

# **Sadakathullah Appa College**

**(Autonomous)**

**(Reaccredited by NAAC at an 'A' Grade. An ISO 9001:2015 Certified  
Institution)**

**Rahmath Nagar, Tirunelveli- 11.  
Tamil Nadu.**

## **DEPARTMENT OF ZOOLOGY**



**CBCS SYLLABUS  
For  
B.Sc. Zoology**

**(Applicable for students admitted in June 2021 and onwards)**



**COURSE Pattern**  
**CBCS Syllabus – B.Sc., ZOOLOGY**  
**(2021-22 onwards)**

| SEM | Part    | P                                     | Title of the paper                                 | S. Code   | H/W | L* | T* | P* | C | Marks |   |   |
|-----|---------|---------------------------------------|--|-----------|-----|----|----|----|---|-------|---|---|
|     |         |                                       |  |           |     |    |    |    |   | I     | E | T |
| I   | I       | I L-I                                 | ,f;fhyj;jkpo;                                      | 21ULTA11  | 6   |    |    |    | 3 |       |   |   |
|     |         |                                       | Grammar and Translation - I                        | 21ULAR11  |     |    |    |    |   |       |   |   |
|     | II      | II L-I                                | Communicative English -I                           | 21ULEN11  | 4   |    |    |    | 4 |       |   |   |
|     | III     | DSC-I                                 | Animal Diversity-I                                 | 21UCZO11  | 4   | 4  |    |    | 4 |       |   |   |
|     | III     | DSC-II                                | Animal Diversity-II                                | 21UCZO12  | 4   | 4  |    |    | 1 |       |   |   |
|     | III     | P-I                                   | Animal Diversity-I& Animal Diversity-II Practicals | 21UCZO1P1 | 2   |    |    | 2  | 3 |       |   |   |
|     | III     | A-I/1                                 | Food Science                                       | 21UAZO11  | 4   | 4  |    |    | 3 |       |   |   |
|     | III     | A-I/1P                                | Food Science Practicals                            | 21UAZO1P1 | 2   |    |    | 2  | 1 |       |   |   |
| IV  | AECC-I  | Value Education I                     | 21USVE1A   | 2         | 2   |    |    |    |   |       |   |   |
|     |         | Value Education II                    | 21USVE1B   |           |     |    |    |    |   |       |   |   |
| II  | I       | I L-II                                | rkaj;jkpo;   | 21ULTA21  | 6   |    |    |    | 3 |       |   |   |
|     |         |                                       | Grammar and Translation - I                        | 21ULAR21  |     |    |    |    |   |       |   |   |
|     | II      | II L-II                               | Communicative English II                           | 21ULEN21  | 6   |    |    |    | 3 |       |   |   |
|     | III     | DSC-III                               | Developmental Biology                              | 21UCZO21  | 4   | 4  |    |    | 4 |       |   |   |
|     | III     | DSC-IV                                | Ecology  | 21UCZO22  | 4   | 4  |    |    | 4 |       |   |   |
|     | III     | P-II                                  | Developmental Biology & Ecology Practicals         | 21UCZO2P1 | 2   |    |    | 2  | 1 |       |   |   |
|     | III     | A-I/2                                 | Applied Nutrition                                  | 21UAZO21  | 4   | 4  |    |    | 3 |       |   |   |
|     | III     | A-I/2P                                | Applied Nutrition Practicals                       | 21UAZO2P1 | 2   |    |    | 2  | 1 |       |   |   |
| IV  | AECC-II | Environmental Studies                 | 21UEVS21   | 2         | 2   |    |    | 2  |   |       |   |   |
| III | I       | I L-III                               | gad;ghl;Lj;jkpo;                                   | 21ULTA31  | 6   |    |    |    | 3 |       |   |   |
|     |         |                                       |  | 21ULAR31  |     |    |    |    |   |       |   |   |
|     | II      | II L-III                              | Communicative English III                          | 21ULEN31  | 6   |    |    |    | 3 |       |   |   |
|     | III     | DSC-V                                 | Cell and Molecular biology                         | 21UCZO31  | 4   | 4  |    |    | 4 |       |   |   |
| III | P-III   | Cell and Molecular biology practicals | 21UCZO3P1  | 2         |     |    | 2  | 1  |   |       |   |   |

|        |                        |              |  |           |   |   |  |   |   |  |  |  |  |
|--------|------------------------|--------------|--|-----------|---|---|--|---|---|--|--|--|--|
|        | III                    | A-II/1       | Plant Diversity & Phytopathology                       | 21UABT31  | 4 | 4 |  |   | 3 |  |  |  |  |
|        | III                    | A-II/1P      | Plant Diversity & Phytopathology Practicals            | 21UABT3P1 | 2 |   |  | 2 | 1 |  |  |  |  |
|        | IV                     | SEC-I        | Nursery And Gardening                                  | 21USIC31  | 2 | 2 |  |   | 2 |  |  |  |  |
|        | IV                     | SEC-II       | (MOOC NPTEL Course)                                    | 21USOC32  | 2 | 2 |  |   | 2 |  |  |  |  |
|        | IV                     | NME-I        | Economic Botany  | 21UNBT31  | 2 | 2 |  |   | 2 |  |  |  |  |
| IV     | I                      | I L-IV       |  | 21ULTA41  | 6 |   |  |   | 3 |  |  |  |  |
|        |                        |              |  | 21ULAR41  |   |   |  |   |   |  |  |  |  |
|        | II                     | II L-IV      |  | 21ULEN41  | 6 |   |  |   | 3 |  |  |  |  |
|        | III                    | DSC-VI       | Biochemistry   | 21UCZO41  | 4 | 4 |  |   | 4 |  |  |  |  |
|        | III                    | P-IV         | Biochemistry practicals                                | 21UCZO4P1 | 2 |   |  | 2 | 1 |  |  |  |  |
|        | III                    | A-II/1       | Plant Anatomy, Physiology And Biotechnology            | 21UABT41  | 4 | 4 |  |   | 3 |  |  |  |  |
|        | III                    | A-II/2P      | Plant Anatomy, Physiology And Biotechnology Practicals | 21UABT4P1 | 2 |   |  | 2 | 1 |  |  |  |  |
|        | IV                     | SEC-III      | Herbal Medicine  | 21USSS41  | 2 | 2 |  |   | 2 |  |  |  |  |
|        | IV                     | SEC-IV       | Diet Therapy   | 21USAN42  | 2 | 2 |  |   | 2 |  |  |  |  |
|        | IV                     | NME-II       | Health And Fitness                                     | 21UNAN41  | 2 | 2 |  |   | 2 |  |  |  |  |
|        | V                      | ECA          |  |           |   |   |  |   | 1 |  |  |  |  |
|        | V                      | SOP          |  |           |   |   |  |   | 1 |  |  |  |  |
| IV     | Filed work/ Internship |              |  |           |   |   |  | 2 |   |  |  |  |  |
| V      | III                    | Core VII     | Animal Physiology                                      | 21UCZO51  | 5 | 5 |  |   | 4 |  |  |  |  |
|        | III                    | Core VIII    | Genetics   | 21UCZO52  | 4 | 4 |  |   | 4 |  |  |  |  |
|        | III                    | Core IX      | Aquaculture  | 21UCZO53  | 4 | 4 |  |   | 4 |  |  |  |  |
|        | III                    | P-V          | Animal Physiology & Genetics practicals                | 21UCZO5P1 | 4 |   |  | 4 | 2 |  |  |  |  |
|        | III                    | P-VI         | Aquaculture practicals                                 | 21UCZO5P2 | 4 |   |  | 4 | 2 |  |  |  |  |
|        | III                    | DSE I- A/B/C | Evolution  | 21UEZO51A | 4 | 4 |  |   | 4 |  |  |  |  |
|        |                        |              | Wildlife Conservation and Management                   | 21UEZO51B |   |   |  |   |   |  |  |  |  |
| Animal |                        |              | 21UEZO51C  |           |   |   |  |   |   |  |  |  |  |

|    |       |                             |  |           |   |   |   |   |   |   |  |  |  |
|----|-------|-----------------------------|--|-----------|---|---|---|---|---|---|--|--|--|
|    |       |                             | Husbandry and its management                             |           |   |   |   |   |   |   |  |  |  |
|    | III   | DSE II-A/B/C                | Fundamentals of Biotechnology                            | 21UEZO52A | 4 | 4 |   | 4 |   |   |  |  |  |
|    |       |                             | Environmental Toxicology                                 | 21UEZO52B |   |   |   |   |   |   |  |  |  |
|    |       |                             | Endocrinology  | 21UEZO52C |   |   |   |   |   |   |  |  |  |
|    | IV    | Library Reading Hour        |  |           | 1 |   | 1 | - |   |   |  |  |  |
| VI | III   | Core X                      | Immunology and Microbiology                              | 21UCZO61  | 4 | 4 |   | 4 |   |   |  |  |  |
|    | III   | Core XI                     | Biostatistics and Computer Application                   | 21UCZO62  | 4 | 4 |   | 4 |   |   |  |  |  |
|    | III   | Core XII                    | Applied Zoology  | 21UCZO63  | 4 | 4 |   | 4 |   |   |  |  |  |
|    | III   | P-VII                       | Immunology and Microbiology & Applied Zoology practicals | 21UCZO6P1 | 4 |   |   | 4 |   | 2 |  |  |  |
|    | III   | P-VIII                      | Biostatistics and Computer Application practicals        | 21UCZO6P2 | 4 |   |   | 4 |   | 2 |  |  |  |
|    | III   | DSE III                     | Applied Biotechnology                                    | 21UEZO61A | 4 | 4 |   | 4 |   |   |  |  |  |
|    |       |                             | Medical Microbiology                                     | 21UEZO61B |   |   |   |   |   |   |  |  |  |
|    |       |                             | Environmental Biotechnology                              | 21UEZO61C |   |   |   |   |   |   |  |  |  |
|    | III   | DSE IV Project              | Core Project   | 21UEZO62  | 4 |   | 4 |   | 4 |   |  |  |  |
| IV | SEC-V | Mushroom Culture Technology | 21USBT61   | 2         | 2 |   |   | 2 |   |   |  |  |  |
|    |       |                             |  |           |   |   |   |   |   |   |  |  |  |

\* L – Lecture hours

\* T – Tutorial hours

\* P – Practical hours

**Department of ZOOLOGY**  
**Programme : B.Sc.**  
**Programme Learning Outcomes**

|            |  |
|------------|--|
| <b>PLO</b> | <b>Upon completion of B.Sc. Degree Programmes, the graduates will be able to:</b>  |
| PLO<br>1   | <b>Disciplinary Knowledge</b><br>Acquire scientific knowledge and the understanding of major concepts and theoretical principles.  |
| PLO<br>2   | <b>Creative Thinking and Practical Skills / Problem Solving Skills</b><br>Enrich skills of observation / research related skills to draw logical inferences from scientific experiments/ programming and skills of creative thinking to develop novel ideas.<br>Hone problem solving skills in theoretical, experimental and computational areas and to apply them in real life situations.  |
| PLO<br>3   | <b>Sense of inquiry and Skilled Communicator</b><br>Develop the capability for raising appropriate questions relating to the current/emerging issues encountered in the scientific field and to plan, execute and express the results of experiments / investigations through technical writings as well as through oral presentations.  |
| PLO<br>4   | <b>Ethical Awareness / Team Work / Environmental Conservation and Sustainability</b><br>Equip them for conducting work as an individual / as a member, or as a leader in diverse teams upholding values such as honesty and precision and thus preventing unethical behaviours such as fabrication, falsification, misrepresentation of data, plagiarism etc. to ensure academic integrity.<br>Realise that environment and humans are dependent on one another and to know about the responsible management of our ecosystem for survival, and for the well-being of the future generation as well. |
| PLO<br>5   | <b>Usage of ICT/ Lifelong Learning / Self-Directed Learning</b><br>Inculcate the habit of learning continuously through the effective adoption of ICT to update knowledge in the emerging areas in Sciences for inventions/discoveries and also to engage in remote / independent learning.  |

### Programme Specific Outcomes

| <b>PSO No.</b> | <b>Upon completion of B.Sc. ZOOLOGY Degree Programme, the students will be able to :</b>   | <b>PLOs Mapped</b> |
|----------------|--|--------------------|
| PSO-1          | Understand the fundamental principles of Zoology which include animal diversity with animal classification, taxonomy and their diagnostic characteristics.   | 1                  |
| PSO-2          | Apply the knowledge to understand the protection and restoration of biological diversity, ecological integrity, health, conservation, management of wildlife and their gene bank.  | 1,4                |
| PSO-3          | Collect, record, analyze and interpret data using appropriate ecological, genetic, and physiological techniques adopted in vivo and in vitro and to express them effectively through written and oral presentations using ICT. | 1,3,4,5            |
| PSO-4          | Analyse the principles, animal development, physiology, genetics animals, their evolution, and to compare the structure of Prokaryotes and Eukaryotes  | 1,4                |
| PSO-5          | Develop creative, practical and problem solving skills to pursue research and gain placements in the fields of Biochemistry, Microbiology, Sericulture, Aquaculture, Apiculture and Biotechnology.                             | 1,2                |

## Semester – I

|                     |                             |
|---------------------|-----------------------------|
| <b>Course Title</b> | <b>ANIMAL DIVERSITY - I</b> |
| <b>Total Hrs</b>    | <b>60</b>                   |
| <b>Hrs/Week</b>     | <b>4</b>                    |
| <b>Sub.Code</b>     | <b>21UCZO11</b>             |
| <b>Course Type</b>  | <b>THEORY</b>               |
| <b>Credits</b>      | <b>4</b>                    |
| <b>Marks</b>        | <b>100</b>                  |

### General Objective:

To understand Morphology, Taxonomy and general characters of Invertebrates

### Course Objectives: The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>  |
|---------------|---|
| CO-1          | List the characters and classification of Phylum Protozoa       |
| CO-2          | Describe the life history of Porifera and Coelenterata          |
| CO-3          | Interpret the pathogenesis of Platyhelminthes and Aschelminthes |
| CO-4          | Distinguish the characters of Annelids and Arthropods           |
| CO-5          | Justify the economic importance of Mollusca                     |

### UNIT I

Introduction to Principles of Taxonomy (Binomial nomenclature), Types of classification-Natural, Artificial, Practical.

**Protozoa:** General characters and classification upto classes with examples.

**Type study:** Paramecium - Morphology – Nutrition – Locomotion – Reproduction - (Binary fission & Conjugation).

**General topic:** General structure, life cycle, pathogenicity and control measures of *Entamoeba histolytica*, *Plasmodium malariae*.

### UNIT II

**Porifera:** General characters and classification upto classes with examples

**Type study:** Scypha (Sycon) - External characters and life history.

**General topic:** Canal system in sponges.

**Coelenterata:** General characters and classification upto classes with examples.

**Type study:** *Obelia geniculata*- External characters and life history.

**General topic:** Coral formation and types of coral reefs.

### UNIT III

**Platyhelminthes:** General characters and classification upto classes with example.

**General topic :** *Taenia solium* –External morphology, life cycle, pathogenicity and control measures.

**Aschelminthes:** General characters and classification upto classes with example

**General topic:** External morphology, life cycle, pathogenicity and control measures of *Ascaris lumbricoides*.

### UNIT IV



**Annelida:** General characters and classification upto classes with examples.

**Type study:** Earthworm – external morphology and reproduction.

**General topic:** Metamerism in Annelids,

**Arthropoda:** General characters and classification upto classes with an example.

**Type study:** Cockroach- Morphology and nervous system.

**General topic:** 1.Economic Importance of Honey Bee. 2. Peripatus and its affinities

#### **UNIT V**

**Mollusca:** General characters and classification upto classes with examples.

**Type study:***Pila globosa* -External characters and life history.

**General topic:** Economic importance of Molluscs. (Oyster and Mussels)

**Echinodermata:** General characters and classification upto classes with examples.

**Type study:** Star fish - External characters and water vascular system only.

**General topic:** Larval forms of Echinodermata.

#### **TEXT BOOKS**

1. Jordon. E.L.and Verma. P. S. 1963 Invertebrate Zoology - S.Chand Publishers.
2. Kotpal, R. L. 2019. Modern Text Book of Zoology – Invertebrates, Rastogi Publications.

#### **REFERENCE BOOKS - INVERTEBRATA**

1. Arora, M. P. 2006. Non – chordates, Himalaya Publishing House.
2. Bhamrah, H.S. *et al.*, 2002- A text Book of Invertebrates –Anmol Publications.
3. Ekambaranatha Iyer .M.A. 1992. Manual of Zoology – Part I - Invertebrata - S.Viswanathan Printers and Publishers.
4. Nair N.C, Murugan. T, Arumugam .2010 -A Text Book of Invertebrates- Saras publications.

#### **Course Outcomes**

| CO No. | Course Outcomes  | PSOs Addressed | Cognitive Level |
|--------|--|----------------|-----------------|
| CO-1   | Recall the general characters and classification of Protozoa   | 1,3            | Remembering     |
| CO-2   | Relate the characters of Porifera and Coelenterata             | 1,2,3          | Understanding   |
| CO-3   | Illustrate the Life cycle of Platyhelminthes and Aschelminthes | 1,3,5          | Applying        |
| CO-4   | Compare and contrast the characters of Annelids and Arthropods | 1,2,3          | Analysing       |
| CO-5   | Assess the Life history of <i>Pila globosa</i> (Mollusca)      | 1,2,3,5        | Evaluating      |

### Relationship Matrix

| Semester              | Course Code  | Title of the Course |       |       |       |                                    | Hours | Credit |       |       |  |
|-----------------------|--|---------------------|-------|-------|-------|------------------------------------|-------|--------|-------|-------|--|
| I                     | 21UCZO11   | Animal diversity -I |       |       |       |                                    | 60    | 4      |       |       |  |
| Course Outcomes (COs) | Programme Learning Outcomes (PLOs)   |                     |       |       |       | Programme Specific Outcomes (PSOs) |       |        |       |       |  |
|                       | PLO 1  | PLO 2               | PLO 3 | PLO 4 | PLO 5 | PSO 1                              | PSO 2 | PSO 3  | PSO 4 | PSO 5 |  |
| CO-1                  | ☐  | ☐                   |       |       | ☐     | ☐                                  |       | ☐      |       |       |  |
| CO-2                  | ☐  | ☐                   |       | ☐     |       | ☐                                  | ☐     | ☐      |       |       |  |
| CO-3                  | ☐  | ☐                   |       |       | ☐     | ☐                                  |       | ☐      |       | ☐     |  |
| CO-4                  | ☐  | ☐                   | ☐     |       | ☐     | ☐                                  | ☐     | ☐      |       |       |  |
| CO-5                  | ☐  |                     | ☐     |       | ☐     | ☐                                  | ☐     | ☐      |       | ☐     |  |
|                       | Number of matches (☐) = ...31....<br>Relationship = Low/Medium/High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                     |       |       |       |                                    |       |        |       |       |  |

Prepared by

Checked by

Dr.S.Peer Mohamed

Signature

Head of the Department

### Semester - I

|              |                                |
|--------------|--------------------------------|
| Course Title | ANIMAL DIVERSITY-II (CHORDATA) |
|--------------|--------------------------------|

|                    |                 |
|--------------------|-----------------|
| <b>Total Hrs</b>   | <b>60</b>       |
| <b>Hrs/Week</b>    | <b>4</b>        |
| <b>Sub.Code</b>    | <b>21UCZO12</b> |
| <b>Course Type</b> | <b>Core</b>     |
| <b>Credits</b>     | <b>4</b>        |
| <b>Marks</b>       | <b>100</b>      |

### General Objective:

To study the structure, functional organization, adaptations and the economic importance of lower and higher chordates

**Course Objectives:** The learner will be able to

| <b>CO</b> | <b>Course Objectives</b>  |
|-----------|---|
| CO-1      | Define the general characters of chordates                            |
| CO-2      | Classify the fresh water and marine fishes                            |
| CO-3      | Sketch amphibians and reptiles  |
| CO-4      | Compare and contrast the flight adaptation of different birds         |
| CO-5      | Distinguish the characteristic features of various species of mammals |

### UNIT I

**Introduction to Chordata:** General characters and classification upto classes with examples.

**Prochordata:** General characters and classification upto orders with examples. **Type Study:** Ascidian – External morphology- Life history

**External features and biological significance of the following Examples** a) Amphioxus b) Balanoglossus

**Agnatha:** Petromyzon – External morphology -Ammocoetes Larva.

### UNIT -II

**Pisces:** General Characters and Classification upto sub-classes with examples **Type Study:** Scoliodon – External characters – Placoid scales – Digestive system .

**General Topics:** (i) Accessory respiratory organs in fishes. (ii) Migration of fishes, (iii) Commercial freshwater Edible fishes (Catla, Rohu, Mrighal and Cat fishes).

### UNIT - III

**Amphibia :** General Characters and Classification upto orders with examples.

**External features and Biological Significance of the following examples** a) Rhachophorus b) Axolotl Larva

**General Topic:** Parental care in Amphibia.

**Reptilia:** General Characters and Classification up to orders with examples.

**External features and Biological significance of the following examples** a) Chamaeleon b) Draco c) Cobra d) Enhydrina

**General Topics:** (i) Identification of poisonous and non-poisonous snakes of South India. (ii) Poison Apparatus – Biting mechanism – Venom – Antivenom – First aid for snake bite

### UNIT IV

**Aves:** General characters and classification upto subclasses with examples.

**Type study:** *Columbalivia* – External characters – Exoskeleton – Flight muscles – Respiratory system

**General Topics:** (i) Migration of Birds, (ii) Flight adaptations in Birds  
(iii) Flightless Birds

#### **UNIT V**

**Mammalia:** General Characters and Classification upto subclasses with examples.

**Type Study:** Rabbit – External Morphology – Dentition – Respiratory System – Circulatory system – Structure of Brain.

**General topic:** (i) Adaptations of aquatic mammals (ii) Egg laying Mammals

#### **TEXT BOOKS**

1. E.L.Jordan and P.S. Verma. 2014. Chordate Zoology. S. Chand & Company Ltd, New Delhi.
2. Kotpal, R. L. 2012. Text book of zoology vertebrates, Global media Publications.

#### **REFERENCE BOOKS**

1. A Text Book Of Zoology Chordata by B.D. Singh (Author) Publisher : KEDAR NATH RAM NATH; 2021st edition (1 January 2020); KEDAR NATH RAM NATH, 132, R.G. College Roads, Meerut-250001 (U.P.)
2. Mohan P. Arora , (2018 ) Chordata – I, Himalaya Publishing House Pvt. Ltd
3. B.N. Pandey ,Vartika Mathur (2018 ) Biology of Chordates PHI Learning
4. Kardong, (2005) K.V. Vertebrates Comparative Anatomy, Function and Evolution. IV Edition. McGrawhill Higher Education.
5. Ekambaranatha Iyer . M. and Anathakrishnan T. N. A Manual of Zoology - Vol. II –Chordata - S. Viswanathan Printers and Publishers Pvt. Ltd. Chennai.

### Course Outcomes

| CO   | Course Outcomes   | PSOs Addressed | Cognitive Level |
|------|---|----------------|-----------------|
| CO-1 | Identify the general characteristics and the classification of Chordates.               | 1,2,3          | Remembering     |
| CO-2 | Relate the respiratory organs in fishes and their adaptation with environment           | 1,2,3,5        | Understanding   |
| CO-3 | Interpret the characters of Amphibians and Reptiles                                     | 1,2,3,5        | Applying        |
| CO-4 | Review the unique characters and functions of aves with reference to their adaptations. | 1,2,3,5        | Evaluating      |
| CO-5 | Compose the classification and characters of Mammals.                                   | 1,2,3,5        | Creating        |

### Relationship Matrix

| Semester              | Course Code  | Title of the Course               |       |       |       |                                    | Hours | Credit |       |       |  |  |
|-----------------------|--|-----------------------------------|-------|-------|-------|------------------------------------|-------|--------|-------|-------|--|--|
| I                     | 21UCZO12   | ANIMAL DIVERSITY-II<br>(CHORDATA) |       |       |       |                                    | 60    | 4      |       |       |  |  |
| Course Outcomes (COs) | Programme Learning Outcomes (PLOs)   |                                   |       |       |       | Programme Specific Outcomes (PSOs) |       |        |       |       |  |  |
|                       | PLO 1  | PLO 2                             | PLO 3 | PLO 4 | PLO 5 | PSO 1                              | PSO 2 | PSO 3  | PSO 4 | PSO 5 |  |  |
| CO-1                  | ☐  |                                   | ☐     |       | ☐     | ☐                                  | ☐     | ☐      |       |       |  |  |
| CO-2                  | ☐  | ☐                                 | ☐     | ☐     |       | ☐                                  | ☐     | ☐      |       | ☐     |  |  |
| CO-3                  | ☐  | ☐                                 | ☐     |       | ☐     | ☐                                  | ☐     | ☐      |       | ☐     |  |  |
| CO-4                  | ☐  | ☐                                 | ☐     |       |       | ☐                                  | ☐     | ☐      |       | ☐     |  |  |
| CO-5                  | ☐  | ☐                                 | ☐     | ☐     |       | ☐                                  | ☐     | ☐      |       | ☐     |  |  |
|                       | Number of matches (☐) = 37- Medium<br>Relationship = High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                                   |       |       |       |                                    |       |        |       |       |  |  |

Prepared by  
Name :Dr. M. I. Zahir Hussain

Checked by  
Head of the Department

## SEMESTER - I

|                     |   |
|---------------------|---|
| <b>Course Title</b> | <b>ANIMAL DIVERSITY I AND II PRACTICALS</b> |
| <b>Total Hrs</b>    | <b>30</b>                                   |
| <b>Hrs/Week</b>     | <b>2</b>                                    |
| <b>Sub.Code</b>     | <b>18UCZO1P1</b>                            |
| <b>Course Type</b>  | <b>Practicals</b>                           |
| <b>Credits</b>      | <b>1</b>                                    |
| <b>Marks</b>        | <b>100</b>                                  |

### General Objective:

To impart knowledge on specific characteristics of invertebrates and chordates.

Course Objectives: The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>   |
|---------------|--|
| CO-1          | Examine the structure of Nervous system and digestive system of a cockroach. |
| CO-2          | Understand the structure of salivary glands and oral system of a cockroach.  |
| CO-3          | Determine the features of different types of scales in fish.                 |
| CO-4          | Compare the nervous system of animals with human beings.                     |
| CO-5          | Create a model regarding the features of poisonous snakes.                   |

### DISSECTION AND MOUNTING

1. Earth worm - Body setae and Penial setae.
2. Cockroach - Nervous system, digestive system, salivary gland and mouth parts.
3. Shark - Placoid scales. Teleost fish - ctenoid and cycloid scales, chick - brain mounting
4. Key for Identification of poisonous and non-poisonous snakes
5. Museum specimens, slides, models and charts:

**Protozoa** –*Amoeba proteus*, *Euglena viridis*, *Paramecium caudatum*;  
**Porifera** –*Sycon ciliatum*, *Leucosolenia cervicornis*; **Coelenterata** - *Obelia sp*, *Physalia sp*, *Aurelia sp*; **Platyhelminthes** - *Taenia solium*, *Fasciola hepatica*; **Aschelminthes** - Male and female *Ascaris lumbricoides*, *Ancylostoma duodenale*; **Annelida**- *Pheretima*, *Nereis*, *Chaetopterus*; **Arthropoda** - *Penaeus monodon*, *Periplaneta americana*, *Bombyx mori*, *Apis indica*; **Mollusca**–*Sepiaglobosa*, octopus, *Pila*;  
**Echinodermata** - *Echinus*, *Cucumaria*, Star fish. **Prochordata**- *Amphioxus*, *Herdmania*, *Balanoglossus*. **Agnatha**-*Tornaria* larva, *Petromyzon*, **Pisces**- *Narcine*, *Scoliodon*, *Anguilla*, **Amphibia**- *Draco*, *Rhacoporus*, **Reptilia**-*Chamaeleon*, *Enhydrina*, *Naja naja*, **Aves**- King Fisher, Pigeon **Mammals**- Bat, *Rabbit*,

An “animal album” containing photographs, cut outs, with appropriate write up about the commonly available animals from different taxa.

Different topics may be given to different sets of students for this purpose.

**Textbooks:** Lab Manual

**Course Outcomes**

| CO No. | Course Outcomes  | PSOs Addressed | Cognitive Level |
|--------|--|----------------|-----------------|
| CO-1   | Classify the structure and functions of Body setae and Penial setae in Earthworms. | 1,2,3          | Understanding   |
| CO-2   | Sketch the brain of chick.   | 1,2,3,4        | Applying        |
| CO-3   | Explain the anatomy of various organ systems of Cockroach.                         | 1,2,3          | Analysing       |
| CO-4   | Experiment the Placoid ,Cycloid and Ctenoid scales.                                | 1,2,3,4        | Evaluating      |
| CO-5   | Infer the features of poisonous and non-poisonous snakes.                          | 1,2,3,5        | Creating        |

**Relationship Matrix**

| Semester   | Course Code                        | Title of the Course                  |        |        |        |                                    | Hours  | Credit |        |       |
|--|------------------------------------|--------------------------------------|--------|--------|--------|------------------------------------|--------|--------|--------|-------|
| I  | 18UCZO1P1                          | ANIMAL DIVERSITY I AND II PRACTICALS |        |        |        |                                    | 30     | 1      |        |       |
| Course Outcomes (COS)                                    | Programme Learning Outcomes (PLOs) |                                      |        |        |        | Programme Specific Outcomes (PSOs) |        |        |        |       |
|  | PLO 1                              | PLO 2                                | PL 0 3 | PL 0 4 | PL 0 5 | PS 0 1                             | PS 0 2 | PS 0 3 | PS 0 4 | PSO 5 |
| CO-1   | ☐                                  | ☐                                    |        |        | ☐      | ☐                                  | ☐      | ☐      |        |       |
| CO-2   | ☐                                  | ☐                                    |        |        | ☐      | ☐                                  | ☐      | ☐      | ☐      |       |
| CO-3   | ☐                                  | ☐                                    |        |        | ☐      | ☐                                  | ☐      | ☐      |        |       |
| CO-4   | ☐                                  | ☐                                    |        |        | ☐      | ☐                                  | ☐      | ☐      | ☐      |       |
| CO-5   | ☐                                  | ☐                                    |        |        | ☐      | ☐                                  | ☐      | ☐      |        | ☐     |
| Number of matches (☐) = ...33....<br>Relationship = High |                                    |                                      |        |        |        |                                    |        |        |        |       |

Prepared by

Checked by.

Dr.S.Mohamed Ramlath Sabura

Head of the Department

## Semester – I

|              |                     |
|--------------|---------------------|
| Course Title | <b>FOOD SCIENCE</b> |
| Total Hrs    | 60                  |
| Hrs/Week     | 4                   |
| Subject Code | 21UAAN11            |
| Course Type  | Allied              |
| Credits      | 3                   |
| Marks        | 100                 |

### General Objective:

This course covers the importance of food groups, nutritional value and their preparation.

**Course Objectives:** The learners will be able to....

| CO.  | Course Objectives                                  |
|------|--|
| CO-1 | Observe the vital link between food and nutrients. |
| CO-2 | Employ different methods of cooking                |
| CO-3 | Compare the nutritive values of nuts               |
| CO-4 | Evaluate the nutritive value of vegetables         |
| CO-5 | Develop innovative methods to discover adulterants |

### UNIT I - INTRODUCTION TO FOOD SCIENCE

Human health: Definition, food and nutrition- Classification of food according to functions, Food groups: Basic IV, V-Food pyramid.

Preliminary preparation of food, Different methods of cooking and their influence on nutrient retention.

### UNIT II - CEREALS AND PULSES

Cereals and millets – Structure of wheat and nutritive value of rice, wheat and ragi; Parboiling of rice – Advantages.

Pulses, – Nutritive value–Germination of pulses and its advantages; Factors influencing cooking quality of pulses.



### **UNIT III FATS AND OIL**

Nuts and oil seeds – Nutritive value of groundnuts, soybeans, sesame, coconut.

Kinds of fats and oils- Mustard oil, sunflower oil, Safflower oil and its importance.

Stages of sugar cookery.

### **UNIT IV- PLANT FOODS**

Vegetables –Classification, Nutritive value, pigments in vegetables and changes during cooking. Fruits – Classification, nutritive value and browning reaction - Types of beverages.

### **UNIT V - ANIMAL FOODS**

Milk – Nutritive value- different types of milk and milk products.

Egg – Structure and nutritive value –uses of egg in cookery.

Flesh foods- Nutritive value – methods of selection of fish, poultry, and meat.

Food Adulteration –common food adulterants and its harmful effects.

### **TEXT BOOK**

B. Srilakshmi., Food Science, 7<sup>th</sup> Edition, 2018, New age International (P) limited publishers.

### **REFERENCE BOOKS:**

1. Dr.M. Swaminathan, Advanced Text – Book on Food & Nutrition, Bappco, Bangalore. 1985
2. N. Shakuntala Manay, M. Shadaksharaswamy, Foods Facts and principles, New age International (p) Ltd., Publishers Second Edition, 2001
3. Food Science, Potter, AVI publishing Company, New York, USA-1992.

### **Course Outcomes**

| <b>CO.</b> | <b>Course Outcomes</b>   | <b>PSOs Addressed</b> | <b>Cognitive level</b> |
|------------|--|-----------------------|------------------------|
| CO-1       | Summarize the basics of food science and its classification.       | 1,2,5                 | Understanding          |
| CO-2       | Experiment the processing techniques of cereals and pulses.        | 1,3,5                 | Applying               |
| CO-3       | Categorize the different types of oil and its influence on health. | 1,4,5                 | Analyzing              |
| CO-        | Assess the loss of nutrients during                                | 1,2,3,5               | Evaluating             |

|      |   |         |          |
|------|---|---------|----------|
| 4    | cooking of vegetables and fruits .                                |         | g        |
| CO-5 | Adapt innovative technologies in the production of milk products. | 1,2,4,5 | Creating |

### Relationship Matrix

| Semester  | Course Code                        | Title of the Course |        |        |        |                                    | Hours  | Credit |        |        |  |  |
|---|------------------------------------|---------------------|--------|--------|--------|------------------------------------|--------|--------|--------|--------|--|--|
| I   | 21UAAN11                           | FOOD SCIENCE        |        |        |        |                                    | 60     | 3      |        |        |  |  |
| Course Outcomes (COs)   | Programme Learning Outcomes (PLOs) |                     |        |        |        | Programme Specific Outcomes (PSOs) |        |        |        |        |  |  |
|   | PL O 1                             | PLO 2               | PL O 3 | PL O 4 | PL O 5 | PS O 1                             | PS O 2 | PS O 3 | PS O 4 | PS O 5 |  |  |
| CO-1  | ☐                                  | ☐                   | ☐      | ☐      |        | ✓                                  | ✓      |        |        | ✓      |  |  |
| CO-2  | ☐                                  | ☐                   | ☐      | ☐      |        | ✓                                  |        | ☐      |        | ✓      |  |  |
| CO-3  | ☐                                  | ☐                   | ☐      | ☐      |        | ✓                                  |        |        | ☐      | ☐      |  |  |
| CO-4  | ☐                                  | ☐                   | ☐      | ☐      |        | ✓                                  | ✓      | ✓      |        | ☐      |  |  |
| CO-5  | ☐                                  | ☐                   | ☐      | ☐      |        | ✓                                  | ✓      |        | ✓      | ☐      |  |  |
| Number of matches (☐) = 37<br>Relationship = Low/Medium/High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                                    |                     |        |        |        |                                    |        |        |        |        |  |  |

Prepared by

Checked by

Name: F. FATHIMA FARZANA  
 Assistant Professor,  
 Department of Applied Nutrition and Public Health

Head of the Department

Signature:

## Semester – I

|                     |                                |
|---------------------|--------------------------------|
| <b>Course Title</b> | <b>FOOD SCIENCE PRACTICALS</b> |
| <b>Total Hrs</b>    | <b>30</b>                      |
| <b>Hrs/Week</b>     | <b>2</b>                       |
| <b>Subject Code</b> | <b>21UAAN1P1</b>               |
| <b>Course Type</b>  | <b>Allied Practical</b>        |
| <b>Credits</b>      | <b>1</b>                       |
| <b>Marks</b>        | <b>100</b>                     |

### General Objective:

This course covers the basics of food preparation.

**Course Objectives:** The learners will be able to:

| <b>Co. No.</b> | <b>Course Objectives</b>                 |
|----------------|--|
| CO-1           | Identify the basic food groups           |
| CO-2           | Observe the methods of cooking           |
| CO-3           | Discover the stages of cooking sugar     |
| CO-4           | Examine the adulterants in food products |
| CO-5           | Prepare a variety of recipes             |

### FOOD SCIENCE PRACTICALS-I

1. Identification of food groups.
2. Tests for detecting food adulteration.
3. Identification of different stages of sugar cooking.
4. Preparation of
  - a. Cereals
  - b. Pulses
  - c. Milk products
  - d. Meat and fish and poultry
  - e. Egg

### Course Outcomes

| CO. No. | Course Outcomes  | PSOs Addressed | Cognitive level |
|---------|--|----------------|-----------------|
| CO-1    | List various food groups.  | 1,3,4          | Remembering     |
| CO-2    | Practice different stages of sugar cookery.                                    | 3,4,5          | Applying        |
| CO-3    | Analyze the food adulterants   | 1,2,4,5        | Analyzing       |
| CO-4    | Assess different methods of cooking and their influence on nutrient retention. | 1,2,4,5        | Evaluating      |
| CO-5    | Develop new recipes on pulses, milk products, meat, fish, poultry and egg.     | 2,3,4,5        | Creating        |

### Relationship Matrix

| Semester   | Course Code                        | Title of the Course            |                          |                          |                          |                                    | Hours                    | Credit                   |                          |                          |
|--|------------------------------------|--------------------------------|--------------------------|--------------------------|--------------------------|------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| I  | 21UAAN1P<br>1                      | FOOD SCIENCE PRACTICALS<br>- I |                          |                          |                          |                                    | 2                        | 1                        |                          |                          |
| Course Outcomes (COs)  | Programme Learning Outcomes (PLOs) |                                |                          |                          |                          | Programme Specific Outcomes (PSOs) |                          |                          |                          |                          |
|  | PL O 1                             | PLO 2                          | PL O 3                   | PL O 4                   | PL O 5                   | PS O 1                             | PS O 2                   | PS O 3                   | PS O 4                   | PS O 5                   |
| CO-1   | <input type="checkbox"/>           | <input type="checkbox"/>       | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/>           |                          | <input type="checkbox"/> | <input type="checkbox"/> |                          |
| CO-2   | <input type="checkbox"/>           | <input type="checkbox"/>       | <input type="checkbox"/> | <input type="checkbox"/> |                          |                                    |                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| CO-3   | <input type="checkbox"/>           | <input type="checkbox"/>       | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/>           | <input type="checkbox"/> |                          | <input type="checkbox"/> | <input type="checkbox"/> |
| CO-4   | <input type="checkbox"/>           | <input type="checkbox"/>       | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/>           | <input type="checkbox"/> |                          | <input type="checkbox"/> | <input type="checkbox"/> |
| CO-5   | <input type="checkbox"/>           | <input type="checkbox"/>       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |                                    | <input type="checkbox"/> |                          | <input type="checkbox"/> | <input type="checkbox"/> |
| Number of matches ( <input type="checkbox"/> ) = 38<br>Relationship = Low/Medium/ <b>High</b><br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                                    |                                |                          |                          |                          |                                    |                          |                          |                          |                          |

Prepared by  
Name: F. Fathima Farzana  
Department  
Signature:

Checked by  
Head of the

## Semester – II

|                     |                               |
|---------------------|-------------------------------|
| <b>Course Title</b> | <b>DEVELOPEMENTAL BIOLOGY</b> |
| <b>Total Hrs</b>    | <b>60</b>                     |
| <b>Hrs/Week</b>     | <b>4</b>                      |
| <b>Sub.Code</b>     | <b>21UCZO21</b>               |
| <b>Course Type</b>  | <b>THEORY</b>                 |
| <b>Credits</b>      | <b>4</b>                      |
| <b>Marks</b>        | <b>100</b>                    |

### General Objective:

To study the principles of developmental Zoology and understand various steps that lead to the formation of a new progeny.

**Course Objectives:** The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>  |
|---------------|---|
| CO-1          | Understand the principle of developmental biology and the progression of gametogenesis. |
| CO-2          | Execute the Spemann's experiment in lower organisms.                                    |
| CO-3          | Distinguish the types and physiology of placenta  |
| CO-4          | Justify the method of in vitro fertilization  |
| CO-5          | Construct a model of teratogenic embryo.  |

### UNIT I – Gametogenesis and Fertilization

Spermatogenesis – Oogenesis. Structure of sperm and egg of Chick and Human. Sperm and egg interaction – pre and post fertilization, theories and biochemical events-Parthenogenesis.

### UNIT II – Cleavage and Gastrulation

Cleavage in Chick and Human. Fate map of Chick and Human. Gastrulation in Chick and Human. Development of Brain and Heart in Chick.

### UNIT III – Extra Embryonic Membranes and Placentation

Extra embryonic membranes in Chick – development, types and physiology. Placentation in mammals – types and physiology. Organizer – Primary and secondary organizers – Spemann's experiment.

### UNIT IV – Human Reproduction and Birth Control

Reproduction in Human – Infertility (male and female), Artificial insemination – Assisted reproductive Technology, (ART) In vitro fertilization and embryo transfer – Test tube babies – Amniocentesis.

Contraceptive devices – Surgical method – Hormonal method – Intra Uterine Contraceptive Devices (IUCD).

### UNIT V – Nuclear transplantation and Regeneration

Nuclear transplantation in *Acetabularia*. Regeneration- definition, types, Regeneration in *Planaria* and Amphibians. Teratogenesis, Embryonic stem cells and significance. Morphogenetic field and gradient hypothesis.

### TEXT BOOKS

Verma . P. S. and V. K. Agarwal. 2006, Chordate Embryology,S. Chand & Company Ltd.

### REFERENCE BOOKS

1. Arora,M.P., 2018 Embryology, Himalaya Publishing House,.
2. Berril, N. J., 1986 Developmental Biology, TataMc.Graw – Hill Publishing Company.
3. Balinsky,B.I.Fabian.B.C. 2012. An Introduction to Embryology, Thomson Press India Ltd.5<sup>th</sup> edition.

### Course Outcomes

| CO No. | Course Outcomes  | PSOs Addressed | Cognitive Level |
|--------|--|----------------|-----------------|
| CO-1   | Describe the development of spermatogenesis and oogenesis. | 1,2,4          | Understanding   |
| CO-2   | Chart the progression of brain and heart in chick.         | 1,2,3          | Applying        |
| CO-3   | Correlate the varieties of placenta.                       | 1,3,4,5        | Analysing       |
| CO-4   | Predict the factors involved in infertility.               | 1,4,5          | Evaluating      |
| CO-5   | Simulate the development of human embryo                   | 1,3,4,5        | Creating        |

### Relationship Matrix

| Semester  | Course Code                        | Title of the Course   | Hours  | Credit |        |                                    |        |        |        |        |
|---|------------------------------------|-----------------------|--------|--------|--------|------------------------------------|--------|--------|--------|--------|
| II  | 21UCZO21                           | DEVELOPMENTAL BIOLOGY | 60     | 4      |        |                                    |        |        |        |        |
| Course Outcomes (COs)   | Programme Learning Outcomes (PLOs) |                       |        |        |        | Programme Specific Outcomes (PSOs) |        |        |        |        |
|   | PL O 1                             | PLO 2                 | PL O 3 | PL O 4 | PL O 5 | PS O 1                             | PS O 2 | PS O 3 | PS O 4 | PS O 5 |
| CO-1  | ☐                                  | ☐                     |        | ☐      |        | ☐                                  | ☐      |        | ☐      |        |
| CO-2  | ☐                                  | ☐                     |        | ☐      |        | ☐                                  | ☐      | ☐      |        |        |
| CO-3  | ☐                                  | ☐                     | ☐      |        | ☐      | ☐                                  |        | ☐      | ☐      | ☐      |
| CO-4  | ☐                                  | ☐                     | ☐      | ☐      |        | ☐                                  |        |        | ☐      | ☐      |
| CO-5  |                                    | ☐                     | ☐      | ☐      | ☐      | ☐                                  |        | ☐      | ☐      | ☐      |
| Number of matches (☐) = ...35....<br>Relationship = High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                                    |                       |        |        |        |                                    |        |        |        |        |

Prepared by  
Dr.M.Sithi Jameela

Checked by

Signature

Head of the Department

### Semester - II

|                     |                 |
|---------------------|-----------------|
| <b>Course Title</b> | <b>ECOLOGY</b>  |
| <b>Total Hrs</b>    | <b>60</b>       |
| <b>Hrs/Week</b>     | <b>4</b>        |
| <b>Sub.Code</b>     | <b>21UCZO22</b> |
| <b>Course Type</b>  | <b>Theory</b>   |
| <b>Credits</b>      | <b>4</b>        |
| <b>Marks</b>        | <b>100</b>      |

#### General Objective:

To create an awareness on the mechanism of eco system and protection of natural resources and biodiversity.

**Course Objectives:** The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>   |
|---------------|--|
| CO-1          | Understand the concepts and scope of various branches of Ecology.                            |
| CO-2          | Sketch the varied types of Food chain and Food web.  |
| CO-3          | Analyse the different types of animal relationship.  |
| CO-4          | Evaluate the faunal adaptations of different habitats.                                       |
| CO-5          | Construct innovative methods to conserve rare, endangered and critically endangered species. |

#### UNIT – I Ecology factors

Ecology and Environmental Science – Definition - Scope – Branches – Abiotic factors –Water, Temperature and Light. Biotic factors – Animal relationship – Symbiosis – Commensalism – Mutualism –Antagonism – Antibiosis – Parasitism and its types and adaptations- Predation – Competition.

#### UNIT – II Ecosystem

Ecosystem –Definition Structure – Pond ecosystem – Primary production – Secondary production –Food chain – Food web – Trophic levels – Energy flow – Pyramid of biomass – Pyramid of energy. Biogeochemical cycles – carbon and nitrogen

#### UNIT – III Community& Population Ecology

CommunityEcology: Introduction – diversity – structure – community dominance – community stratification – periodicity – community interdependence -Ecotone – Edge effect – ecological niche – concepts of community –Ecological succession

Population Ecology – Definition – Density – Estimation –Natality – Mortality – Age distribution – Age pyramids – Population growth and Population equilibrium.

#### **UNIT - IV Habitat Ecology**

Characteristic features of different habitats and faunal adaptations of fresh water (Lentic and Lotic), marine, estuarine, mangrove, cave, forest and desert.

#### **UNIT - V Biodiversity in Conservation**

Biodiversity – definition, loss and cause. IUCN, CITES and brief outlines of Indian laws of conservation. Biodiversity hotspots in India, Indian endangered species and conservation, community reserves, sanctuaries, national parks and tiger reserves in TamilNadu. Afforestation and deforestation. Human animal conflicts

#### **TEXT BOOKS:**

1. P.S.Verma, V.K.Agarwal (2010)Environmental biology, S.Chand & Co. New Delhi.
2. Text book of Ecology & Animal Distribution by P.S.Verma V.K.Agarwal S.Chand & Co. New Delhi.

#### **REFERENCE BOOKS:**

1. Odum, E.P., 1971 – Fundamentals of Ecology., W.B. Saunders Company.
2. Verma, P.S. and V.K.Agarwal 2013. Cell Biology, Genetics, Molecular Biology, Evolution & Ecology. S.Chand & Company.
3. Arumugam.N and V.Kumaresan 2014. Environmental Studies, Saras Publication.
4. S.V.S. Rao (2013), Ecology and Environmental science, PHI Publishers
5. P.D. Sharma (2011 )Ecology and Emvironmental, Rastogi publishers
6. Fundamentals of Ecology and Environment by Pranav Kumar (Author), 2nd edition (Editor) Publisher : Pathfinder Publication a unit of Pathfinder Academy Pvt. Ltd; Second edition (1 January 2017)

#### **Course Outcomes**

| <b>CO No.</b> | <b>Course Outcomes</b>   | <b>PSOs Addressed</b> | <b>Cognitive Level</b> |
|---------------|--|-----------------------|------------------------|
| CO-1          | Understand the relationship between the biotic and abiotic factors.          | 1,2,3,5               | Understanding          |
| CO-2          | Integrate the features of ecosystems and their diversity.                    | 1,2,5                 | Applying               |
| CO-3          | Distinguish the features between Population and community.                   | 1,2,4,5               | Analysing              |
| CO-4          | Comment on the characteristics of different habitats and faunal adaptations. | 1,2,4                 | Evaluating             |



|      |  |           |          |
|------|--|-----------|----------|
| CO-5 | Devising the Strategies to improve the protection of Rare, endemic, threatened and endangered species. | 1,2,3,4,5 | Creating |
|------|--|-----------|----------|

### Relationship Matrix

| Semester  | Course Code                        | Title of the Course      |                          |                          |                          |                                    | Hours                    | Credit                   |                          |                          |  |
|---|------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--|
| I   | 21UCZO22                           | Ecology                  |                          |                          |                          |                                    | 60                       | 4                        |                          |                          |  |
| Course Outcomes (COS)   | Programme Learning Outcomes (PLOs) |                          |                          |                          |                          | Programme Specific Outcomes (PSOs) |                          |                          |                          |                          |  |
|   | PLO 1                              | PLO 2                    | PLO 3                    | PLO 4                    | PLO 5                    | PSO 1                              | PSO 2                    | PSO 3                    | PSO 4                    | PSO 5                    |  |
| CO-1  | <input type="checkbox"/>           | <input type="checkbox"/> |                          | <input type="checkbox"/> |                          | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/> |  |
| CO-2  | <input type="checkbox"/>           | <input type="checkbox"/> |                          | <input type="checkbox"/> |                          | <input type="checkbox"/>           | <input type="checkbox"/> |                          |                          | <input type="checkbox"/> |  |
| CO-3  | <input type="checkbox"/>           | <input type="checkbox"/> |                          | <input type="checkbox"/> |                          | <input type="checkbox"/>           |                          |                          | <input type="checkbox"/> | <input type="checkbox"/> |  |
| CO-4  | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/>           | <input type="checkbox"/> |                          | <input type="checkbox"/> |                          |  |
| CO-5  | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  |
| Number of matches ( <input type="checkbox"/> ) = .....36.<br>Relationship =High |                                    |                          |                          |                          |                          |                                    |                          |                          |                          |                          |  |

Prepared by

Dr.S.Mohamed Ramlath Sabura

Signature

Checked

Head of the Department

## Semester – II

|                    |   |
|--------------------|---|
| <b>Total Hrs</b>   | <b>Developmental Biology and Ecology Practicals</b> |
| <b>Hrs/Week</b>    | <b>2</b>  |
| <b>Sub.Code</b>    | <b>21UCZO2P1</b>                                    |
| <b>Course Type</b> | <b>Practical</b>                                    |
| <b>Credits</b>     | <b>1</b>  |
| <b>Marks</b>       | <b>100</b>  |

### General Objective:

To acquire key experimental skills and explore simple experiments relevant to developmental biology and ecology.

### Course Objectives: The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>  |
|---------------|---|
| CO-1          | Examine the Hardness of water in diverse samples.   |
| CO-2          | Explain the different embryonic stages of chick and developmental stages of frog.                 |
| CO-3          | Apply the principle of dissolved oxygen content in various water samples and observe the results. |
| CO-4          | Assess the primary productivity using light and dark bottle method.                               |
| CO-5          | Develop replica of different types of placenta.   |

### DEVELOPMENTAL BIOLOGY

1. Temporary mounting and observation of Chick embryo - 24, 48, 72 and 96 Hours.
2. Frog – Egg/sperm - Demonstration only – Model/ chart/ CD
3. **Museum specimens, slides, models and charts:**
  - a) Human Sperm
  - b) Egg of Insect.(Cockroach&Silkworm).
  - c) Tadpole
  - d) Axolotl larva.
  - e) Developmental stages of Frog:Egg,Morula, Blastula, Gastrula and yolk plug stage
  - f) Chick embryo – 24, 48, 72 & 96 hrs.
  - g) Contraceptive devices – Condom, Copper T and Pills ( Mala-D).
  - h) Placenta in mammals – Diffuse, Discoidal, Zonary and Cotyledonary.

### ECOLOGY

1. Estimation of Dissolved oxygen in two water samples (River and Pond water)
2. Estimation of Hardness in two water samples (River and Pond water)
3. Determination of primary productivity using light and dark bottle method (Demonstration)

4. a) Mutualism- Hermit crab and Sea anemone b) Commensalism – Echeneis and Shark c) Parasitism – Ascaris.

**Museum specimens, slides, models and charts**

5. a) Food chain b) Food web c) Ecological pyramids d) Age pyramids e) Growth curves  
 6. Biogeochemical cycles – carbon and nitrogen  
 7. Biodiversity hotspots in India  
 8. Indian endangered species (any four)  
 9. a) Nauplius larva b) Zoea larva c) Mysis larva.

**Reference Books:**

1. A. Gibbs, A Practical Guide to Developmental Biology, Oxford Exclusive, 2006.  
 2. W. Fresenius, K.E.Quentin & W.Schneider, Water analysis, Springer, 2011.

**Course Outcomes**

| CO No. | Course Outcomes  | PSOs Addressed | Cognitive Level |
|--------|--|----------------|-----------------|
| CO-1   | Discuss various embryonic stages in chick.                             | 1,3,5          | Understanding   |
| CO-2   | Sketch the progressive and larval phases in amphibians.                | 1,2,3          | Applying        |
| CO-3   | Correlate the dissolved oxygen content present in soft and hard water. | 1,2,4          | Analysing       |
| CO-4   | Validate the results of primary productivity in various samples.       | 1,2,3,5        | Evaluating      |
| CO-5   | Construct a chart of Biodiversity hotspots in India.                   | 1,2,3,5        | Creating        |

**Relationship Matrix**

| Semester                          | Course Code                        | Title of the Course                             |                          |                          |                          |                                    | Hours                    | Credit                   |                          |                          |
|-----------------------------------|------------------------------------|---|--------------------------|--------------------------|--------------------------|------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| II                                | 21UCZO2P1                          | Developmental Biology and Ecology Practical- P2 |                          |                          |                          |                                    | 30                       | 1                        |                          |                          |
| Course Outcomes (COs)             | Programme Learning Outcomes (PLOs) |   |                          |                          |                          | Programme Specific Outcomes (PSOs) |                          |                          |                          |                          |
|                                   | PL O 1                             | PLO 2   | PL O 3                   | PL O 4                   | PL O 5                   | PS O 1                             | PS O 2                   | PS O 3                   | PS O 4                   | PS O 5                   |
| CO-1                              | <input type="checkbox"/>           | <input type="checkbox"/>                        |                          |                          | <input type="checkbox"/> | <input type="checkbox"/>           |                          | <input type="checkbox"/> |                          | <input type="checkbox"/> |
| CO-2                              |                                    | <input type="checkbox"/>                        | <input type="checkbox"/> |                          | <input type="checkbox"/> | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> |                          |                          |
| CO-3                              | <input type="checkbox"/>           | <input type="checkbox"/>                        | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/>           |                          | <input type="checkbox"/> | <input type="checkbox"/> |                          |
| CO-4                              |                                    | <input type="checkbox"/>                        |                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/> |
| CO-5                              | <input type="checkbox"/>           | <input type="checkbox"/>                        |                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/> |
| Number of matches (☐) = ...34.... |                                    |   |                          |                          |                          |                                    |                          |                          |                          |                          |

|  |                     |
|--|---------------------|
|  | Relationship = High |
|--|---------------------|

Prepared by  
Dr.M.Sithi Jameela  
Name and Signature

Checked by  
Head of the Department

## Semester – II

|                     |                   |
|---------------------|-------------------|
| <b>Course Title</b> | APPLIED NUTRITION |
| <b>Total Hrs</b>    | 60                |
| <b>Hrs/Week</b>     | 4                 |
| <b>Subject Code</b> | 21UAZO21          |
| <b>Course Type</b>  |                   |
| <b>Credits</b>      | 3                 |
| <b>Marks</b>        | 100               |

### **General Objective:**

This course covers the role of nutrition, their deficiencies and prevention of diseases.

### **Course Objectives: The learners will be able to**

| <b>Co. No.</b> | <b>Course Objectives</b>  |
|----------------|---|
| CO-1           | Recognize different food groups and their nutritive values                |
| CO-2           | Apply various methods of nutritional assessment for different age groups. |
| CO-3           | Classify the functions and sources of lipids as well as proteins.         |
| CO-4           | Evaluate the role of nutrition in preventing and managing diseases.       |
| CO-5           | Generalize importance of Macro and micro nutrients in human diet          |

### **UNIT I MENU PLANNING**

Menu planning- Principles of planning diet, points to be considered in planning a diet.

Assessment of Nutritional status – Methods- Anthropometric measurements, biochemical examination, clinical examination and diet surveys.

### **UNIT II ENERGY & CARBOHYDRATES**

Energy – Unit of energy - Bomb calorimeter, Physiological energy value of food.

BMR- Definition and Factors affecting BMR

Carbohydrates – Classification, functions and sources.

### **UNIT III LIPIDS & PROTEINS**

Lipids – Classification, functions and sources.

Proteins – Classification, functions, and sources.

### **UNIT IV VITAMINS**

Fat soluble Vitamins A,D,E,K – Functions, Sources requirements and deficiency

Water soluble Vitamins C, B group vitamins- B1,B2,B3,B5,B6,B12 and folic acid- Functions, Sources, requirements and deficiency

### **UNIT V MINERALS**

Minerals- Macro minerals- Calcium and Phosphorus- Functions, Sources, requirements and deficiency; Micro minerals- Iron, Fluorine and Iodine- Functions, Sources, requirements and deficiency.

Role of fibre in preventing and managing diseases, Sources of fibre.

Water –functions and dehydration

### **TEXT BOOKS**

1. Srilakshmi, Nutrition Science, 6<sup>th</sup> Edition, 2018, New age International (P) limited publishers.
2. Srilakshmi, Dietetics, 7<sup>th</sup> Edition, 2014, New age International (P) limited publishers.

### **REFERENCE BOOKS:**

1. Dr.M. Swaminathan, Advanced Text – Book on Food & Nutrition, Bappco, Bangalore. 1985
2. Foundation of Food Preparation, peck am, McMillan Company, London 1994.
3. Krause's Food, Nutrition and Diet Therapy, Mahan W.B Saunders Company, 10<sup>th</sup> edition, 2000.
4. Normal and therapeutic nutrition, Robinson C.H. and Lawler, McMillan Publications Co. Inc., New York, 1990, Revised Edition.
5. Introductory Nutrition, Guthrie & Boston, 8<sup>th</sup> Edition. 1989.

### Course Outcomes

| CO. No. | Course Outcomes   | PSOs Addressed | Cognitive level |
|---------|---|----------------|-----------------|
| CO-1    | Understand the importance of planning menus for different age groups and health conditions. | 1,2,3,4        | Understanding   |
| CO-2    | Illustrate the classifications, functions and sources of carbohydrate.                      | 1,3,4,5        | Applying        |
| CO-3    | Categorize the functions, sources of proteins and lipids                                    | 1,2,3,5        | Analyzing       |
| CO-4    | Summarize fat soluble and water soluble vitamins.   | 1,2,3,5        | Evaluating      |
| CO-5    | Integrate the functions of Macro and Micro minerals, fibre and water.                       | 1,2,4,5        | Creating        |

### Relationship Matrix

| Semester  | Course Code                        | Title of the Course      |                          |                          |        |                                    | Hours                    | Credit                   |                          |                          |  |  |
|---|------------------------------------|--------------------------|--------------------------|--------------------------|--------|------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--|--|
| II  | 21UAZO21                           | Applied Nutrition        |                          |                          |        |                                    | 60                       | 3                        |                          |                          |  |  |
| Course Outcomes (COs)   | Programme Learning Outcomes (PLOs) |                          |                          |                          |        | Programme Specific Outcomes (PSOs) |                          |                          |                          |                          |  |  |
|   | PL O 1                             | PLO 2                    | PL O 3                   | PL O 4                   | PL O 5 | PS O 1                             | PS O 2                   | PS O 3                   | PS O 4                   | PS O 5                   |  |  |
| CO-1  | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |        | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |                          |  |  |
| CO-2  | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |        | <input type="checkbox"/>           |                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  |  |
| CO-3  | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |        | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/> |  |  |
| CO-4  | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |        | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/> |  |  |
| CO-5  | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |        | <input type="checkbox"/>           | <input type="checkbox"/> |                          | <input type="checkbox"/> | <input type="checkbox"/> |  |  |
| Number of matches ( <input type="checkbox"/> ) = 40<br>Relationship = Low/Medium/ <b>High</b> |                                    |                          |                          |                          |        |                                    |                          |                          |                          |                          |  |  |

Prepared by

Checked by

Name: F. Fathima Farzana

Head of the Department

Signature:

## Semester – II

|                     |                                     |
|---------------------|-------------------------------------|
| <b>Course Title</b> | <b>APPLIED NUTRITION PRACTICALS</b> |
| <b>Total Hrs</b>    | 30                                  |
| <b>Hrs/Week</b>     | 2                                   |
| <b>Sub.Code</b>     | <b>21UAZO2P1</b>                    |
| <b>Course Type</b>  | <b>Allied</b>                       |
| <b>Credits</b>      | 1                                   |
| <b>Marks</b>        | 100                                 |

### General Objective:

This course focuses on the basic knowledge of planning menus for different age groups.

### Course Objectives: The learners will be able to

| <b>Co.No.</b> | <b>Course Objectives</b>                                  |
|---------------|---|
| CO-1          | Describe the basic principles and properties of nutrients |
| CO-2          | Interpret the chemistry of starch and proteins            |
| CO-3          | Analyze the nutrients qualitatively and quantitatively    |
| CO-4          | Summarize the principles of menu planning                 |
| CO-5          | Plan and prepare the menu for different age groups        |

1. Principles of Nutrition practicals
  1. Qualitative estimation of Carbohydrate
  2. Qualitative estimation of protein
  3. Estimation of vitamin C in foods
2. Planning menu for the following age groups
  - a. Adult women
  - b. Pregnant mothers
  - c. Lactating women
  - d. Vitamin A deficient school child
  - e. College going girl – diet for Anaemia
3. Visit to (ANY ONE) milk factory, food analysis institute, CFTRI, observing school lunch program and ICDS programme.

### Course Outcomes

| <b>CO. No.</b> | <b>Course Outcomes</b>               | <b>PSOs Addressed</b> | <b>Cognitive level</b> |
|----------------|--------------------------------------|-----------------------|------------------------|
| CO-            | Estimate vitamin C in different food | <b>1,4,5</b>          | Understandin           |



|      |  |              |            |
|------|--|--------------|------------|
| 1    | products.  |              | g          |
| CO-2 | Demonstrate qualitative estimation of carbohydrate and protein.                    | <b>1,4,5</b> | Applying   |
| CO-3 | Prioritize menu for pregnant and lactating women based on their health condition.  | <b>1,3,5</b> | Analyzing  |
| CO-4 | Estimate a menu for vitamin A deficient school child based on the nutritive value. | <b>1,3,5</b> | Evaluating |
| CO-5 | Plan and prepare a menu for anemic college going girl.                             | <b>1,3,5</b> | Creating   |

### Relationship Matrix

| Semester              | Course Code   | Title of the Course          |        |        |        |                                    | Hours  | Credits |        |        |  |  |
|-----------------------|---|------------------------------|--------|--------|--------|------------------------------------|--------|---------|--------|--------|--|--|
| II                    | 21UAZO2P1   | Applied Nutrition Practicals |        |        |        |                                    | 30     | 1       |        |        |  |  |
| Course Outcomes (COs) | Programme Learning Outcomes (PLOs)                                    |                              |        |        |        | Programme Specific Outcomes (PSOs) |        |         |        |        |  |  |
|                       | PL O 1  | PLO 2                        | PL O 3 | PL O 4 | PL O 5 | PS O 1                             | PS O 2 | PS O 3  | PS O 4 | PS O 5 |  |  |
| CO-1                  | ☐   | ☐                            | ☐      |        |        | ☐                                  |        |         | ☐      | ☐      |  |  |
| CO-2                  | ☐   | ☐                            | ☐      |        |        | ☐                                  |        |         | ☐      | ☐      |  |  |
| CO-3                  | ☐   | ☐                            | ☐      |        |        | ☐                                  |        | ☐       |        | ☐      |  |  |
| CO-4                  | ☐   | ☐                            | ☐      |        |        | ☐                                  |        | ☐       |        | ☐      |  |  |
| CO-5                  | ☐   | ☐                            | ☐      |        |        | ☐                                  |        | ☐       |        | ☐      |  |  |
|                       | Number of matches (☐) = 30<br>Relationship = Low/ <b>Medium</b> /High |                              |        |        |        |                                    |        |         |        |        |  |  |

Prepared by

Checked by

Name : **F. Fathima Farzana,**

Head of the Department

Signature :

### Semester – III

|                     |                                   |
|---------------------|-----------------------------------|
| <b>Course Title</b> | <b>CELL AND MOLECULAR BIOLOGY</b> |
| <b>Total Hrs</b>    | <b>60</b>                         |
| <b>Hrs/Week</b>     | <b>4</b>                          |
| <b>Sub.Code</b>     | <b>21UCZO31</b>                   |
| <b>Course Type</b>  | <b>Core</b>                       |
| <b>Credits</b>      | <b>4</b>                          |
| <b>Marks</b>        | <b>100</b>                        |

#### General Objectives:

To gain knowledge of the structure as well as functions of cell, cellular components and its cytological techniques.

Course Objectives: The learner will be able to

| <b>CO Bo.</b> | <b>Course Objectives</b>  |
|---------------|---|
| CO-1          | Define the basic concept of cell                                      |
| CO-2          | Discuss the integrated activity of the animal cell.                   |
| CO-3          | Interpret the microscopic techniques with various animal cells        |
| CO-4          | Distinguish between chromosome and special variant of chromosome      |
| CO-5          | Evaluate the ultra structure and functions of various cell organelles |

#### UNIT I - Introduction

Cell biology–Introduction – History and scope - cell types - prokaryotes and eukaryotes. Microscopy - detailed study of compound, phase contrast and electron microscopes – Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM)

#### UNIT II – Cell organelles

Ultra structure, chemical composition and functions of cell organelles:  
a) Plasma membrane b) Mitochondria c) Golgi apparatus d) Endoplasmic reticulum e) Ribosomes f) Lysosomes g) Centriole h) Nucleus i) Nucleolus.

#### UNIT III – Cell Division

Ultra structure, chemical composition and functions of Chromosomes- types - Euchromatin, heterochromatin, Sat chromosomes, Karyotype, chromosomal banding- Special type of chromosomes (Polytene and lampbrush). Cell Division and Cell cycle - Amitosis, Mitosis, Meiosis and their significance. Apoptosis.

#### UNIT IV - Molecular Biology and Cancer Biology

DNA - types, structure, replication - DNA as the genetic material.

RNA- types, structure and transcription

Cancer cells – Carcinogenesis – definition, types, causes, properties, theories, diagnosis and treatment – Oncogenes.

#### UNIT V – Genetic Code and Protein Synthesis

Mechanism of protein synthesis. Genetic code – codons and anticodons  
 - Regulation of gene expression in prokaryotes and eukaryotes, lac-operon concept.

### TEXT BOOK

Verma.P.S and Agarwal V K.2010. Molecular Biology, S.Chand&Co.Limited, 7361, Ram Nagar,QutubRoad,New Delhi – 110 055

### REFERENCE BOOKS

1. **Lodish** *et al.*,2007. Molecular Biology, 6<sup>th</sup> edition, W.H.Freeman and Company, Newyork.
2. Agarwal, V. K. Cell Biology, S. Chand & Co. Limited, 7361, Ram Nagar, Qutub Road, New Delhi – 110 055.
3. Arora, M.P. and Humanshu Arora.2017. Molecular Biology. HimalayaPublishingHouse,Ramdoot,Dr. BhaleroMarg, Giraon, Mumbai 400 004.
4. Anand Kumar and Shailendra Singh Shera. 2020. Basic concepts of Molecular Biology, VikasPublishingHouse Private Ltd. 576, Maszid Road,Jangpura, New Delhi – 100 014.
5. Powar, C.B., 2010. Cell Biology, Himalaya Publishing House, Mumbai.
6. Gupta, M.L. and Jangir, M.L., 2012. Cell Biology. Student Edition, Jodhpur.
7. Rastogi, 2005. Cell Biology, Wiley Eastern Limited, New Delhi.
8. Gerald Karp. 2013. Cell Biology. Wiley Eastern Limited, New Delhi.

### Course Outcomes

| CO   | Course Outcomes   | PSOs Addressed | Cognitive Level |
|------|---|----------------|-----------------|
| CO-1 | Enumerate the importance of cell and cellular components          | 1,2,4,5        | Remembering     |
| CO-2 | Relate the properties, structure and functions of cell organelles | 1,2,5          | Understanding   |
| CO-3 | Explain the process of cell cycle                                 | 1,3,5          | Applying        |
| CO-4 | Distinguish between the structure of DNA and RNA.                 | 1,2,3,5        | Analysing       |
| CO-5 | Evaluate the mechanism of protein synthesis                       | 1,2,3,5        | Evaluating      |

### Relationship Matrix

| Semester              | Course Code  | Title of the Course      |       |       |       |                                    | Hours | Credit |       |       |
|-----------------------|--|--------------------------|-------|-------|-------|------------------------------------|-------|--------|-------|-------|
| III                   | 21UCZO31   | Cell & Molecular Biology |       |       |       |                                    | 60    | 4      |       |       |
| Course Outcomes (COs) | Programme Learning Outcomes (PLOs)   |                          |       |       |       | Programme Specific Outcomes (PSOs) |       |        |       |       |
|                       | PL O1  | PLO 2                    | PL O3 | PL O4 | PL O5 | PS O1                              | PS O2 | PS O3  | PS O4 | PS O5 |
| CO-1                  | ☐  | ☐                        | ☐     |       | ☐     | ☐                                  | ☐     |        | ☐     | ☐     |
| CO-2                  | ☐  | ☐                        | ☐     | ☐     |       | ☐                                  | ☐     |        |       | ☐     |
| CO-3                  | ☐  | ☐                        | ☐     |       | ☐     | ☐                                  |       | ☐      |       | ☐     |
| CO-4                  | ☐  | ☐                        | ☐     | ☐     |       | ☐                                  | ☐     | ☐      |       | ☐     |
| CO-5                  | ☐  | ☐                        | ☐     |       |       | ☐                                  | ☐     | ☐      |       | ☐     |
|                       | Number of matches (☐) = 37<br>Relationship = High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                          |       |       |       |                                    |       |        |       |       |

Prepared by

Checked by

Name :Dr.M.I.Zahir Hussain

Head of the Department

Signature :

### Semester – III

| Course Title | CELL & MOLECULAR BIOLOGY PRACTICALS<br>CORE ZOOLOGY PRACTICALS – III |
|--------------|--|
| Total Hrs    | 30   |
| Hrs/Week     | 2  |
| Sub.Code     | 21UCZO3P1  |
| Course Type  | Core practical   |
| Credits      | 1  |
| Marks        | 100  |

#### General Objectives:

To gain knowledge of the structural and functional details of cell, cell organelles and understand the cytological techniques using scientific methods.

Course Objectives: The learner will be able to

| CO   | Course Objectives   |
|------|---|
| CO-1 | Examine the giant chromosomes in animals.                             |
| CO-2 | Identify the different stages of mitosis in plants.                   |
| CO-3 | Understand the cytological techniques of various cellular components. |
| CO-4 | Interpret the RBC and WBC in human beings.                            |
| CO-5 | Test the different stages of meiosis in grasshopper.                  |

#### CELL & MOLECULAR BIOLOGY PRACTICALS

1. Onion root tip squash: Observation of different stages of mitosis.
2. Chironomous larva: Mounting of Polytene chromosomes.
3. Male Grasshopper: Observation of different stages of meiosis.
4. Preparation of the following:
  - a) Human Squamous epithelium
  - b) Human blood smear
5. Models & charts:
  - a) DNA
  - b) tRNA
  - c) Ribosome
  - d) Protein synthesis
  - e) Mitochondria
  - f) Golgi apparatus
  - g) Nucleus
  - h) Endoplasmic reticulum
  - i) Lysosomes
  - j) Microtome.
  - k) Frog Blood Smear
  - l) Cell cycle
  - m) Histology of cancer cells (sarcoma and carcinoma)

### Course Outcomes

| CO   | Course Outcomes                                   | PSOs Addressed | Cognitive Level |
|------|---|----------------|-----------------|
| CO-1 | Identify the varied cell organelles               | 1,2,3          | Remembering     |
| CO-2 | Observe the various stages of mitosis and meiosis | 2,4,5          | Understanding   |
| CO-3 | Examine the blood cells in human beings           | 1,2,3,5        | Applying        |
| CO-4 | Dissect the giant chromosomes of chromomous larva | 1,2,3,4        | Analysing       |
| CO-5 | Create models of a range of cell organelles       | 2,3,4          | Evaluating      |

### Relationship Matrix

| Semester   | Course Code                        | Title of the Course           |       |       |       |                                    | Hours | Credit |       |       |  |  |
|--|------------------------------------|-------------------------------|-------|-------|-------|------------------------------------|-------|--------|-------|-------|--|--|
| III  | 21UCZO3P1                          | CORE ZOOLOGY PRACTICALS - III |       |       |       |                                    | 30    | 1      |       |       |  |  |
| Course Outcomes (COs)  | Programme Learning Outcomes (PLOs) |                               |       |       |       | Programme Specific Outcomes (PSOs) |       |        |       |       |  |  |
|  | PL O1                              | PLO 2                         | PL O3 | PL O4 | PL O5 | PS O1                              | PS O2 | PS O3  | PS O4 | PS O5 |  |  |
| CO-1   | ☐                                  | ☐                             | ☐     |       |       | ☐                                  | ☐     | ☐      |       |       |  |  |
| CO-2   | ☐                                  | ☐                             | ☐     |       |       |                                    | ☐     |        | ☐     | ☐     |  |  |
| CO-3   | ☐                                  | ☐                             | ☐     |       |       | ☐                                  | ☐     | ☐      |       | ☐     |  |  |
| CO-4   | ☐                                  | ☐                             | ☐     |       |       | ☐                                  | ☐     | ☐      | ☐     |       |  |  |
| CO-5   | ☐                                  | ☐                             | ☐     |       |       |                                    | ☐     | ☐      | ☐     |       |  |  |
| Number of matches (☐) = 32<br>Relationship = Medium<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                                    |                               |       |       |       |                                    |       |        |       |       |  |  |

Prepared by

Checked by

Name :Dr.M.I.Zahir Hussain

Head of the Department

Signature :



### Semester III

|                     |   |
|---------------------|---|
| <b>Course Title</b> | <b>PLANT DIVERSITY &amp; PHYTOPATHOLOGY</b> |
| <b>Total Hours</b>  | <b>60</b>                                   |
| <b>Hrs/Week</b>     | <b>4</b>                                    |
| <b>Sub.Code</b>     | <b>21UABT31</b>                             |
| <b>Course Type</b>  | <b>Allied</b>                               |
| <b>Credits</b>      | <b>3</b>                                    |
| <b>Marks</b>        | <b>100</b>                                  |

#### General Objective:

To educate students on plant-biodiversity for higher academic pursuits, especially in the field of Biological Sciences, environment and conservation.

**Course Objectives:** The learners will be able to:

| <b>CO. No.</b> | <b>Course Objectives</b>   |
|----------------|--|
| <b>CO-1</b>    | Understand the origin and evolution of life with reference to lower plants ranging from various groups such as algae and fungi and their economic importance.                        |
| <b>CO-2</b>    | Develop knowledge of the plant groups such as lichens, bryophytes and their economic importance and to enable students understand the relevance of environment and human well-being. |
| <b>CO-3</b>    | Explain the structure and their economic importance of pteridophytes and gymnosperms.  |
| <b>CO-4</b>    | Identify nomenclature and classify the plants by determining the morphology, its salient features and the economic importance of angiosperms.  |
| <b>CO-5</b>    | Examine the concepts and principles of phytopathology.   |

#### UNIT I - Algae & Fungi

Algae – General characteristics; Economic importance; Morphology, Structure, Reproduction & life cycle in *Sargassum*. Fungi - General characters; Economic importance; Morphology, Structure, Reproduction & life cycle in *Puccinia*.



## **UNIT II – Lichens and Bryophytes**

Lichens- General characteristics;Economic importance; Types – Crustose, Foliose, Frustricose. Bryophytes- General characters; Economic importance; Morphology, Structure,Reproduction& life history in *Marchantia*-

## **UNIT III – Pteridophytes & Gymnosperms**

Pteridophytes- General characteristics;Economic importance; Morphology, Structure, Reproduction & life cycle in *Lycopodium* and *Adiantum*. Gymnosperms – General characteristics;Economic importance; Morphology, Structure, Reproduction & life cycle in *Pinus*.

## **UNIT IV – Plant Taxonomy**

Brief account on Classification: Natural – Bentham & Hooker. Morphology and reproductive characters of flowering plants (Pyllostaxy and inflorescence). Study of the following families – Fabaceae, Asteraceae, Solanaceae and Poaceae.

## **UNIT V – Phytopathology**

Terms and concepts; pertaining to phytopathology; Disease cycle and environmental relation; prevention and control of plant diseases. Fungal diseases – Early blight of potato, White rust of crucifers. Bacterial diseases – Citrus canker and angular leaf spot of cotton. Viral diseases – Tobacco Mosaic viruses.

### **TEXT BOOKS:**

1. Pandey B.P. 2001. College Botany Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta.S. Chand & Company Ltd, New Delhi.
2. Pandey.B.P.1997 – Taxonomy of Angiosperms – S.Chand& Co., New Delhi
3. Vashishta, B.R. 2008. Botany for Degree Students – Vol I Algae.
4. Sethi, I.K. and Walia, S.K. 2011. Text Book of Fungi and Their Allies, Macmillan Publishers Pvt.Ltd. Delhi.
5. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.
6. Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.

### **REFERENCE BOOKS:**

1. Parihar. N. S.2001. Bryophyta - Central Book Depot Publications in Botany, Allahabad
2. Vashista. B R .1997, The Algae, S .Chand& Co. Ltd... New Delhi
3. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology. 4<sup>th</sup>edition.John Wiley & Sons (Asia) Singapore.

4. Webster, J. and Weber, R. (2007). Introduction to Fungi. 3<sup>rd</sup> edition. Cambridge University Press, Cambridge.
5. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.
6. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International Publishers, New Delhi, India.
7. R.S. Mehrotra. (2003). Plant Pathology. Tata McGraw-Hill Education, New Delhi.

**Course Outcomes:** The learners would have learnt to:

| CO   | Course Outcomes   | PSOs Addressed | Cognitive Level             |
|------|---|----------------|-----------------------------|
| CO-1 | Observe the knowledge of microbial diversity and describe the characters, structure and life history of some common algae, fungi and their economic importance. | 1,2,3          | Remembering / Understanding |
| CO-2 | Determine the general features and life cycle patterns of lichens and bryophytes.   | 1,2,4          | Applying                    |
| CO-3 | Explain the characters, structure and life history of some common Pteridophytes and Gymnosperms and their economic importance                                   | 1,2            | Analyzing                   |
| CO-4 | Summarize taxonomy and the basic principles of environment.   | 1,2,5          | Evaluating                  |
| CO-5 | Collaborate with farmers to advise them on various plant diseases.  | 1,2,3,4,5      | Creating                    |

### Relationship Matrix

| Semester              | Course Code   | Title of the Course              |      |      |      |                                    | Hours | Credit |      |       |  |  |
|-----------------------|---|----------------------------------|------|------|------|------------------------------------|-------|--------|------|-------|--|--|
| III                   | 21UABT31  | PLANT DIVERSITY & PHYTOPATHOLOGY |      |      |      |                                    | 60    | 3      |      |       |  |  |
| Course Outcomes (COs) | Programme Learning Outcomes (PLOs)  |                                  |      |      |      | Programme Specific Outcomes (PSOs) |       |        |      |       |  |  |
|                       | PLO1  | PLO2                             | PLO3 | PLO4 | PLO5 | PSO 1                              | PSO2  | PSO3   | PSO4 | PSO 5 |  |  |
| CO-1                  | ☐   | ☐                                | ☐    | -    | ☐    | ☐                                  | ☐     | ☐      | -    | -     |  |  |
| CO-2                  | ☐   | ☐                                | -    | ☐    | ☐    | ☐                                  | ☐     |        | ☐    | -     |  |  |
| CO-3                  | ☐   | ☐                                | -    | -    | -    | ☐                                  | ☐     | -      | -    | -     |  |  |
| CO-4                  | ☐   | ☐                                | -    | -    | ☐    | ☐                                  | ☐     | -      | -    | ☐     |  |  |
| CO-5                  | ☐   | ☐                                | ☐    | ☐    | ☐    | ☐                                  | ☐     | ☐      | ☐    | ☐     |  |  |
|                       | Number of matches (☐) = 34<br>Relationship = Low/Medium/ <b>High</b><br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                                  |      |      |      |                                    |       |        |      |       |  |  |

Prepared by

Checked by

Name:Dr. M. SYED ALI FATHIMA

Head of the Department

Signature:

### Semester III

|                     |  |
|---------------------|--|
| <b>Course Title</b> | <b>PLANT DIVERSITY AND PHYTOPATHOLOGY PRACTICALS</b> |
| <b>Total Hours</b>  | <b>30</b>  |
| <b>Hrs/Week</b>     | <b>2</b>   |
| <b>Sub.Code</b>     | <b>21UABT3P1</b>                                     |
| <b>Course Type</b>  | <b>Allied (Practical)</b>                            |
| <b>Credit</b>       | <b>1</b>   |
| <b>Marks</b>        | <b>100</b>   |

#### General Objective:

To study about the various groups of non-flowering plants in developing skill to identify from the flowering plants to species level.

**Course Objectives:** The learners will be able to:

| <b>CO</b>   | <b>Course Objectives</b>  |
|-------------|---|
| <b>CO-1</b> | Observe and understand the internal organization of plant body such as primary, secondary and anomalous, anatomical structure of stem and root. |
| <b>CO-2</b> | Identify and describe the specimens belonging to higher cryptogams.   |
| <b>CO-3</b> | Categorize the sections of plant materials of anatomical and morphological interest for identification.   |
| <b>CO-4</b> | Summarize the features of plant taxonomy.   |
| <b>CO-5</b> | Distinguish the plant diseases and casual organisms.  |

#### DIVERSITY OF PLANT LIFE& PHYTOPATHOLOGY

1. Micropreparation& Identification of the following:  
Sargassum – Thallus.  
Marchantia - Thallus.

2. Observation and Identification of Permanent slide –  
Sargassum – Male and female conceptacles.  
Marchantia sporophyte.  
Puccinia – Permanent Slide.
3. Micropreparation & Identification of Lycopodium and Adiantum Stem & Pinus needle.
4. Study of vegetative and floral characters of the following families prescribed in the theory syllabus (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):
5. Identification of plant diseases prescribed in the syllabus – Specimen/Photograph.
6. Field trip for specimen collection.

**REFERENCE BOOKS:**

1. Gunasekaran, P., 1996. Lab Manual in Microbiology. New Age International (P), Ltd., Publishers, New Delhi.
2. Parihar, N.S. 19985, The Biology and Morphology of Pteridophytes, Central Book Department, Allahabad.
3. Sporne, K.R. 1971, The Morphology of Gymnosperms, Hutchinson University library London.
4. Pandey, B.P. 2010. Modern Practical Volume – 1. S.Chand & company Ltd. New Delhi.
5. Santra. S.C, Chatterjee, T.P and Das, A.P. 2001. College botany practical – Vol. II. New Central Book Agency (p) Ltd. India.

**Course Outcomes:** The learners would have learnt to:

| <b>CO</b> | <b>Course Outcomes</b>   | <b>PSOs Addressed</b> | <b>Cognitive Level</b> |
|-----------|--|-----------------------|------------------------|
| CO-1      | Discuss the structure and reproduction of select algae, fungi and bryophytes.  | 1,2                   | <b>Understanding</b>   |
| CO-2      | Examine the structures of morphology and the internal structures of the select species of pteridophyte and gymnosperms.        | 1,2,4                 | <b>Applying</b>        |
| CO-3      | Analyze the importance of plant diversity.   | 1,2                   | <b>Analyzing</b>       |
| CO-4      | Distinguish various angiosperm plant habits by comprehending the concepts of plant taxonomy and classification of angiosperms. | 1,4                   | <b>Evaluating</b>      |

|      |   |       |                   |
|------|---|-------|-------------------|
| CO-5 | Assess the bacterial and fungal disease of crop plants. | 1,2,5 | <b>Evaluating</b> |
|------|---|-------|-------------------|

### Relationship Matrix

| Semester  | Course Code                        | Title of the Course                                 |       |       |       |                                    | Hours | Credit |       |       |
|---|------------------------------------|---|-------|-------|-------|------------------------------------|-------|--------|-------|-------|
| III   | 21UABT3P<br>1                      | PLANT DIVERSITY AND<br>PHYTOPATHOLOGY<br>PRACTICALS |       |       |       |                                    | 30    | 1      |       |       |
| Course Outcomes (COs)                               | Programme Learning Outcomes (PLOs) |   |       |       |       | Programme Specific Outcomes (PSOs) |       |        |       |       |
|   | PL O1                              | PLO 2   | PL O3 | PL O4 | PL O5 | PS O1                              | PS O2 | PS O3  | PS O4 | PS O5 |
| CO-1  | ☐                                  | ☐   | -     | -     | -     | ☐                                  | ☐     | -      | -     | -     |
| CO-2  | ☐                                  | ☐   | -     | ☐     | ☐     | ☐                                  | ☐     | -      | ☐     | -     |
| CO-3  | ☐                                  | ☐   | ☐     | -     | ☐     | ☐                                  | ☐     | ☐      | -     | -     |
| CO-4  | ☐                                  | -   | -     | ☐     | ☐     | ☐                                  | -     | -      | ☐     | -     |
| CO-5  | ☐                                  | ☐   | -     | -     | ☐     | ☐                                  | ☐     | -      | -     | ☐     |
| Number of matches (☐) = 29<br>Relationship = Medium |                                    |   |       |       |       |                                    |       |        |       |       |

Prepared by

Checked by

Name: Dr. M. SYED ALI FATHIMA

Head of the Department

Signature:

### Semester III

|                     |                              |
|---------------------|------------------------------|
| <b>Course Title</b> | <b>NURSERY AND GARDENING</b> |
| <b>Total Hours</b>  | <b>30</b>                    |
| <b>Hrs/Week</b>     | <b>2</b>                     |
| <b>Sub.Code</b>     | <b>21USIC31</b>              |
| <b>Course Type</b>  | <b>SEC-I</b>                 |
| <b>Credits</b>      | <b>2</b>                     |
| <b>Marks</b>        | 100                          |

#### General Objective:

To gain knowledge of gardening, cultivation, multiplication and raising seedlings of ornamental plants.

**Course Objectives:** The learners will be able to:

| <b>CO</b>   | <b>Course Objectives</b>  |
|-------------|---|
| <b>CO-1</b> | Understand the methods to prepare nursery plants.   |
| <b>CO-2</b> | Develop themselves to do vegetative propagation.  |
| <b>CO-3</b> | Plan to know about landscaping design.  |
| <b>CO-4</b> | Predict the design and components of parks and to develop the knowledge about the soil condition for seedling, manuring and harvesting. |
| <b>CO-5</b> | Recommend the storage of seeds and know about the methods of marketing.   |

#### UNIT I

Nursery: definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants.

#### UNIT II

Vegetative propagation: Air layering, cutting, grafting, budding. Hardening of plants - green house, shade house and glass house.

### UNIT III

Gardening: definition, objectives and scope - different types of gardening - landscape and home gardening

### UNIT IV

Parks and its components - plant materials and design - soil laying, manuring, watering, management of pests and diseases and harvesting.

### UNIT V

Sowing/raising of seeds and seedlings - Transplanting of seedlings - Study of cultivation of different vegetables: cabbage, brinjal, onion. Storage and marketing procedures.

### TEXT BOOKS

1. Kumar, N., 1997, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil

### REFERENCE BOOKS:

1. Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi.
2. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
3. Edmond Musser & Andres, Fundamentals of Horticulture, McGraw Hill Book Co., New Delhi.
4. Agrawal, P.K. 1993, Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi.
5. Janick Jules. 1979. Horticultural Science. (3<sup>rd</sup> Ed.), W.H. Freeman and Co., San Francisco, USA.

**Course Outcomes:** The learners would have learnt to:

| CO No. | Course Outcomes   | PSOs Addressed | Cognitive Level |
|--------|---|----------------|-----------------|
| CO-1   | Explain how nursery of the plants is prepared.  | 1,3,4          | Understanding   |
| CO-2   | Determine the various resources required for the development of vegetative propagation.                                 | 1,3,4,5        | Applying        |
| CO-3   | Develop knowledge to distinguish among the different forms of sowing and growing of plants.                             | 2,3,4          | Analyzing       |
| CO-4   | Summarize the process of vegetative propagation by appreciating the diversity of plants and the selection of gardening. | 2,3,4          | Evaluating      |



|      |  |         |            |
|------|--|---------|------------|
| CO-5 | Choose the methods of cultivation of different vegetables and growth of plants in nursery and gardening. | 2,3,4,5 | Evaluating |
|------|--|---------|------------|

### Relationship Matrix

| Semester   | Course Code                        | Title of the Course   |       |       |       |                                    | Hours | Credits |       |       |  |  |
|--|------------------------------------|-----------------------|-------|-------|-------|------------------------------------|-------|---------|-------|-------|--|--|
| III  | 21USIC31                           | NURSERY AND GARDENING |       |       |       |                                    | 30    | 2       |       |       |  |  |
| Course Outcomes (COs)                                    | Programme Learning Outcomes (PLOs) |                       |       |       |       | Programme Specific Outcomes (PSOs) |       |         |       |       |  |  |
|  | PL O1                              | PLO 2                 | PL O3 | PL O4 | PL O5 | PS O1                              | PS O2 | PS O3   | PS O4 | PS O5 |  |  |
| CO-1   | ☐                                  | ☐                     | ☐     | ☐     | ☐     | ☐                                  | -     | ☐       | ☐     | -     |  |  |
| CO-2   | ☐                                  | ☐                     | ☐     | ☐     | ☐     | ☐                                  | -     | ☐       | ☐     | ☐     |  |  |
| CO-3   | -                                  | ☐                     | ☐     | ☐     | ☐     | -                                  | ☐     | ☐       | ☐     | -     |  |  |
| CO-4   | -                                  | ☐                     | ☐     | ☐     | ☐     | -                                  | ☐     | ☐       | ☐     | -     |  |  |
| CO-5   | -                                  | ☐                     | ☐     | ☐     | ☐     | -                                  | ☐     | ☐       | ☐     | ☐     |  |  |
| Number of matches (☐) = 39<br>Relationship = <b>High</b> |                                    |                       |       |       |       |                                    |       |         |       |       |  |  |

Prepared by

Checked by

Name: Dr. M. SYED ALI FATHIMA

Head of the Department

Signature:

### Semester III

|                     |                        |
|---------------------|------------------------|
| <b>Course Title</b> | <b>ECONOMIC BOTANY</b> |
| <b>Total Hours</b>  | <b>30</b>              |
| <b>Hrs/Week</b>     | <b>2</b>               |
| <b>Sub.Code</b>     | <b>21UNBT31</b>        |
| <b>Course Type</b>  | <b>NME</b>             |
| <b>Credits</b>      | <b>2</b>               |
| <b>Marks</b>        | <b>100</b>             |

#### **General Objectives:**

To teach students about economic botany, its principles, comprehensive knowledge of usefulness of plant resources, practices and how plants and societies are related.

**Course Objectives:** The learners will be able to:

| <b>Co.</b>  | <b>Course Objectives</b>  |
|-------------|---|
| <b>CO-1</b> | Understand the economic importance of food plants, their life cycle, processing, plant part used for the production of plant resources and production of new varieties. |
| <b>CO-2</b> | Give examples of plants used as fiber resources.  |
| <b>CO-3</b> | Explain various plant resources concerning timber.  |
| <b>CO-4</b> | Discover the specific roles of plant as beverage and address the emerging environmental issues.   |
| <b>CO-5</b> | Compile the knowledge of plants' usefulness as a spice and condiments for human welfare.  |

**A Study on the following with references to their botanical name, morphology of useful part, family and economic importance.**

#### **UNIT I**

Plant resources as food: Cereals; Origin, Morphology & uses– Rice, Wheat; Millets – Ragi; General account with special reference to Gram. Vegetables – lady; Fruits – Mango, Banana.

#### **UNIT II**

Plant resources as fibers – Classification – Surface fibers –Cotton, Coir; Soft fibers – Jute, Aloe, banana.

**UNIT III**

Plant resources as timbers – Wood Classification, properties (Mechanical, Physical)– Teak, Pine; Gums – Gum Arabic; Resin – Oleoresin.

**UNIT IV**

Plant resources as beverages – Coffee, Tea – (morphology, processing, uses).

**UNIT V**

Plant resources as Spices and Condiments – General account with special reference to (Botanical name, family, part used, morphology and uses) Seed – Cardamom; Bark – Cinnamon; Fruit – Coriander, Leaves – Mint, Flower – Clove, Rhizome – Zinger, Root – *Withania*.

**TEXT BOOKS:**

1. Pandey, B.P. 1997. Economic Botany–S. Chand & company Ltd. New Delhi.
2. Verma, V. 198. Economic Botany – Emkay publication, New Delhi.

**REFERENCE BOOKS:**

1. Kochhar, S.L. (2012). Economic Botany in Tropics. New Delhi, India: MacMillan & Co.
2. Wickens, G.E. (2001). Economic Botany: Principles & Practices. The Netherlands: Kluwer Academic Publishers.
3. Chrispeels, M.J. and Sadava, D.E. (1994) Plants, Genes and Agriculture. Jones & Bartlett - Publishers.

**Course Outcomes: The learners would have learnt to:**

| CO   | Course Outcomes   | PSOs Addressed | Cognitive Level      |
|------|---|----------------|----------------------|
| CO-1 | Understand the core concepts of Economic Botany and relate with food plants, environment, populations, communities, and ecosystems. | 1,2,3,4        | <b>Understanding</b> |
| CO-2 | Develop the knowledge of plant resource as fibre.   | 1,2,3,4        | <b>Applying</b>      |
| CO-3 | Distinguish and demonstrate the botanical name, family, and morphology of specific plant resources as timbers.                      | 1,2,3,4        | <b>Analyzing</b>     |
| CO-4 | Analyze the cultivation practice of beverages.  | 1,2,3,4        | <b>Analyzing</b>     |
| CO-5 | Assess the opportunity in plant resource as spices and condiments.  | 1,2,3,4,5      | <b>Evaluating</b>    |

### Relationship Matrix

| Semester   | Course Code                        | Title of the Course |       |       |       |                                    | Hours | Credit |       |       |
|--|------------------------------------|---------------------|-------|-------|-------|------------------------------------|-------|--------|-------|-------|
| III  | 21UNBT31                           | ECONOMIC BOTANY     |       |       |       |                                    | 30    | 2      |       |       |
| Course Outcomes (COs)  | Programme Learning Outcomes (PLOs) |                     |       |       |       | Programme Specific Outcomes (PSOs) |       |        |       |       |
|  | PL O1                              | PLO 2               | PL O3 | PL O4 | PL O5 | PS O1                              | PS O2 | PS O3  | PS O4 | PS O5 |
| CO-1   | ☐                                  | ☐                   | ☐     | ☐     | ☐     | ☐                                  | ☐     | ☐      | ☐     | -     |
| CO-2   | ☐                                  | ☐                   | ☐     | ☐     | -     | ☐                                  | ☐     | ☐      | ☐     | -     |
| CO-3   | ☐                                  | ☐                   | ☐     | ☐     | -     | ☐                                  | ☐     | ☐      | ☐     | -     |
| CO-4   | ☐                                  | ☐                   | ☐     | ☐     | -     | ☐                                  | ☐     | ☐      | ☐     | -     |
| CO-5   | ☐                                  | ☐                   | -     | ☐     | ☐     | ☐                                  | ☐     | ☐      | ☐     | ☐     |
| Number of matches (☐) = 42<br>Relationship = Low/Medium/ <b>High</b> |                                    |                     |       |       |       |                                    |       |        |       |       |

Prepared by  
Name: Dr. M. SYED ALI FATHIMA

Checked by  
Head of the Department

Signature:

## Semester – IV

|                     |                     |
|---------------------|---------------------|
| <b>Course Title</b> | <b>BIOCHEMISTRY</b> |
| <b>Total Hrs</b>    | <b>60</b>           |
| <b>Hrs/Week</b>     | <b>4</b>            |
| <b>Sub.Code</b>     | <b>21UCZO41</b>     |
| <b>Course Type</b>  | <b>Theory</b>       |
| <b>Credits</b>      | <b>4</b>            |
| <b>Marks</b>        | <b>100</b>          |

### General Objective:

The course focuses on to gain knowledge on the basics of biochemistry along with principles and techniques.

### Course Objectives: The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>  |
|---------------|---|
| CO-1          | Identify the atomic structure and chemical bonds present in a molecule. |
| CO-2          | Discuss the classification, structure and metabolism of carbohydrates.  |
| CO-3          | Apply the knowledge of conformation of protein in drug designing.       |
| CO-4          | Analyze the mechanism of enzyme activity and its regulation.            |
| CO-5          | Evaluate pH of disparate sample by using pH meter.                      |

### Unit – I - Basic concepts of Biochemistry

Introduction, Scope and Importance of Biochemistry. Atomic structure, Chemical bonds – Ionic, Covalent & Hydrogen bond – vander Waal's force, pH value - Acid & base concept, Chemical equilibrium - buffers. Chemical nature & biological significance of water.

### UNIT II – Carbohydrate and its Metabolism

Classification, structure and biological significance of Monosaccharides (Glucose and Fructose), Disaccharides (Lactose and Sucrose) and Polysaccharides (Starch and Glycogen). Glycolysis, Krebs's Cycle, Electron transport chain and ATP synthesis, Glycogenolysis and Glycogenesis.

### UNIT III – Proteins and Lipids:

Classification, structure and biological significance of Amino acids and Proteins - Primary, Secondary, Tertiary and Quaternary structure of Proteins.

Structure and biological significance of Lipids. Fatty acids- Types and Nomenclature (saturated and unsaturated). Classification - Triglycerides, Phospholipids, Sphingolipids, Cholesterol,  $\beta$ -oxidation and omega-oxidation of saturated fatty acids.

**UNIT IV- Enzyme Kinetics** Enzymes: Classification and nomenclature of enzymes– physico- chemical-properties of enzymes, enzyme kinetics- (determination of  $K_m$  and  $V_{max}$  using Michaelis-Menten and Lineweaver-Burk plots). Mechanism of enzyme action-factors affecting enzyme activity. Regulation of enzyme Activity and inhibition.

### UNIT V – Instrumentation

Basic instruments – Principle and applications of pH meter, Colorimeter, Spectrophotometer and Electrophoresis – Agarose Gel

Electrophoresis (AGE) and Polyacrylamide Gel Electrophoresis (PAGE), Centrifuge, Chromatography – Paper and thin layer Chromatography.

### TEXT BOOKS

1. Ambika Shanmugam, Fundamentals of Biochemistry for Medical Students, Wolters kluwer India Pvt Ltd, 2016.
2. Agarwal, G. R . Kiran Agarwal and O. P. Agarwal– Text Book of Biochemistry, Krishna Prakashan Media Pvt Ltd, 2007.

### REFERENCE BOOKS

1. Lubert Stryer, Jeremy M. Berg , John Tymoczko, Gregory Gatto Biochemistry, W.H. Freeman & Company, Newyork. 2019.
2. David L. Nelson & Michael Cox. Lehninger Principles of Biochemistry , (7<sup>th</sup> edition) International Edition, 2017.
3. Geoffrey Zubay, Biochemistry (4th edition) McGraw-Hill College, 2017

### Course Outcomes

| CO No. | Course Outcomes   | PSOs Addressd | Cognitive Level |
|--------|---|---------------|-----------------|
| CO-1   | Define the basic concepts of biochemistry in living organisms.  | 1,3,4         | Remembering     |
| CO-2   | Interpret the types of carbohydrates and its metabolism in human body.  | 1,2,4,5       | Understanding   |
| CO-3   | Make use of current biochemical and molecular techniques to carry out experiments in biochemical and Molecular biology. | 1,2,4         | Applying        |
| CO-4   | Infer the process of regulation of enzyme Activity and its inhibition.  | 1,3,4         | Analysing       |
| CO-5   | Assess the dissimilar samples of amino-acids using chromatographic techniques.  | 1,2,4,        | Evaluating      |

### Relationship Matrix

| Semester   | Course Code                        | Title of the Course | Hours  | Credit |        |                                    |        |        |        |        |
|--|------------------------------------|---------------------|--------|--------|--------|------------------------------------|--------|--------|--------|--------|
|  | 21UCZO41                           | BIOCHEMISTR<br>Y    | 60     | 4      |        |                                    |        |        |        |        |
| Course Outcomes (Cos)  | Programme Learning Outcomes (PLOs) |                     |        |        |        | Programme Specific Outcomes (PSOs) |        |        |        |        |
|  | PL O 1                             | PLO 2               | PL O 3 | PL O 4 | PL O 5 | PS O 1                             | PS O 2 | PS O 3 | PS O 4 | PS O 5 |
| CO-1   | ☐                                  | ☐                   | ☐      |        | ☐      | ☐                                  |        | ☐      | ☐      |        |
| CO-2   | ☐                                  | ☐                   |        | ☐      | ☐      | ☐                                  | ☐      |        | ☐      | ☐      |
| CO-3   | ☐                                  |                     | ☐      |        | ☐      | ☐                                  | ☐      |        | ☐      |        |
| CO-4   |                                    | ☐                   | ☐      | ☐      | ☐      | ☐                                  |        | ☐      | ☐      |        |
| CO-5   | ☐                                  | ☐                   | ☐      |        | ☐      | ☐                                  | ☐      |        | ☐      |        |
| Number of matches (☐) = ...35....<br>Relationship = High<br>Low (If the No. Of matches are less than 25)<br>Medium (If the No. Of matches are between 25 and 33) |                                    |                     |        |        |        |                                    |        |        |        |        |

|   |
|---|
| High (If the No. Of matches are more than 33) |
|---|

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Dr.M.Sithi Jameela  
Name and Signature

Checked by  
Head of the Department

### Semester – IV

|                     |                                |
|---------------------|--------------------------------|
| <b>Course Title</b> | <b>BIOCHEMISTRY PRACTICALS</b> |
| <b>Total Hrs</b>    | <b>30</b>                      |
| <b>Hrs/Week</b>     | <b>2</b>                       |
| <b>Sub.Code</b>     | <b>21UCZO4P1</b>               |
| <b>Course Type</b>  | <b>PRACTICAL</b>               |
| <b>Credits</b>      | <b>1</b>                       |
| <b>Marks</b>        | <b>100</b>                     |

#### General Objectives:

The Course aims at developing skills of executing basic bio-chemical tests and to expand familiarity with bio-chemical laboratory techniques,

**Course Objectives:** The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>   |
|---------------|--|
| CO-1          | List the basic concepts of biochemistry necessary for biochemical studies.                   |
| CO-2          | Recognize the biochemical structure of various compounds.                                    |
| CO-3          | Apply Beer's and Lambert's law using Colorimeter to measure the optical density of a sample. |
| CO-4          | Examine the properties of macromolecules.  |
| CO-5          | Evaluate pH in various samples with the help of pH meter.                                    |

1. Beer's and Lambert's law verification using Colorimeter.
2. Separation of Amino acid using paper Chromatography.
3. Separation of Amino acid using Thin layer Chromatography.
4. Qualitative tests for Carbohydrates (Glucose, Fructose, Lactose and Starch), Proteins & Lipid.
5. Preparation of starch from potato
6. pH measurement of any two samples with the help of pH meter.
7. **Charts/Models:**
  - a) Glucose
  - b) Amino acid
  - c) Steroid
  - d) Electrophoresis unit
  - e) Colorimeter
  - f) pH meter
  - g) Chromatogram.
  - h) Krebs cycle
  - i) Glycolysis

#### Textbooks:

1. S. P. Singh, Practical Manual of Biochemistry, CBS Publishers & Distributors. 2013.



- Jeyaraman, J. Laboratory Manual in Biochemistry. New Age International Publishers. 2011.

**Reference Books:**

- David T. Plummer. An Introduction to Practical Biochemistry. Tata Mc. Graw Hill Publishing Company Limited. , 2006.
- Soundravally,Rajendiran , Pooja,Dhiman, Biochemistry Practical Manual Elsevier India, 2019.
- Anju Jain, Veena Singh, Ghalaut. Manual of Practical Biochemistry, Arya Publishing Company,2018.

**Course Outcomes**

| <b>CO No.</b> | <b>Course Outcomes</b>   | <b>PSOs Addressed</b> | <b>Cognitive Level</b> |
|---------------|--|-----------------------|------------------------|
| CO-1          | Define the basic principles of biochemistry and identify the biochemical apparatus and models. | 1,2,4                 | Remembering            |
| CO-2          | Discuss the principle, Instrumentation and its applications in various fields of research.     | 1,2,3,4               | Understanding          |
| CO-3          | Experiment the given carbohydrate, protein and lipid sample, qualitatively.                    | 1,2,3,4,5             | Applying               |
| CO-4          | Test the amino acid samples qualitatively by using chromatography.                             | 1,2,4,5               | Analysing              |
| CO-5          | Measure the optical density of samples with the principle of colorimetre.                      | 1,2,4                 | Evaluating             |

### Relationship Matrix

| Semester              | Course Code   | Title of the Course       |        |        |        |                                    | Hours  | Credit |        |        |
|-----------------------|---|---------------------------|--------|--------|--------|------------------------------------|--------|--------|--------|--------|
| IV                    | 21UCZO4P1   | BIOCHEMISTRY<br>PRACTICAL |        |        |        |                                    | 30     | 1      |        |        |
| Course Outcomes (COs) | Programme Learning Outcomes (PLOs)  |                           |        |        |        | Programme Specific Outcomes (PSOs) |        |        |        |        |
|                       | PL O 1  | PLO 2                     | PL O 3 | PL O 4 | PL O 5 | PS O 1                             | PS O 2 | PS O 3 | PS O 4 | PS O 5 |
| CO-1                  | ☐   | ☐                         | ☐      | ☐      | ☐      | ☐                                  |        | ☐      | ☐      | ☐      |
| CO-2                  | ☐   | ☐                         | ☐      |        | ☐      | ☐                                  | ☐      | ☐      | ☐      | ☐      |
| CO-3                  | ☐   | ☐                         |        | ☐      | ☐      | ☐                                  |        |        | ☐      | ☐      |
| CO-4                  | ☐   | ☐                         | ☐      |        | ☐      | ☐                                  |        |        | ☐      | ☐      |
| CO-5                  | ☐   | ☐                         |        | ☐      | ☐      |                                    | ☐      | ☐      | ☐      | ☐      |
|                       | Number of matches (☐) = ...40....<br>Relationship = High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                           |        |        |        |                                    |        |        |        |        |

Prepared by

Checked by

Dr.M.Sithi Jameela

Name and Signature

Head of the Department

## Semester IV

|                     |  |
|---------------------|--|
| <b>Course Title</b> | <b>PLANT ANATOMY, PHYSIOLOGY &amp; BIOTECHNOLOGY</b> |
| <b>Total Hours</b>  | <b>60</b>  |
| <b>Hrs/Week</b>     | <b>4T+2P</b>   |
| <b>Sub.Code</b>     | <b>21UABT41</b>                                      |
| <b>Course Type</b>  | <b>Allied</b>  |
| <b>Credits</b>      | <b>3</b>   |
| <b>Marks</b>        | <b>100</b>   |

### General Objective:

To learn the concepts, scope, instrumentation, basic requirements and applied aspects of plant tissue culture besides plant physiology and anatomy in detail.

**Course Objectives:** The learners will be able to:

| <b>CO</b>   | <b>Course Objectives</b>   |
|-------------|--|
| <b>CO-1</b> | Understand the primary, secondary and anomalous, anatomical structure of plants besides inculcating the primary tissues.                                   |
| <b>CO-2</b> | Develop the knowledge in physiological process and learn the physiological mechanisms.   |
| <b>CO-3</b> | Determine the scope and importance of assimilatory function of plants.   |
| <b>CO-4</b> | Apply the knowledge in understanding about respiration and the physiological effects of hormones in plant growth.  |
| <b>CO-5</b> | Develop knowledge on plant tissue culture techniques and organize themselves to become entrepreneurs with the knowledge of bio-fertilizers in large scale. |

### UNIT I- PLANT ANATOMY

Root and shoot apical meristems; Simple and complex tissues. Primary structure of dicot and monocot stem, root. Secondary growth in dicot stem. Anomalous secondary growth- *Boerhaavia*. Annual ring.

### UNIT II- PLANT PHYSIOLOGY

Importance of water, water potential and its components; Diffusion, Imbibition & Osmosis. Absorption of water – Mechanism of water absorption – active and passive. Ascent of sap – Path and Mechanism, Cohesion theory. Root pressure and guttation. Transpiration -Types – Cellular, Stomatal, Lenticular and its significance; Factors affecting transpiration;–. Mechanism of Stomatal Transpiration. (Theories not needed). Antitranspirant.

### **UNIT III**

Photosynthesis – Ultra Structure of Chloroplast. Photosynthetic Pigment systems I and II. 'Z' scheme of electron transport – C<sub>3</sub> Cycle, factors affecting photosynthesis – significance of photosynthesis.

### **UNIT IV**

Respiration – Ultra Structure of Mitochondria. Types – Aerobic & Anaerobic, Glycolysis – Krebs's cycle. Growth Hormones – Discovery and Physiological role of Auxins and Gibberellin.

### **UNIT V- PLANT BIOTECHNOLOGY**

Plant tissue culture: Definition, Historical perspective, Scope & importance. Totipotency, Callus & Meristem Culture. Application of tissue culture. Biofertilizer – General account about the following microbes used as biofertilizer – *Rhizobium* – isolation, identification, mass multiplication of *Rhizobium*, BGA – *Spirulina*.

#### **TEXT BOOKS:**

1. Jain V. K. 1996 - Fundamentals of Plant Physiology 5<sup>th</sup> edition - S Chand & Co., New Delhi.
2. Kumar H. D. 1998 - Modern Concept of Biotechnology, Vikas Publishing House Ltd., New Delhi.

#### **REFERENCE BOOKS:**

1. Dubey R.C. 2001 A Text Book of Biotechnology, S. Chand & Co., New Delhi.
2. Thakur. K. and Bassi. K, 2007. Diversity of microbes and cryptogams. S.Chand & company Ltd. New Delhi.
3. M.S. Tayal, Plant Anatomy, Rostegi Publication. Meerat.
4. Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
5. Frank B. Salisbury, Cleon W. Ross. 1985. Plant Physiology. Wadsworth Publishing Company. University of Minnesota.

**Course Outcomes:** The learners would have learnt to:

| CO No. | Course Outcomes   | PSOs Addressed | Cognitive Level |
|--------|---|----------------|-----------------|
| CO-1   | Understand the various cells and tissues, meristem, epidermal and vascular tissue system in plants.                                 | 1,2            | Understanding   |
| CO-2   | Apply the basic principles of plant functions and cell physiology.  | 1,2,3          | Applying        |
| CO-3   | Explain the basic principles of photosynthesis in plant growth and development.   | 2,3            | Analyzing       |
| CO-4   | Estimate the importance of plant hormones.  | 3,4            | Evaluating      |
| CO-5   | Evaluate the various plant tissue culture techniques and applications of biotechnology in different fields to become entrepreneurs. | 4,5            | Evaluating      |

#### Relationship Matrix

| Semester   | Course Code                        | Title of the Course                                   |       |       |       |                                    | Hours | Credit |       |       |
|--|------------------------------------|---|-------|-------|-------|------------------------------------|-------|--------|-------|-------|
| IV   | 21UABT41                           | <b>PLANT ANATOMY, PHYSIOLOGY &amp; BIOTECHNOLOGY-</b> |       |       |       |                                    | 60    | 3      |       |       |
| Course Outcomes (COs)                                      | Programme Learning Outcomes (PLOs) |   |       |       |       | Programme Specific Outcomes (PSOs) |       |        |       |       |
|  | PL O1                              | PLO 2   | PL O3 | PL O4 | PL O5 | PS O1                              | PS O2 | PS O3  | PS O4 | PS O5 |
| CO-1   | ☐                                  | ☐   | -     | -     | -     | ☐                                  | ☐     | -      | -     | -     |
| CO-2   | ☐                                  | ☐   | ☐     | -     | ☐     | ☐                                  | ☐     | ☐      | -     | -     |
| CO-3   |                                    | ☐   | ☐     | -     | ☐     | -                                  | ☐     | ☐      | -     | -     |
| CO-4   | -                                  | ☐   | ☐     | ☐     | ☐     | -                                  | -     | ☐      | ☐     | -     |
| CO-5   | -                                  | -   | -     | ☐     | ☐     | -                                  | -     | -      | ☐     | ☐     |
| Number of matches (☐) = 26<br>Relationship = <b>Medium</b> |                                    |   |       |       |       |                                    |       |        |       |       |

Prepared by

Checked by

Name: Dr. M. SYED ALI FATHIMA

Head of the Department

Signature:

## Semester IV

|                     |   |
|---------------------|---|
| <b>Course Title</b> | <b>PLANT ANATOMY, PHYSIOLOGY AND BIOTECHNOLOGY PRACTICALS</b> |
| <b>Total Hours</b>  | <b>30</b>   |
| <b>Hrs/Week</b>     | <b>2</b>  |
| <b>Sub.Code</b>     | <b>21UABT3P1</b>  |
| <b>Course Type</b>  | <b>Allied (Practical)</b>                                     |
| <b>Credit</b>       | <b>1</b>  |
| <b>Marks</b>        | <b>100</b>  |

### General Objective:

To identify the various groups of non-flowering and flowering plants by taking sections of plant materials in anatomical and morphological interest.

**Course Objectives:** The learners will be able to:

| <b>CO</b>   | <b>Course Objectives</b>   |
|-------------|--|
| <b>CO-1</b> | Define the internal structures of stem and root.                                     |
| <b>CO-2</b> | Associate themselves with fundamentals of the major physiological aspects of plants. |
| <b>CO-3</b> | Explain the basic knowledge of physiological activities of plants.                   |
| <b>CO-4</b> | Assess the scope of biotechnology in the light of recent developments.               |
| <b>CO-5</b> | Predict the issues pertaining to plant tissue culture techniques.                    |

### Plant Anatomy:

1. Micropreparation and Identification of
  - a. Dicot Stem
  - b. Monocot Stem
  - c. Dicot Root
  - d. Monocot Root.
2. To observe and identify the following slides showing
  - a. Meristems – Shoot apex and root apex
  - b. Simple tissues.

**Plant Physiology:**

To demonstrate simple set up in Plant Physiology.

1. DPD (Diffusion Pressure Deficit)- Gravimetric Method. Transpiration Ganong's potometer experiment.
2. To demonstrate plasmolysis by using Tradescantia leaf.
3. Ganong's light screen experiment.
4. Transpiration- Stomatal Index.

**Plant Biotechnology:**

Photograph / model in Biotechnology.

1. Biofertilizer – Rhizobium/B.G.A./ Spirulina.
2. Tissue culture - Photograph (Callus & Meristem culture).
3. Industrial visit.

**REFERENCES:**

1. Pandey, B.P. 2010. Modern Practical Volume –III. S.Chand & company Ltd. New Delhi.
2. Pandey, B.P. 2010. Botany for degree students. S.Chand & Company Ltd. New Delhi.
3. Santra. S.C, Chatterjee, T.P and Das, A.P. 2005. College botany practical – Vol. I. New Central Book Agency (p) Ltd. India.

**Course Outcomes:** The learners would have learnt to:

| CO   | Course Outcomes  | PSOs Addressed | Cognitive Level |
|------|--|----------------|-----------------|
| CO-1 | Understand the anatomical features of stem and root during sectioning besides identifying the various plant tissues. | 1,2,3          | Understanding   |
| CO-2 | Demonstrate DPD, plasmolysis and transpiration in Plant Physiology.  | 1,2,3,4        | Applying        |
| CO-3 | Apply the basic knowledge of Ganong's light experiment and Transpiration-stomatal index in Plant Physiology.         | 1,2,4          | