Supplementary gene factors
   - 2.3. Inhibitory factors
   - 2.4. Lethal gene factors
   - 2.5. Epitasis
3. Sex chromosomes and sex linked inheritance
   - 3.1. Types of sex chromosomes and sex chromatin
   - 3.2. Sex linkage in Drosophila
   - 3.3. Sex linkage in man
   - 3.4. Sex linked lethal genes
4. Chromosomal methods of sex determination
   - 4.1. Heterogametic Males
     - i. xx–xo type
     - ii. xx–xy type
   - 4.2 Heterogametic Females
     - i. zo–zz system
     - ii. zw–zz system

**UNIT – II**

1. Linkage and crossing over
   - 1.1. Kinds of linkages and significance
   - 1.2. Mitotic and meiotic crossing over
   - 1.3. Mechanism of meiotic crossing over
   - 1.4. Kinds of crossing over
2. Mutations
   - 2.1. Gene mutation
   - 2.2. Chromosome mutation – Autopolyploidy, Aneuopolyploidy
   - 2.3. Induced mutation & CIB method

2.4. Mutagenic agents

3. Multiple Alleles and Inheritance
   3.1. Multiple allelism A–B–O blood groups
   3.2. Inheritance of A–B–O blood groups and medico–legal applications
   3.3. Rh–factor and Erythroblastosis foetalis

**UNIT – III**

**Human Genetics**

3. Numerical abnormalities of human chromosomes and related syndromes
   3.1. Non–disjunction, Aneuploidy
   3.2. Patau syndrome
   3.3. Down syndrome
4. Sex chromosomes –
   2.1 Turner's syndrome
   2.2 Klinefilter's syndrome
5. Structural abnormalities of human chromosomes and related syndromes
   3.1. Cri–du–chat syndrome
   3.2. Robert–Sonian translocation
   3.3. Prader–Willi Syndrome
   3.4. William's Syndrome
6. Human metabolic disorder
   4.1. Phenylketouria
   4.2. Alcaptoneuria, Tay–Sach's disease
   4.3. Glucose–6–phosphate dehydrogenase deficiency, Emphysemia

**UNIT – IV**

1. Introduction to recombinant DNA technology
2. Enzymes used in DNA technology
3. Cloning vectors – Plasmids, Phages, Cosmids
4. Cloning techniques – Isolation and purification of genomic and plasmid DNA and
5. RNA, Gel electrophoresis of nucleic acids
6. Gene transfer techniques – Electroportation and microinjection
7. Applications of recombinant DNA technology. Monitoring of gene expression in live
8. cells, crop and live stock improvement

## Suggested Reading for Genetics and Genetic Engineering

**References Books**


1. Genetics – P. K. Gupta (Rastogi Publication, Meerut).
2. Genetics – Verma P. S. and Agarwal V. K. (S. Chand Publication Delhi).
3. Cytology, Genetics and Evolution – P. K. Gupta (Rastogi Publication Delhi).
4. Elementary Genetics – Single tone.
5. Genetics – Winchester (Oxford LBH Publication).
6. Genetics and Evolution – A. P. Jha (Macmillon India).
7. Concepts of genetics – W. S. Clug (Pearson Education ISBN).
8. Genetics – Strickberger (Prentice – Hall).
9. Principle of genetics – R. H. Tamarin (Tata Mc Graw Hill Publication India).
10. Concepts of Genetics – R. L. Kotpal (Rastogi Publication).
11. Genetics and Genetic Engineering – Dr. R. P. Meyyan (Saras Publication).
12. Foundations of Genetics – Pai A. C. (Mc Graw Hill Publication).
13. Molecular Genetics – Gunther, S. Stent, (Macmillon).
14. Principles of Genetics – Sinnott, Dunn and Dobzansky (Tata McGraw Hill Pub. Delhi).
15. Genetic – Sarin C. (Tata McGraw Hill Publication Delhi).
16. Principles of Gene Manipulation and Introduction of Genetic Engineering – R.W. Old and S. B. Primerose.
17. Text Book of Genetics – H.S. Bhamrah (Amol Publication, New Delhi).
18. Genetics – M. P. Arora (Himalaya Publication).
19. Genetics and Evolution – N. Armugam (Saras Publication).
20. Genetic – Veer Bala (Rastogi Publication).
21. Cytology and genetics – Dyansagar V.R. (Tata McGraw Hill Pub. 1992 Reprint).

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – IV)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-I:**

Laboratory course: 401

**GENETICS AND GENETIC ENGINEERING**

Practicals: 15 Credit : 04

1. Preparation of pedigree chart of some phenotypic characters of human
2. Study of sex–chromatic from buccal smear or hair root cells
3. Identification and preparation of human Karyotypes
4. DNA sequencing
5. Estimation of DNA by spectrophotometer
6. Study of mitosis using onion root tip cells
7. Study of meiosis in grasshopper testis
8. Study of polytene chromosomes in chironomous larval salivary glands
9. Study of blood sugar estimation in normal and diabetic patients
10. Study of monohybrid, dihybrid crosses and interaction of genes with suitable examples
11. Gel electrophoresis of nucleic acids (DNA/RNA). Isolation and detection of DNA/RNA on agarose gel.
12. Isolation of DNA/RNA from blood
13. Plasmid isolation from bacterium
14. Transformation experiment
15. Restriction digestion of DNA

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

# Detailed Syllabus

Fourth Semester :

**Course Code – ZOOL-402**

## Theory Paper-II

## Title of the Paper: ENDOCRINOLOGY

**(With Reference to Mammal / Human)**

Periods : 60 Credit : 04

**UNIT – I**

**1. Introduction to Endocrinology**

1.1. Hypothalamo – Hypophysial portal system.
1.2. Pituitary gland – Structure and location.
1.3. Structure, histology and hormones of Adenohypaphysis.
1.4. Structure, histology and hormones of Neurohypophysis.
1.5. Biosynthesis of protein hormones and mechanism of hormone action.
1.6. Biosynthesis of peptide hormones and mechanism of hormone action.

