Swami Ramanand Teerth Marathwada University, Nanded.

B.Sc. Second Year
Zoology

Choice Based Credit System (CBCS) Course Structure
Semester Pattern Syllabus
w.e.f. June 2017

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure

Faculty of Science

B. Sc. Second Year Syllabus

Semester Pattern effective from June 2017

Subject: Zoology

Semester	Course No.	Name of the Course	Instructions Hrs/ Week	Total Periods	Marks for		Total Marks	Credits
					Internal (CA)	External (ESE)		
III	CCZ III (Section A)	Genetics (P-VI)	03	45	10	40	50	02
	CCZ III (Section B)	Comparative Anatomy and Physiology (P-VII)	03	45	10	40	50	02
	CCZP II [CCZ III & IV (Section A)]	Practical's based on P-VI & P-VIII (P-X)	03 03	Practical's 10 10	05 05	20 20	25 25	01 01
	SECZ I	SEC I (Anyone Skill from optional)	02	02 + 01 = 03	25 (15 + 10)	25 (10+10+ 05)	50	(02)*
IV	CCZ IV (Section A)	Genetic Engineering and Evolution (P-VIII)	03	45	10	40	50	02
	CCZ IV (Section B)	Endocrinology, Histology and Biochemistry (P-IX)	03	45	10	40	50	02
	CCZP III [CCZ III & IV (Section B)]	Practical's based on P-VII & P-IX (P-XI)	03 03	Practical's 10 10	05 05	20 20	25 25	01 01
	SECZ II	SEC II (Anyone Skill from optional)	02	02 + 01 = 03	25 (15 + 10)	25 (10+10+ 05)	50	(02)*
Total Marks and Credits Semester III and IV					**110**	**290**	**400**	**12(04)***

(**CCZ-** Core Course Zoology**; CCZP**- Core Course Zoology Practical; **CA**- Continuous Assessment; **ESE** – End of Semester Examination; **SECZ**- Skill Enhancement Course Zoology)

SEC **CA - 25 :** Seminar – 15 & Test – 10

ESE - 25 : Report Submission – 10; Presentation – 10 & Overall Skill Judgment – 05

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. Second Year (Semester- III)

Semester Pattern effective from June -2017

Zoology

CCZ III (Section A)

GENETICS (P-VI)

Credits: 02 (Marks: 50) Periods: 45

Unit – I **11**

1) Introduction to Genetics

2) Mendelism

i) Mendel's Laws of inheritance

ii) Monohybrid, dihybrid cross and ratio.

iii) Incomplete dominance.

iv) Back cross and test cross.

3) Interaction of genes

i) Complementary factor (9:7)

ii) Supplementary factor (9:3:4)

iii) Inhibitory factor (13:3)

iv) Duplicate genes (15:1)

v) Lethal genes (1:2:1)

Unit – II **11**

1) Multiple Alleles and Genes

i) Inheritance of ABO Blood groups in Man.

ii) Rh factor and Erythroblastosis foetalis in man.

iii) Multiple genes – skin pigmentation in man.

2) Linkage and Crossing over

i) Linkage – definition, types and significance

ii) Crossing over –

a) Mechanism of crossing over,

b) Factor affecting crossing over,

c) Significance of crossing over.

Unit – III **12**

1) Sex determination

i) Chromosomal methods of sex determination.

ii) Bridge's ratio theory of genic balance.

2) Sex linked inheritance

i) Sex linked inheritance in Drosophila.

ii) Sex linked inheritance in man – colourblindness, haemophilia, Hypertrichosis

3) Cytoplasmic Inheritance-Ex. Kappa Particles (Paramecium)

4) Mutation

i) Chromosomal mutations – Structural alterations & Numerical alteration (Polyploidy).
ii) Gene mutations – Sickle Cell Anaemia.
iii) Mutagenic agents.

Unit – IV **11**

1) Human Genetics

i) Syndromes – *Turner, Klinefelter, Down, Cat – Cry, patus.*
ii) Inborn errors of metabolism – Phenylketonuria (PKU), Alkaptonura, Albinism.
iii) Human pedigree analysis with symbols.

2) Nature and functions of genetic materials.

i) DNA – structure, functions and replications
ii) RNA – Structure, types and functions.
iii) Genetic code

REFERENCES BOOKS

1. Genetics – P.K. Gupta (Rastogi Pub. Meerut)
2. Genetics – Verma P.S. and Agarwal V.K. (S. Chand Publications, Delhi.)
3. Cytology, Genetics and Evolution – P.K. Gupta (Rastogi Publications, Delhi)
4. Elementary Genetics – Single tone
5. Genetics – Winchester (Oxford LBH Publications)
6. Concepts of Genetics – W.S. Clug (Pearson Education ISBN)
7. Genetics – Strickberger (Prentice – Hall)
8. Principle of Genetics – R.H. Tamarin (Tata Mc Graw Hill Publications India)
9. Concepts of Genetics – R. L. Kotpal (Rastogi Publications)
10. Foundations of Genetics – Pai A.C. (Mc Graw Hill Publications)
11. Molecular Genetics – Gunther, S. Stent, (Macmillon)
12. Principles of Genetics – Sinnott, Dunn and Dobzansky (Tata McGraw Hill Pub. Delhi).
13. Genetic – Sarin C. (Tata McGraw Hill Publications, Delhi)
14. Text Book of Genetics – H. S. Bhamrah (Amol Pub. New Delhi.)
15. Genetics – M. P. Arora (Himalaya).
16. Genetic – Veer Bala (Rastogi Publication)
17. Cytology and genetics – Dyansagar V. R. (Tata McGraw Hill Pub. 1992 Reprint)
18. Manual of Practical Zoology – P. K. G. Nair and K. P. Achar (Himalaya Publication)
19. A Textbook of Practical Physiology – V. G. Ranade (P. V. G. Prakashan Pune.)

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. Second Year (Semester- III)

Semester Pattern effective from June -2017

Zoology

CCZ III (Section B)

COMPARATIVE ANATOMY AND PHYSIOLOGY (P-VII)

Credits: 02 (Marks: 50) Periods: 45

Unit –I **11**

1) Comparative Anatomy of Vertebrates

i) Integument
ii) Heart
iii) Kidney

Unit –II **11**

1) Enzymes

i) Nature and Classification of enzymes.
ii) Mechanism of enzyme action.
iii) Factors affecting on enzymes activity.

2) Nutrition

i) Digestion of carbohydrates, proteins and lipids.
ii) Vitamins – Fat soluble and Water soluble vitamins
(Sources, deficiency diseases and effects)

Unit –III **11**

1) Respiration

i) Definition of Aquatic and Aerial respiration.
ii) Respiratory organs in man.
iii) Mechanism of respiration.
iv) Transport of O_2 and CO_2

2) Circulation

i) Blood – composition and functions.
ii) Structure and working of heart.
iii) E.C.G. and Blood Pressure.
iv) Blood clotting.

Unit- IV **12**

1) Excretion

i) Modes of excretion in animals (Ammonotelism,Ureotelism and Uricotelism)
ii) Structure of kidney (V.S.)
iii) Structure of uriniferous tubules.
iv) Physiology of urine formation.
v) Composition of urine.

2) Nerve Physiology

i) Structure and types of neurons.

ii) Structure of synapse.

iii) Conduction of nerve impulse.

3) Muscle Physiology

i) Types of muscles- smooth muscles, skeletal muscles and cardiac muscles.

ii) Ultra structure of skeletal muscles.

REFERENCES BOOKS

(Anatomy)

1. Comparative anatomy of vertebrates – Kent C. G.
2. Outlines of comparative Anatomy of Vertebrates – Kingsley C. G. (Central Book Depot Allahabad)
3. An Introduction of Vertebrates Anatomy – Messers H. M.
4. Comparative Anatomy – Montagna W., John Wiley and Sons Inc.

(Physiology)

1. Manual of Practical Zoology – P. K. G. Nair and K. P. Achar (Himalaya Pub.)
2. Eckert R. Animal Physiology (W. H. Freeman)
3. A Textbook of Animal Physiology – K. A. Goel and K. V. Shastri (Rastogi Pub.)
4. A Textbook of Practical Physiology – V.G. Ranade (P. V. G. Prakashan Pune.)
5. Animal Physiology – A. Maria Kyttikan and N. Armugam (Saras Pub.)
6. Biochemistry – Arumugam et.al, (Saras Pub.)
7. Clinical Pathology and Haematology – Nanda Baheti (Kanhaiya Pub.)
8. Comparative Animal Physiology - C. Ladd Prosser.
9. Experimental Physiology – S. C. Rastogi (Wiley Eastern Ltd. London)
10. Human Physiology - Vander A. J., Sherman J. H. and Luciano D. S. (Mc Graw Hill London)
11. Medical Laboratory Techniques – Ramni Sood (Jaypee Brothers medical Pub. Pvt. Ltd. New Delhi).
12. Principles of Anatomy and Physiology – Tortora G. H. and Grabowasky S. R. (Harper Collins College Publication)
13. Text book of Animal Physiology – A. K. Berry (Emkay Publications, Delhi)
14. Principles of Animal Physiology – D. W. Wood
15. Physiology – Guyton and Hall

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. Second Year (Semester- IV)

Semester Pattern effective from June -2017

Zoology

CCZ IV (Section A)

GENETIC ENGINEERING AND EVOLUTION

(P-VIII)

Credits: 02 (Marks: 50) Periods: 45

UNIT - I **12**

1) Introduction of Genetic Engineering

2) Recombinant DNA Technology

i) Tools: - A) Enzymes: - a) Lysing b) Ligases c) Nucleases (Exonucleases, Endonucleases, Restriction Endonucleases) d) Synthetases (DNA polymerase, Reverse transcriptase)

B) Vectors: - Cloning vectors

(Plasmid -psBR322, Bacteriophage-Lambda phage, Virus-SV40, Cosmid vectors)

3) Techniques: -

i) Gel-Electrophoresis

ii) PCR (Polymerase Chain Reaction)

iii) Southern, Northern and Western Blotting.

UNIT- II **11**

1) Construction of rDNA

2) c-DNA libraries and Genomic libraries

3) Transgenesis and Transgenic animals (Transgenic cattle, sheep, pig and fish)

4) Cloning and cloned animals (Dolly sheep)

5) DNA fingerprinting.

UNIT- III **11**

1) Concept of Evolution

2) Theories of organic evolution

i) Lamarck's theory

ii) Darwin's theory

iii) Modern synthetic theory-Neo-Darwinism

iv) Hugo De Vries theory

UNIT- IV **11**

1) Evidences of organic evolution

a) Anatomical b) Embryological

c) Paleontological d) Biochemical

2) Adaptations:-Aquatic, Terrestrial, Fossorial, Volant and Desert.

3) Hardy-Weinberg's law

REFERENCES BOOKS

1. Genetics – P.K. Gupta (Rastogi Pub. Meerut)
2. Genetics – Verma P.S. and Agarwal V.K. (S. Chand Pub. Delhi.)
3. Cytology, Genetics and Evolution – P.K. Gupta (Rastogi Pub. Delhi)
4. Elementary Genetics – Single tone
5. Genetics – Winchester (Oxford LBH Pub.)
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 Pub. India)
10. Concepts of Genetics – R. L. Kotpal (Rastogi Pub.)
11. Genetics and Genetic Engineering – Dr. R.P. Meyyan (Saras Pub.)
12. Foundations of Genetics – Pai A.C. (Mc Graw Hill Pub.)
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 Pub. Delhi)
16. Organic Evolution – M.P. Arora (Himalaya Pub. House)
17. Evolution – M.W. Strickberger (CB Publishers)
18. Organic Evolution – N. Armugam (Saras Pub.)
19. Principles of Gene Manipulation and Introduction of Genetic Engineering R. W. Old and S. B. Primerose.
20. Text Book of Genetics – H. S. Bhamrah (Amol Pub. New Delhi.)
21. Genetics – M. P. Arora (Himalaya).
22. Genetics and Evolution – N. Armugam (Saras Pub.)
23. Genetic – Veer Bala (Rastogi Pub.)
24. Evolution – Moody
25. Evolution – Gopalkrishnan
26. Cytology and genetics – Dyansagar V. R. (Tata McGraw Hill Pub. 1992 Reprint)
27. Organic evolution – Harjendra Singh and C. M. Chaturvedi (Amul Pub.)
28. Manual of Practical Zoology – P. K. G. Nair and K. P. Achar (Himalaya Pub.)

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. Second Year (Semester- IV)

Semester Pattern effective from June -2017

Zoology

CCZ IV (Section B)

ENDOCRINOLOGY, HISTOLOGY AND BIOCHEMISTRY (P-IX)

Credits: 02 (Marks: 50) Periods: 45

Unit – I **11**

1) Endocrinology

i) Pituitary gland
ii) Thyroid gland
iii) Adrenal gland
iv) Islet's of Langerhans (Pancreas)
v) Menstrual Cycle.

Unit – II **12**

1) Histology of mammalian organs and tissues.

i) Stomach ii) Intestine iii) Pancreas iv) Liver v) Kidney vi) Testes vii) Ovary.

Unit – III **11**

1) Carbohydrate metabolism:

i) Glycogenesis, Glycogenolysis and Gluconeogenesis
ii) Glycolysis
iii) Krebs's cycle

Unit – IV **11**

1) Protein metabolism :

i) Deamination and Transamination
ii) Ornithine cycle.

2) Lipid metabolism :

i) B-Oxidation
ii) Ketosis, Ketogenesis and Ketolysis.

REFERENCES BOOKS

(Endocrinology)

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, NewYork, 1991.

(Histology)

1. Bailey's Textbook of Histology – Williams and Wilkins (Baltmore and Scientific Book Agency, Culcutta Copenhaver W. M.).
2. Text book of Histology – Bloom W. and Fawcett D. W.
3. Histology of Mammals – Athavale M. V. and latey A. N.
4. Histology – Lippinocott, Han A. W.
5. Human Histology – Leslie Brainerd Arey (Khosla Pub. House, Delhi)

(Biochemistry)

1. Tools of Biochemistry – T. G. Cooper.
2. Biochemistry – C. B. Power (Himalaya Pub.)
3. Outline of Biochemistry – Conn. E.E. and Stumpf P. V.
4. Biochemistry – Leninger A. L.
5. Biochemistry – Das.
6. Textbook of Biochemistry – Rao K. R.
7. Textbook of Biochemistry West E. S., Todd W. R. Mason H. S. and VanBruggen J. T.

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. Second Year Semester Pattern effective from June - 2017

ZOOLOGY

PRACTICAL PAPER NO. - X

Based on P-VI & P-VIII

Genetics, Genetic Engineering and Evolution

Practical Paper: CCZP II [Based on CCZ III & CCZ IV (Section A)]

Credits: 02 Marks: 50

1. Problems based on Monohybrid and Dihyrid cross.
2. Problems based on interaction of genes (Complementary, Supplementary, Inhibitory Duplicate factors)
3. Problems based on blood group inheritance in man.
4. Problems based on sex linked inheritance.
5. Culture of Drosophila and its observation of genetic characters likes eyes and wings.
6. Preparation of temporary slides of salivary gland chromosomes from chironomous larva .
7. Study of permanent slide of sickle cell anaemia.
8. Study of chromosomal abnormalities in man with the help of photographs/charts and Karyotypes
   a) Down's syndrome
   b) Klinfelter's syndrome
   c) Turner's syndrome
9. Human pedigree analysis- various symbols used.
10. Estimation of DNA by Diphenyl amine (DPA method)
11. Study of human genetic traits (Rolling tongue, Length of index and ring finger, ear lobes) by using Hardy Weinberg's principle.
12. Calculation of frequencies of recessive and dominant gene in a population by using Hardy Weinberg Principle.
13. Calculation of heterozygote and homozygote in population by using Hardy Weinberg's principle.
14. Study of evidences by using photograph/charts and models
    a) Analogous and Homologous organs
    b) Connecting link (Peripatus and Archaeopteryx)
    c) Embryological evidences
15. Study of adaptations (Museum Specimens).

Note: Demonstration of animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C Guidelines.

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. Second Year Semester Pattern effective from June - 2017

ZOOLOGY

PRACTICAL QUESTION PAPER PATTERN - X

Based on P-VI & P-VIII

Genetics, Genetic Engineering and Evolution

Practical Paper: CCZP II [Based on CCZ III & CCZ IV (Section A)]

Credits: 02 (Marks: 50) Time: 04 Hrs

Q.1)	Solve one problem from monohybrid cross and one problem from dihybrid cross.	(05)
Q.2)	Solve one problem based on blood group inheritance.	(05)
	OR	
	Solve any one problem based on sex-linked inheritance.	
Q.3)	Solve any two problems on Interaction of genes. (Complementary, Supplementary, Inhibitory Factors, Duplicate genes.)	(10)
Q.4)	Identification of human syndromes (any two)	(05)
	OR	
	Preparation of temporary mount of salivary gland chromosomes of chironomous larvae.	
	OR	
	Observation of genetic characters of Drosophila.	
Q.5)	Identify and Comments on as per instructions. a) Humans pedigree analysis (Any five symbols) b) Sickle cell anaemia –slide/photograph/ charts.	(05)
	OR	
	Problems based on Hardy- Weinberg Principle for the calculation of …….	
	OR	
	Estimation of DNA by DPA Method.	
Q.6)	Identify and comments on as per the instructions. a) Adaptations (any two) Aquatic, Terrestrial, Aerial/ Volant, Fossorial, Desert b) Evidence (any two) Analogous and Homologous organs, Connecting links, Embryological evidence	(10)
Q.7)	Submission of Record Book and Viva- Voce	(10)

Note: Demonstration of animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C Guidelines.

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. Second Year Semester Pattern effective from June - 2017

ZOOLOGY

PRACTICAL PAPER NO. - XI

Based on P-VII & P-IX

Comparative Anatomy and Physiology

Endocrinology, Histology and Biochemistry

Practical Paper: CCZP III [Based on CCZ III & CCZ IV (Section B)]

Credits: 02 Marks: 50

1) Qualitative detection of digestive enzymes (Protease, Amylase and Lipase) in cockroach.
2) Detection of human salivary amylase.
3) Estimation of oxygen consumption in fish or any other suitable aquatic animal.
4) R.B.C. counting.
5) W.B.C. counting.
6) Estimation of Haemoglobin.
7) Detection of blood groups.
8) Measurement of B.P. by using B.P. apparatus (Demonstration only).
9) Qualitative detection of nitrogenous waste products (Ammonia, Urea, Uric acid) in bird's excreta and urine of Mammals.
10) Preparation of Haematin crystals.
11) Temporary preparation of squamous epithelium, ciliated epithelium, skeletal muscle fiber and blood smear.
12) Study of histological structure of following organs – stomach, intestine, pancreas, liver, kidney, testis, ovary, thyroid and pituitary.
13) Structure of synapse, structure of neurons (slide/chart)
14) Types of nerve cells - Unipolar, Biopolar, Multipolar (Slides)
15) Location of endocrine glands through charts or models.
16) Preparation of block.
17) Compulsory educational excursion tour to visit various zoological important centers.

Note: Demonstration of animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C Guidelines.

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. Second Year Semester Pattern effective from June - 2017

ZOOLOGY

PRACTICAL QUESTION PAPER PATTERN - XI

Based on P-VII & P-IX

Comparative Anatomy and Physiology

Endocrinology, Histology and Biochemistry

Practical Paper: CCZP III [Based on CCZ III & CCZ IV (Section B)]

Credits: 02 (Marks: 50) Time: 04 Hrs

Q.1)	Qualitative detection of digestive enzymes (Protease, Amylase and Lipase) in Cockroach	(10)
	OR	
	Detection of human salivary amylase	
Q.2)	Estimation of O_2 consumption in fish or any suitable aquatic animal	(10)
	OR	
	Detect any two nitrogenous waste products.	
Q.3)	Estimate the haemoglobin percentage in a given sample of blood	(05)
	OR	
	Measurement of blood pressure in Man	
Q.4)	Counting of R.B.C. / W.B.C. in blood sample provided	(05)
	OR	
	Prepare haematin crystals from blood sample provided	
	OR	
	Detection of blood groups from given sample	
Q.5)	Identify any two endocrine glands in charts/ models provided	(05)
	OR	
	Preparation of block from given tissue	
Q.6)	Identify and describe the two histological slides	(05)
Q.7)	Viva-voce, and excursion report	(05)
Q.8)	Record book	(05)

Note: Demonstration of animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C Guidelines.

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. Second Year Semester Pattern effective from June - 2017

Skill Enhancement Course (SEC)

ZOOLOGY

Silent Features of the Skill

Zoology is the study of animal biology in all its aspects, from cells to population and from neurons to behavior. Zoology skill courses provide you with specific scientific recent knowledge. The course will help to asses prior basic knowledge of zoology at UG level and will refresh the applied zoology to prepare students for a carrier as a zoologist or researchers. The main aim of the skill based course is to train the students in a wide range of zoological science based skills that provide the learning base of future carriers in discipline such as health science, publishing, teaching, research and management.

Utility : At the end of course, student should be –

1. Able to analyze, study and report on material learned.
2. Able to assess the scope of animal biology and select appropriate area for further study.
3. Able to integrate related topic from separate parts of the course.

Learning Objectives :

1. The subject aims to provide a broad multidisciplinary course in zoology.
2. To promote training in practical and conceptual skills in biology.
3. To improve students for global competition and their chances of employment.
4. To equip students with adequate practical knowledge that will enable them be self reliant and captain of biomedical, agro-aqua cultural, environmental and human development industries.
5. To equip students with adequate research techniques that will enable them towards the perfection for national and global economics.

Prerequisites :

1. General Biology
2. Cell Biology
3. Genetics
4. Physiology
5. Ecology
6. Computer Knowledge.

Swami Ramanand Teerth Marathwada University, Nanded

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science

B.Sc. Second Year, Semester – III
SEC – I : Skills for 02 Credits
w. e. f. Academic Year June 2017
(02 Periods, 01 Theory Per week: Max. Marks : 50)

PROPOSED SKILLS IN ZOOLOGY FOR B.SC. II YEAR SEMESTER - III

Skill Enhancement Course

SECZ – I (A) : HAEMATOLOGY

UNIT – I

1. Introduction - Definition, Components, Cells – Structure and Functions of cells, Lymph.
   - Collection of Blood- Collection of capillary blood by skin puncture, Collection of blood by Venipuncture, Collection of arterial blood, Criteria for sample collection.

- Practical – Collection of blood by Venipuncture and arterial blood.

UNIT – II

2. Anticoagulants - Definition, Action of E. D. T. A., Oxalates, double oxalates, fluorides, acid citrate, detxtrose-trisodium citrate, heparin.
   - Effect of anticoagulants on blood cell morphology.
3. Haemoglobin - Normal structure and various haemoglobin, Determination of haemoglobin by various methods.
   - Anaemia.

- Practical – Determination of haemoglobin from given blood sample, Clotting and bleeding time of blood.

UNIT – III

4. Study of Blood Cell Count - Total WBC Count, Total RBC Count, Platelets Count, Absolute Eosinophil Count, Reticulocyte Count.

- Practical – Determination of Total Count of RBC, WBC.

UNIT – IV

5. Study of Blood Smear for differential WBC Count - Preparation and Staining of smears, Counting Methods, Morphology of White cells, Types of White Cells, Abnormalities in morphology of blood cells and related diseases.

- Practical – Determination of differential WBC Count by blood Smear.

REFERENCE BOOKS:

1. Medical Laboratory Technology - Ramnik Sood
2. Medical Lab Technology Vol. I, II & III – Kanai Mukherjee
3. Hand Book of Medical Technology - Mrs. Chitra
4. Medical Laboratory Technology – A. Ananthanarayan
5. Manual for Laboratory Technician of Primary Health by Minister of Health
6. Human Physiology Vol. I & II – C. C. Chatterjee

Swami Ramanand Teerth Marathwada University, Nanded

CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER PATTERN
Faculty of Science
B.Sc. Second Year, Semester – III
SEC – I : Skills for 02 Credits
w. e. f. Academic Year June 2017
(02 Periods, 01 Theory Per week: Max. Marks : 50)

PROPOSED SKILLS IN ZOOLOGY FOR B.SC. II YEAR SEMESTER - III

Skill Enhancement Course
SECZ – I (B) : URINOLOGY

UNIT - I

1. Definition, Structure and Functions of Urinary System, Physiology of Mechanism of Urine formation.

UNIT - II

2. Constituents and composition of Urine
   i) Normal constituents and abnormal constituents of Urine- i) Qualitative tests for sugar, albumin, ketone bodies, bile salts and bile pigments.

- Practical – Study of normal and abnormal constituents of Urine.

UNIT - III

3. Renal Function Tests
   i. Definition, importance of tests like urea, creatinine, uric acid, proteins
   ii. Importance of Dialysis

- Practical- Biochemical Qualitative and Quantitative tests for urine.

UNIT - IV

4. Collection and preservation of Urine Sample
   i. Physical and Chemical Examinations of abnormal constituents.
   ii. Microscopic Examination of urine
   iii. Preparation of Urine Report
   iv. Urinometer.

- Practical- Study of Microscopic Examination of urine.

REFERENCE BOOKS

7. Medical Laboratory Technology - Ramnik Sood
8. Medical Lab Technology Vol. I, II & III – Kanai Mukherjee
9. Hand Book of Medical Technology- Mrs. Chitra
10. Medical Laboratory Technology – A. Ananthanarayan
11. Manual for Laboratory Techniian of Primary Health by Minister of Health
12. Human Physiology Vol. I & II – C. C. Chatterjee

Swami Ramanand Teerth Marathwada University, Nanded

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science

B.Sc. Second Year, Semester – IV
SECZ – II : Skills for 02 Credits
w. e. f. Academic Year June 2017
(02 Periods, 01 Theory Per week: Max. Marks : 50)

PROPOSED SKILLS IN ZOOLOGY FOR B.SC. II YEAR SEMESTER - IV

Skill Enhancement Course

SEC – II (C) : HISTOTECHNOLOGY

UNIT - I

1. Introduction – Definition of Histotechnology
2. Methods of examination of tissues and cells, Collection and labeling of specimens, Methods of preparation and examination of tissues (fresh and fixed tissue)

UNIT - II

3. Fixation of tissue - Definition, Criteria for an ideal fixative, types (Simple and Compound), Properties of Simple and Compounds fixatives (Microanatomical, cytological and histochemical)

- Practical – Isolation and collection of tissue, fixing and block preparation.

UNIT - III

4. Tissue processing - Manual and automatic tissue processing, Different embedding media, Steps of tissue processing (Dehydration, Clearing, Impregnation).
5. Embedding- Methods of Embedding, Embedding medium, names of medium and moulds, Automatic Tissue Processes (Structure and Working, Advantages and Disadvantages).

- Practical – Tissue processing of prepared blocks.

UNIT - IV

6. Section Cutting - Types of Microtome, Rotary Microtome -Parts and their functions, Microtome Knives- Types, Care and Maintenance Techniques of sharpening; Technique of Section Cutting, Preparation of Adhesive Mixture, Mounting.
7. Staining - Definition and Significance of Staining, Stain and Staining Types, Theory of Staining, Methods of Staining.

- Practical – Section Cutting, fixing, alcohol grading, staining and preparation of permanent slide.

REFERENCE BOOKS:

1. Histochemical Techniques – J. D. Bancrot.
2. Handbook of Histopathological and Histochemical Techniques - C.F.A. Culling.
3. Histological and Histochemical Methods 4th Edition – John Kiernan.

Swami Ramanand Teerth Marathwada University, Nanded

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science

B.Sc. Second Year, Semester – IV
SECZ – II : Skills for 02 Credits
w. e. f. Academic Year June 2017
(02 Periods, 01 Theory Per week: Max. Marks : 50)

PROPOSED SKILLS IN ZOOLOGY FOR B.SC. II YEAR SEMESTER - IV

Skill Enhancement Course

SEC – II (D) : APICULTURE

UNIT – I : BIOLOGY OF BEES

1. History, Classification and Biology of Honeybees.
2. Social Organization of Honey bees.

UNIT – II : REARING OF HONEY BEES

3. Artificial Bee Rearing (Apiary), Believes – Newton and Langstroth, Bee Pasturage, Selection of Bee Species for apiculture, Bee keeping equipment, Methods of extraction of honey (Indigenous and Modern).

- Practical - Visit to the Apiculture centers, Collect practical information of artificial Bee Hives and its mechanism.

UNIT – III : DISEASES AND ENEMIES

4. Bee diseases and enemies, Control and preventive measures.

UNIT – IV : ECONOMY OF BEES AND ENTREPRENEURSHIP

5. Products of Apiculture industry and its uses (Honey, Bee wax, Propolis, Pollen etc.).
6. Bee keeping industry – Recent efforts, Modern methods in employing artificial believes for Cross pollination in horticulture gardens.

- Practical – Collection of natural bee hives, wax, honey etc.

REFERENCE BOOKS:

1. Apiculture - Prost, P. J. (1962), Oxford and IBH, New Delhi.
2. Apiculture - Bisht D. S., ICAR Publications.
3. Bee Keeping in India - Indian Council of Agricultural Research, New Delhi.