**UNIT – II**

**2. Adrenal Gland**

2.1 Structure and histology of Adrenal gland
2.2 Adrenal cortex hormones – Mineralocorticoids and Glucocorticoids and Renin – Angiotensin system.
2.3 Hormones of Adrenal Medulla – Epinephrine and Norepinephrine.
2.4 Hormones of Pancreas – Insulin and Glucagon
2.5 Types of Diabetes: Insulin Dependent Diabetes Mellitus (IDDM) and Insulin Independent Diabetes Mellitus (IIDM)
2.6 Structure and histology of parathyroid gland, Parathyroid hormone – Parathormone and calcium metabolism.

**UNIT – III**

3.1 Endocrine Role of Pineal Gland – Melatonin.
3.2 Neurohormones – NO, CO, Endorphins
3.3 Structure and Histology of Thyroid Gland
Hormones of Thyroid – Thyroxine and Triiodo thyroxine biosynthesis and mechanism of steroid hormone action.

**UNIT – IV**

4.1 Hormones of Female Reproductive Physiology – Estrogens and Progesterone
4.2 Placenta, Hormones of Placenta – HCG & functions
4.3 Hormones of Male Reproductive Physiology – Androgens – Testosterane, Dihydrotesteronc.
4.4 Gastrointestinal Hormones – Gastrin, Secretin, Cholecystokinin (CCK), Gastric Inhibitory Peptide (GIP), Vasoactive Intestinal Peptide (VIP)

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – IV)**

## Suggested Readings for Endocrinology (With Reference to Mammal / Human)


1) Williams Text Book of Endocrinology – Tenth Edition, Saunders, 2003.
2) Endocrinology – Mac E. Hadley, Fifth Edition, Pearson Education, 2004.
3) Molecular Endocrinology – Bolander, F.F., Academic, Son–Diego, 1989.
4) Textbook of Endocrinology – Griffin J.E., S.R. Ojeda, Oxford, New York, 1988.
5) Basic and Clinical Endocrinology – Greenspan, F.S., 3rd Edi., Appleton and Lange.
6) Basic Medical Endocrinology – Goodman, H.M., Raven, New York, 1988.
7) Hormones - From Molecules to Diseable, Bailiene, E.E. & P.A. Kelly, Herman, New York, 1991.
8) Text Book Medical Physiology – Guyton Hall, Tenth Edition, Saunders, 2003.

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – IV)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-I:**

Laboratory course: 402

**ENDOCRINOLOGY**

**(With Reference to Mammal / Human)**

Practicals: 15 Credit : 04

1) Dissection of Endocrine glands in Rat or any other vertebrate
2) Determination of protein and glycogen in endocrine material (using spectrophotometer)
3) Determination of sugar level in diabetic and non–diabetic blood samples
4) Microtomy of Endocrine glands (Tissue fixation, Paraffin block preparation, sectioning, staining and Mounting).
5) Histology of Rat / Rabbit / Mammal Endocrine glands – Observation of histological section of different endocrine glands.
6) Hypophysectomy, Thyroidectomy, Adrenalectomy, Ovariectomy, in Rat / Mammal, Hysterectomy, Vasectomy.
7) Effect of Thyroxin on oxygen consumption of a fish.
8) Separation of plasma proteins by electrophoresis.
9) RIA and ELISA for any hormone or second messenger.
10) Estimation of at least one hormone.
11) Preparation of vaginal smear, staining and identification of reproductive phase in Rat.
12) Identification of chemical structure of steroid hormone.

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

# Detailed Syllabus

Fourth Semester :

**Course Code – Zoo - 403 (A)**

## Theory Paper-III

## Title of the Paper: ECONOMIC ENTOMOLOGY

Periods: 60 Credit : 04

**UNIT – I:**

i. Sericulture: Mulberry silkworm: life history, seed production, silkworm rearing, silk glands and silk production, cocoon formation, cocoon harvesting and reeling, silkworm diseases and management, non–mulberry sericulture, sericulture as a cottage industry.

ii. Lac culture: Biology of lac insects, lac cultivation and economic importance of lac.

**UNIT – II:**

i. Apiculture: types of honey bees, life cycle, apiary products, bee keeping and techniques, bee rearing management, movable frame hive; economic importance of honey, wax and apiary products.

ii. Insects as pollinators

iii. Insects as food

iv. Insect as a source of drugs and dyes

v. Insects in research

vi. Butterfly farming

vii. Insects in forensic entomology

**UNIT – III:**

i. Medical entomology: Morphology, Vectorship, Pathogenecity & Control of: Mosquito, housefly, Ratfleas, head louse.

ii. Morphology, Vectorship, Pathogenecity & Control of: Pests of domestic animals, Horse and Cattles.

**UNIT – IV:**

i. Household pests: Morphology, damage caused & Control measure of: Cockroach, Cricket, Carpet beetle, Ants and termites, Bed bugs, Lepisma, Wasps.

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – IV)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-III:**

Laboratory course: 403 (A)

**ECONOMIC ENTOMOLOGY**

Practicals: 15 Credit : 04

1) Study of silk worm adult, caterpillar and cocoon, sericulture practices, equipments used in sericulture.
2) Study of honey bees and their castes; apiculture equipments.
3) Study of lac insects, lac cultivation, lac products.
4) Study of household pests *viz.* House fly, Cockroach, Lepisma, Ants, termites, Cricket.
5) Study of insect vectors like Mosquito, bed bug, flea, body louse, Rat flea.
6) Study of beneficial insects (predatory and parasite insects) and their importance.
7) Study & rearing of biological control agents (At least one)

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

# Detailed Syllabus

Fourth Semester :

**Course Code – Zoo - 404 (A)**

## Theory Paper-III

## Title of the Paper: AGRICULTURE ENTOMOLOGY & PEST MANAGEMENT

Periods: 60 Credit : 04

**UNIT – I:**

i. Concept of pest; origin of pest; types of pests; nature of damage; pest resurgence.
ii. Classification, Morphology, bionomics, damage and control measures of
a) Pests of cotton: Cotton Bollworms; Red cotton bug; Cotton whitefly.
b) Pests of sugarcane: sugarcane leafhopper.
c) Pests of paddy: Yellow stem borer.

**UNIT – II:**

i. Classification, Morphology, bionomics, damage and control measures of
a) Pests of Jowar: Jowar stem borer, Jowar shoot fly, Jowar midge fly; armyworm.
b) Pests of fruit crops: Lemon butterfly, mango stem borer, coconut borer.
c) Pests of oil seed crops: Safflower aphid.
d) Pests of stored grains: Rice weevil, Red flour beetle, pulse beetle.
e) Defoliaters, sap suckers & fluid sucker pests of forest trees.

**UNIT – III:**

Pest Management:
i. Physical and mechanical control, cultural control, legal control.
ii. Chemical control: Insecticidal formulations, classification of insecticides, mode of action of insecticide, merits and demerits of chemical control, plant protection equipments.

**UNIT – IV:**

i. Biological control: Principles, procedure, Biological agents; success and limitations.
ii. Hormonal control of insect pests.
iii. Genetic control of insect pests.
iv. Integrated pest management (IPM) Principles, modeling and application

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – IV)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-III:**

Laboratory course: 404 (A)

## AGRICULTURE ENTOMOLOGY & PEST MANAGEMENT

Practicals: 15 Credit : 04

1) Study of morphology, identification, nature of damage of pests of Jowar, Cotton, Paddy, Vegetables, Fruit Crops, Stored Grains.
2) Collection and study of insect infested / damaged parts of plants.
3) Collection and study of parasactisc, predatory, pollinator insects & biological control agents.
4) Study of life history stages of different pests.
5) Study of plant protection equipments.

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – IV)**

### 403(A) + 404(A)

### ECONOMIC ENTOMOLOGY +
### AGRICULTURE ENTOMOLOGY &PEST MANAGEMENT

## Suggested Reading


1) Nayer, K.K., T. Anant Krishnan and B.W. David : General and Applied Entomology
2) Metcalf, G.L. and W.P. Fling : Destructive and Useful Inset
3) Hemsingh Pruthi : A Text Book of Agricultural Entomology
4) Wigglesworth : Principles of Insect Physiology
5) ESSIG : College Entomology
6) M.S. Mani : A Text Book of General Entomology
7) Government of Maharashtra Publication : Crop Pests and How to Fight Them
8) Oldoyd, N. : A Collection, Preserving and Studying Insects
9) Roger P. and Anderson : Forest and Shade Tree Entomology
10) Tembhare, D.B. : Modem Entomology
11) Fradt, R.E. : Fundamentals of Applied Entomology
12) Smith, K.G.V. : Insects and Other Arthropods of Medical Importance
13) Ray, D.N. and A.W.A. Brown : Entomology Medical & Veterinary
14) Chandler, A.C. and Read, C.P. : Introduction of Parasitology
15) Debatch, R. : Biological Control of Natural Enemies
16) Apple, J.L. and Smith, R.F. : Integrated Pest Management
17) Cheny : General Parasitology
18) Corbet, J. R. : The Biochemical Mode of Action of Pesticides
19) Champaman, R.F. : Insects – Structure and Function
20) Richards, O.W. and R.G. Davies, IMMS : Text Book of Entomology
21) Bursel, E. : An Introduction to Insect Physiology
22) Rockstein M. : The Physiology of Insects (Vol. 1–VI)
23) Shrivastava, K.P. : A Text Book of Applied Entomology (Vol. I–H)
24) Johnson, O.A. : Embryology of Insects and Myriopods
25) Ross, H.A. : Text Book of Entomology
26) Roddick : Insect Physiology

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

# Detailed Syllabus

Fourth Semester :

**Course Code – Zoo - 403 (B)**

## Theory Paper-III

## Title of the Paper: FISHERIES AND FISH CULTURE - I

Periods : 60 Credit : 04

**Unit-I**

11. Introduction, Scope and importance of Capture and Culture Fisheries
12. Fish culture - Study of commercially important cultivable fresh water fishes (Growth, Food and Feeding habits, Maturity, Spawning)
    c) Indian major carps - Rohu, Catla, Mrigal
    d) Exotic Carps - Common Carp, Grass Carp, Silver Carp
13. Monoculture and Composite Fish culture, Polyculture

**Unit-II**

1. Fish Farm Engineering
   - Topography
   - Soil type
   - Water supply
   - Design
2. Fish Farm Management
   - Types of Ponds required
   - Management of Hatcheries
   - Types of Hatcheries

1. Hatching pits
2. Hapa
3. Chinese Hatchery System
4. Pre stocking, Stocking and Post stocking management of Nursery, Rearing and Stocking ponds

3. Aquatic weeds and their Control
   - Types of Aquatic Weeds
   - Advantages and Disadvantages of Aquatic Weeds
   - Weed Control by manual, mechanical, chemical and biological methods

**Unit-III**

1. Induced breeding by hormones
   - Selection of breeders
   - Injection and dosage
   - Breeding happa and spawning
2. Collection of breeders from natural Bundh
   - Bundh breeding - Wet and Dry bundh
3. Fish Transport

- Scope and requirement of fish transport
- Tools and Techniques used for fish transport
- Problems in fish transport

4. Fish sedatives and anaesthetics
    - Scope of sedatives and anaesthetics in fishery
    - Natural and synthetic sedatives and anaesthetics
    - Application of sedatives and anaesthetics in fishery

**Unit - IV**

1. Fish Pathology
    - Symptoms and treatment of
        - Parasitic diseases
        - Non Parasitic diseases
        - Miscellaneous diseases
2. Fish Preservation
    - Causes of Fish spoilage
    - Various methods of Fish preservation
3. Fish by products

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – IV)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-III:**

Laboratory course: 403 (B)

## FISHERIES AND FISH CULTURE – I

Practicals: 15 Credit : 04

1) Identification of Indian Major Carps and Exotic Carps.
2) Layout of Fish Farm.
3) Identification of Hatcheries (Model Study).
4) Identification of Aquatic weeds, Predatory Fishes, Weed Fishes, Aquatic insects.
5) Identification of Spawn, Fry and fingerlings of culturable Fishes.
6) Collection and preservation of Pituitary gland.
7) Preparation of Pituitary extract and injection of Pituitary extract – by demonstration
8) Identification of parasites and their control.
9) Visit to Fish Farm.
10) Preparation of by products like Fish manure, Fish meal, Issin glass etc.

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

# Detailed Syllabus

Fourth Semester :

**Course Code – Zoo - 404 (B)**

## Theory Paper-III

## Title of the Paper: FISHERIES AND FISH CULTURE - II

Periods : 60 Credit : 04

**Unit-I**

1. Scope and importance of Aquaculture
2. Inland Fishery - Riverine & Reservoir Fisheries (general introduction)
3. Culture methods :
   - Cage Culture
   - Pen Culture
   - Race way Culture
4. Integrated Fish Farming- Paddy cum Fish Culture

**Unit-II**

1. Sewage Fed Fish Culture
2. Mussel Culture
3. Prawn Culture allied activities – Feed for Prawn seed, Transport of Prawn seed, Prawn seed diseases.
4. Pearl oyster Culture

**Unit-III**

1. Man made hazards and Aquaculture
2. Methods of Fishing
   - Crafts and Gears used
   - Electrical Fishing, Light Fishing, Fish finder

**Unit- IV**

2) Marine Fisheries
   - i) Mackerel Fishery
   - ii) Oil Sardine Fishery
   - iii) Bombay Duck Fishery
   - iv) Prawn Fishery

3) Legislative framework for Fishery in India-
   - 4.1. Biological Diversity Act 2002 with reference to fish diversity.
   - 4.2. Illegal, Unreported, and Unregulated (IUU) Fishing – Indian Scenario
   - 4.3. Endangered fishes of India by charts and models.

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – IV)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-III:**

Laboratory course: 404 (B)

## FISHERIES AND FISH CULTURE - II

Practicals : 15 Credit : 04

1) Study of Cage, Pen and Race way (Model Study).
2) Identification Mussels, Prawn and Pearl oyster.
3) Study of crafts and gears: Hooks, Line-Gear, Cast net, Gill net, Drag net, Trawl net, Catamaron, Masula, Coracle, Trawler.
4) Identification of Food Fishes from Rivers, Reservoir and Sea.
5) Visit to Rivers, Reservoirs to Study Riverine & Reservoir Fisheries.
6) Study of Endangered fishes of India.

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – IV)**

### 403 (B) + 404 (B)

### FISHERIES AND FISH CULTURE – I & II

## Suggested Reading


1. A Text Book of Fishery Science in Indian - C. B. L. Srivasta
2. Fish and fisheries of India - V. J. Jhingran.
3. A manual of freshwater fish culture - R. Santharmma N. Sakuran and Natrajan.
4. A Text Book of Fishery Science in Indian - C. B. L. Srivasta
5. An Introduction to Indian Fisheries. - Sharma and Grover
6. Introduction of Fishes by - S. S. Khanna
7. Bal D.V. and Rao K.V. 1989 - Marine Fisheries
8. Hand Book Breeding of Indian Major carps by Chondar S.Z.
9. Huet M. 1972 Text Book of Fish culture Breeding and cultivation of fish fishing New (Books) Ltd. Surrey England.
10. Jayaram K.C. 1978 Fresh Water Fishes of India, Pakistan, Bangladesh, Burma and Srilanka - Hand Book Zoological survey of India Calcutta.
11. C.V. and Sebastian V.O. 1986 Prawns and Fisheries of India Hindustan Publishing corop - Delhi.
12. Moyle P.B. and Cech. J.J. Jr 1988 - Fishes an Introduction to Ichthyology - Prentice all, Englewood cliffs N.J.
13. Norman J.R. 1975 A History of Fishes Third Edn by PH.
14. Balkrishnan N.N. and Thampy D.M. 1980 A Text Book of Marine Ecology, Macmillan India.
15. A Text Book of Fish Biology and Fisheries - by S.S. Khanna and H.R. Singh.
16. Anatomy and Physiology of Fishes - by Santosh Kumar and Manju Tembhre
17. Practical Manual on Fish Biology by Ashok Kumar, Jaiswal, S.K. Chakraverthy, CIFE Publication
18. An Introduction to Fishes - by S.S. Khanna.
19. Ichthyology - by Lagler

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

# Detailed Syllabus

Fourth Semester :

**Course Code – Zoo - 403 (C)**

## Theory Paper-III

## Title of the Paper: Applied Parasitology-I (Trematodes And Cestodes)

Periods : 60 Credit : 04

**Unit I:**

1. General organization of Trematodes and its classification upto family level.
2. General organization of Monogenea, Aspidobothria and Digenea.
3. Functional anatomy of Male and Female reproductive system in Digenea.
4. Biology of Egg, Egg Sheel formation, Chemistry of egg shell formation, factors influencing embryonation and hatching in Trematodes.

**Unit II:**

5. Larval forms in Trematodes
6. Immunology, Basic concept, Antigen Antibody reaction, Innate and Acquired resistance.
7. Study of Morphology, Life cycle, Pathogenicity, Prophylaxis of following parasites:
   1. *Fasciolopsis buski*
   2. *Schistosoma Japonicum and Schistosoma mansoni.*
   3. *Clonorchis sinensis*
   4. *Paragonimus wetermani.*

**Unit III:**

8. General organization of cestodes and its classification up to order level.
9. Structural organization of cestodarians.
10. General important features of the following orders:
    a) Proteocephalidea
    b) Tetraphyllidea
    c) Davaineidea
    d) Hymenolepidea
14. Hold fast organs in Cestodes.
15. Modification of uterus in Cestodes.

**Unit IV:**

16. Larval forms in Cestodes.
17. Study of following important parasites with respect to their geographical distribution, habitat, morphology, Life cycle, Pathogenicity, Diagnosis, Treatment and Prophylaxis.
    *a) Taenia Solium*
    *b) Echinococcus granulosus*
    *c) Diphyllobothrium latum*
    *d) Hymenolepis nana*
    *e) Dipylidium caninum*

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – IV)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-III:**

Laboratory course: 403 (C)

Practicals: 15 Credit : 04

1. Preparation of stains: Haematoxylin, Acetocarmine, Borax caramine and Bouins fluid.
2. Preparation of Different Grades of Alcohols.
3. General principles of Collection, Preservation, Staining and Mounting of Trematodes and Cestodes.
4. Collection of Trematodes and Cestode parasites from locally available different hosts.
5. Preparation and identification of collected helminth parasites (Trematodes and cestodes) At least Ten.
6. Study of permanent mounts of Trematodes and cestodes viz.
   1. *Polystoma*
   2. *Gyrodactylus*
   3. *Paramphistomum*
   4. *Fasciola hepatica*
   5. *Gastrothylax*
   6. *Fasciolopsis buski*
   7. *Schistosoma Japonicum*
   8. *Schistosoma mansoni.*
   9. *Clonorchis sinensis*
   10. *Paragonimus wetermani.*
   11. *Taenia solium& Taenia saginata*
   12. *Moniezia expansa*
   13. *Railletina*
   14. *Cotugnia*
   15. *Echinococcus granulosus*
   16. *Diphyllobothrium latum*
   17. *Dipylidium caninum*
   18. *Hymenolepis nana*
   19. *Dipylidium caninum*
   20. *Gyrocotyle*

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – IV)**

**Course Code – Zoo - 403(C) Applied Parasitology-I**

**(Trematodes And Cestodes)**

## Suggested Reading


1. An Introduction to Parasitology – By chandler
2. General Parasitology – By Cheng T. C.
3. Biology of Parasites – By Cheng
4. Systema Helminthum – By S. Yamaguti
5. Biology of Animal parasites – By Saunders.
6. Clinical Parasitology – By Faust
7. Medical Helminthology – By Watson
8. Parasitology – By K. D. Chatterjee
9. Medical Parasitology – By N. C. Dey, T. K. Dey.

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

# Detailed Syllabus

Fourth Semester :

**Course Code – Zoo - 404 (C)**

## Theory Paper-III

## Title of the Paper: Applied Parasitology-II (Animal Nematodes and Plant Nematodes)

Periods : 60 Credit : 04

**Unit I:**

1. General organization of Nematode body.
2. Ultra structure of Cuticle-Chemical Composition and Organization
3. Feeding and Nutrition in Nematodes.
4. Carbohydrate and Protein Metabolism in Nematodes.
5. Nematode egg, Development, Hatching, Moulting.
6. Functional anatomy of reproductive system of Nematodes.

**Unit II :**

7. Larval forms in Nematodes with special reference to Pathogenicity.
8. Study of following important parasites with respect to their Geographical Distribution, Habitat, Morphology, Life-cycle, Pathogenicity, Diagnosis, Treatment and Prevention.

*a) Ancylostoma duodenale*
*b) Wuchereria bancrofti*
*c) Dracunculus medinensis*
*d) Trichinella spiralis,*
*e) Strongyloides stercoralis.*
*f) Enterobius vermicularis.*

9. Nematode as models and model nematodes (Toxicity, Gerntology, Parasitic, Genetic)

**Unit III :**

10. Plant parasitic Nematodes – General account
11. Plant parasitic Nematodes – symptoms of nematode injuries to plants.

a) Above ground symptoms
b) Below ground symptoms.

12. Controlling of the Nemic Diseases of Plant – Heat, fallow, crop rotation, Biological control, organic matter and mulching, Root Diffusates, natural enemies.
13. Chemical Control.

a) Nematicidal chemicals
b) Application of Nematicides
c) Procedure in soil fumigation

**Unit IV:**

14. Structure, Life cycle and Control of the following Nematodes.

*a) Anguina (Seed Gall- nematode)*
*b) Meloidogyne (Root knot nematode)*
*c) Heterodera (cyst nematode)*
*d) Tylenchulus (citrus nematode)*
e) *Pratylenchus (Lesion nematode)*

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – IV)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-III:**

Laboratory course: 404 (C)

## Applied Parasitology-II (Animal Nematodes and Plant Nematodes)

Practicals : 15 Credit : 04

1. General principles of collection, preservation, staining and mounting of Animal parasitic Nematodes.
2. Collection of Animal and plant parasitic Nematodes from locally available different hosts/sources.
3. Preparation and identification of collected Animal parasitic Nematodes and plant parasitic Nematodes (At least Ten).
4. Study of permanent slides of Animal parasitic and plant parasitic Nematodes viz.

*1. Ascaris lumbricoides*
*2. Oxyuris*
*3. Ancylostoma duodenale*
*4. Wuchereria bancrofti*
*5. Dracunculus medinensis*
*6. Trichinella spiralis,*
*7. Strongyloides stercoralis.*
*8. Enterobius vermicularis.*
*9. Anguina (Seed Gall- nematode)*
*10. Meloidogyne (Root knot nematode)*
*11. Heterodera (cyst nematode)*
*12. Tylenchulus (citrus nematode)*
13. *Pratylenchus (Lesion nematode)*
*14. Ditylenchus dipsaci*
*15. Tylenchorhynchus*
*16. Belonolaimus gracilis*
*17. Hoplolaimus coronatus*
*18. Radopholus similis*
*19. Trichodorus christiei*
*20. Xiphinema americanus*

5. Collection Techniques
- Baerman's funnel techniques
- Oostenbrinks elutriator
- Sieving, Fixation, Dehydration.

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – IV)**

### Course Code – Zoo – 404 (C) Applied Parasitology-II

### (Animal Nematodes and plant Nematodes)

## Suggested Reading


1. An Introduction to Parasitology – By chandler
2. General Parasitology – By Cheng T. C.
3. Biology of Parasites – By Cheng
4. Systema Helminthum – By S. Yamaguti
5. Biology of Animal parasites – By Saunders.
6. Clinical Parasitology – By Faust
7. Medical Helminthology – By Watson
8. Parasitology – By K. D. Chatterjee
9. Medical Parasitology – By N. C. Dey, T. K. Dey.
10. Nematode Parasites – N. D. Levine
11. Structure of Nematodes – A. F. Bird
12. An Introduction to Nematology – Chitwood
13. Essentials of Nematodology – Skrjabin, Shikhobalova & Shults

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

# Detailed Syllabus

Fourth Semester :

**Course Code – Zoo - 403 (D)**

## Theory Paper-III

## Title of the Paper: Mammalian Physiology – I

Periods : 60 Credit : 04

**UNIT – I: Digestive System**

1.1. Digestive Tract
1.2. Histological structure of stomach, small intestine
1.3. Liver – Structure and Functions
1.4. Pancreas – Structure and secretion of enzymes
1.5. Gall Bladder – Physiology
1.6. Gastro Intestinal Hormones and their role
1.7. Physiology of digestion of protein, carbohydrate and lipid
1.8. Brush Border Enzymes
1.9. Physiology of Absorption of Proteins, Carbohydrates and Lipids
1.10 Disorders – i) Peptic Ulcers ii) Cirrhosis
iii) Hepatitis iv) Gallstones
1.11 Secretion of HCl by parietal cells – Mechanism

**UNIT – II: Respiratory System**

2.1 Structure of Respiratory System– Nose, Pharynx, Larynx, Voice Production, Trachea, Bronchi, Lungs
2.2 Mechanism of breathing
2.3 Lung volume and lung capacities
2.4 Transport of oxygen and carbon dioxide between blood and tissues
2.5 Chemical and nervous control of respiration
2.6 Disorders– i) Asthma ii) Emphysema
iii) Pneumonia iv) Cystic Fibrosis

**UNIT – III: Cardiovascular System**

3.1 Composition and functions of blood
3.2 Formation of blood cells – Erythropoiesis, Leucopoiesis
3.3 Blood Volume, Erythrocyte Sedimentation Rate (E.S.R.)
3.4 Bone Marrow- Definition and Functions, Methods of examination
3.5 Lymph and Lymph Nodes – Structure, composition and Functions
3.6 Disorders – Anaemia, Leukaemia
3.7 Blood Cholesterol
3.8 Heart –Internal structure, conducting system, heart beat and regulation of heart beat
3.9 Cardiac cycle, cardiac output and ECG
3.10 Disorders – Coronary Artery Disease (CAD)

**UNIT – IV: Excretory System- Kidney**

4.1 Kidney– Anatomy and Functions
4.2 Blood supply to Kidney
4.3 Renal Physiology – Mechanism of urine formation- Glomerular Filtration, Tubular Reabsorption and Tubular Secretion
4.4 Structure and histology of Nephron
4.5 Counter – Current mechanism
4.6 Dialysis therapy- Definition and types
4.7 Renal function tests
4.8 Disorders– i) Urinary tract infections
ii) Acute and Chronic Renal Failure
4.9 Physiology of Micturition

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – IV)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-III:**

Laboratory course: 403 (D)

### Mammalian Physiology – I

Practicals: 15 Credit : 04

1) Estimation of serum amylase.
2) Estimation of SGOT / SGPT.
3) Estimation of serum / plasma glucose by colorimetric method.
4) Estimation of total proteins in blood.
5) Estimation of total cholesterol in blood.
6) Estimation of Low Density Lipoproteins (LDL) and High Density Lipoproteins (HDL) in blood.
7) Microscopic examination of urine.
8) Estimation of serum urea.
9) Detection of normal and abnormal constituents of urine.
10) Estimation of total oxygen consumption and rate of oxygen consumption by using any aquatic animal.

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marthwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. In Zoology**

# Detailed Syllabus

Fourth Semester :

**Course Code – Zoo - 404 (D)**

**Theory Paper-III**

**Title of the Paper: Mammalian Physiology – II**

Periods : 60 Credit : 04

**UNIT – I: Nervous System (CNS, PNS and ANS)**

1.1 Meninges – Dura matter, Arachnoid matter and Pia matter
1.2 Central Nervous System- Structure and functions of forebrain- Olfactory lobes, Cerebrum and Diencephalon
1.3 Structure and functions of midbrain- Corpora quadrigemina and Crura cerebri
1.4 Structure and functions of hindbrain- Pons varolli and medulla oblongata (Brain Stem)
1.5 Electroencephalogram, sleep and learning physiology
1.6 Spinal Cord
1.7 Peripheral Nervous System - Nerves and their functions
1.8 Autonomic Nervous System (ANS) - Sympathetic and Parasympathetic Nervous System

**UNIT – II: Reproductive System**

2.1 Male Reproductive System - external morphology and histological structure of testis
2.2 Spermatogenesis, hormonal control of spermatogenesis
2.3 Accessory sex glands
2.4 Semen- composition and functions of seminal fluids
2.5 Female Reproductive System – external morphology and histological Structure of ovaries
2.6 Oogenesis, hormonal control of oogenesis
2.7 Mammary Glands – Anatomy, histology and development of mammary glands, physiology breast cancer
2.8 Female Reproductive Cycle – Phases of female reproductive cycle and their hormonal control
2.9 Birth Control Measures – Sterilization in male and female
2.10 Hormonal Methods
2.11 Intra Uterine Devices
2.12 Barrier Methods
2.13 Chemical Methods
2.14 Physiological Methods
2.15 Abortion

**UNIT – III: Muscle Physiology**

3.1 Types, functions and characteristics of muscle
3.2 Ultra structure of skeletal muscle and protein activities
3.3 Chemical composition of muscle fiber, neuromuscular junction
3.4 Contraction of muscle – Sliding filament mechanism
3.6 Role of calcium and regulator proteins
3.7 Power stroke and the role of ATP

3.8 Twitch contraction, Tetanus, Staircase effect CT
3.9 Muscle Metabolism – Phosphagen system and Glycogen – Lactic acid system
3.10 Disorders – i) Muscular Dysterophies
ii) Myasthenia Gravis

**UNIT – IV: Special Senses**

4.1 Ear- External, Middle and Internal Structure and Physiology of hearing
4.4 Properties of Sound and Sound Perception
4.5 Physiology of Equilibrium– Otolithic organs, Semicircular canals and path of vestibular impulses
4.7 Disorder – Deafness
4.8 Eye- Accessory structure and anatomy of the eyeball
4.9 Physiology of Vision- Refraction of light rays, accommodation of near point vision, constriction of the pupil

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)

## SEMESTER PATTERN

**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.Sc. ZOOLOGY (Second Year Semester – IV)**

**LABORATORY COURSE WORK BASED ON THEORY PAPER-III:**

Laboratory course: 404 (D)

### Mammalian Physiology – II

Practicals : 15 Credit : 04

1) Preparation of simple muscle curve.
2) To study the effect of fatigue on muscle contraction.
3) Dissection of male reproductive system of Rat (Demonstration only).
4) Dissection of female reproductive system of Rat (Demonstration only).
5) Separation and identification of Amino Acids (in plasma/ tissue extracts) by paper chromatography
6) Separation of plasma proteins / tissue proteins by Paper Electrophoresis / by Gel Electrophoresis.
7) Histochemical demonstration of proteins, Glycogen and lipids (in tissue paraffin sections) by Nile Blue Sulphate, Best Carmine and Sudan Black method or any other histochemical staining method (Demonstration only).
8) Quantitative estimation of Na, k, Ca and phosphorus.
9) Pregnancy Test (using commercial available pregnancy test kits).
10) Estimation serum creatinine and serum urea.

**[Note-1) Demonstration of Animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C. Guidelines]**

**2) Essential animal material should collected from slaughter house]**

# Swami Ramanand Teerth Marathwada University, Nanded

## CHOICE BASED CREDIT SYSTEM (CBCS)
## SEMESTER PATTERN

**Faculty of Science**
**w. e. f. Academic Year 2015-2016**
**M.Sc. ZOOLOGY (Second Year Semester – IV)**

**403 (D) + 404 (D)**
**Animal Physiology- I & II**

**Title of the Paper: MAMMALIAN PHYSIOLOGY – I & II**

## Suggested Reading


1) Review of Medical Physiology – W.F. Ganong 16th Edition, 1993, Appleon and Lange (A Publishing Division of Prentice Hall).
2) Text Book of Medical Physiology – Arthur C. Guyton and John E. Hall, 10th Edition, 2000, Saundus An Imprint of Elsevier.
3) Human Physiology – Lauralee Sherwood, 6th Edition 2007, Thomson, India Edition.
4) Human Physiology – Vander, Sherman, Luciano, 6th Edition, McGraw–Hill Inc., International Edition, 1994.
5) Principles of Anatomy and Physiology – Gerard J. Tortora and Sandra Reynolds Grabowsky Harper Collins College Publishers, 8th Edition, 1996.
6) Text Book of Physiology – Smith, Patterson, Read and Scratched, ELBS, 11th Edition, 1988.
7) Marshall's Physiology of Reproduction – Vol. 1 to 5, Amming C.E., Edition, Churchill Livingstone, 1984.
8) Physiology – Bullock, J. Boyle, Harward Pull, 1991.
9) Essential Endocrinology – Laycock, J.F., and Wise, Peter, H. ELBS, 1983.
10) Hole's Human Anatomy and Physiology, 7th Edition By David Shier.
11) Human Physiology – Stuart Ira Fox, McGraw Hill, 6th Edition, 1999.
12) Human Physiology – David Moffett, Stacia Moffett Charles Schauf, Mosby International Edi., 1993.
13) Human Anatomy and Physiology – Elaine N. Marieb, 3rd Ed., The Benjamin / Cummings Publishing Inc., 1995.
14) Physiology – Berne, R.M. and M.N. Levy, Mosby, 3rd Edi., St. Louis,

# Swami Ramanand Teerth Marathawada University, Nanded
## CHOICE BASED CREDIT SYSTEM (CBCS)
## SEMESTER PATTERN
**Faculty of Science**

**w. e. f. Academic Year 2015-2016**

**M.sc. Theory Examination (Second Year: Semester – III & IV)**
**THEORY QUESTION PAPER PATTERN**
**Subject: Zoology**

Max. Marks: 75 Credit: 03

Time: 03 Hours

| | | |
|---|---|---|
| Q.1 | Long Answer Question (Based on Unit No. I) | (15) |
| | OR | |
| | Long Answer Question | |
| Q. 2 | Long Answer Question (Based on Unit No. II) | (15) |
| | OR | |
| | Long Answer Question | |
| Q. 3 | Long Answer Question (Based on Unit No. III) | (15) |
| | OR | |
| | Long Answer Question | |
| Q. 4 | Long Answer Question (Based on Unit No. IV) | (15) |
| | OR | |
| | Long Answer Question | |
| Q. 5 | Write short notes on any three:<br>a) Based on Unit No. I<br>b) Based on Unit No. II<br>c) Based on Unit No. III<br>d) Based on Unit No. IV | (15) |

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स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ
नांदेड– ४३१६०६ (महाराष्ट्र)
SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY
NANDED-431606, MAHARASHTRA STATE, INDIA.
Established on 17th September 1994 - Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

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# परिपत्रक

सर्व संबधितांना या परिपत्रकान्वये कळविण्यात येते की, प्रस्तुत विद्यापीठाच्या विज्ञान विद्याशाखेंतर्गत M.Sc. Zoology द्वितीय वर्ष अभ्यासक्रमातील Laboratory Course मध्ये खालीलप्रमाणे दुरुस्ती करण्यात येऊन शैक्षणिक वर्ष २०१५—१६ पासून लागू करण्यास मा. कुलगुरूंनी मा. विद्या परिषदेच्या वतीने मान्यता प्रदान करण्यात आली आहे.

**Laboratory Course Work for M.Sc. Zoology Second Year Annual Pattern**

| Paper Number & Title | Credits (Marks) | | |
|---|---|---|---|
| | **External: ESE** | **Internal: CA** | **Total Credits (Marks)** |
| Laboratory Course Work-V:<br>Based on theory paper- XI & XII<br>(XI-Vertebrate: Structure and Function;<br>XII-Molecular Cell Biology ) | Credit:03<br>(Marks:75) | Credit:01<br>(Marks:25) | Credit:04<br>(Marks:100) |
| Laboratory Course Work-VI:<br>Based on theory paper-XVI &XVII<br>(LC XVI – Genetics and Genetic Engineering;<br>LC XVII – Endocrinology) | Credit:03<br>(Marks:75) | Credit:01<br>(Marks:25) | Credit:04<br>(Marks:100) |
| * Laboratory Course Work-VII:<br>Based on theory paper-<br>XIII, XIV, XVIII & XIX (A/B/C/D) | Credit:03<br>(Marks:75) | Credit:01<br>(Marks:25) | Credit:04<br>(Marks:100) |
| * Laboratory Course Work-VIII:<br>Project Work | Credit:03<br>(Marks:75) | Credit:01<br>(Marks:25) | Credit:04<br>(Marks:100) |
| Total | Credit:12<br>(Marks:300) | Credit:04<br>(Marks:100) | Credit:16<br>(Marks:400) |

(ESE: End of Semester examination, CA: Continuous Assessment, *: Elective Paper)

तरी सदरील बाब सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

''ज्ञानतीर्थ'' परिसर )(
विष्णुपूरी, नांदेड. )(
जा.क्र.शैक्षणिक/०१/अभ्यासक्रम/ )( स्वा/—
/२०१५—२०१६/४६१७ )( **संचालक**
दिनांक : १४/०३/२०१६ )( महाविद्यालय व विद्यापीठ विकास मंडळ

**प्रत माहिती व पुढील कार्यवाहीस्तव :**

१) प्राचार्य, सर्व संबंधित महाविद्यालये, प्रस्तुत विद्यापीठ.
२) परीक्षा नियंत्रक, प्रस्तुत विद्यापीठ.
३) कुलसचिव, (निवडणूक व सभा कक्ष) यांचे कार्यालय, प्रस्तुत विद्यापीठ.
४) उपकुलसचिव, पदव्युत्तर विभाग व पात्रता विभाग, प्रस्तुत विद्यापीठ.
५) सिस्टीम एक्सपर्ट, प्रस्तुत विद्यापीठ. (सदरील परिपत्रक विद्यापीठाच्या संकेतस्थळावर प्रसारित करावे.)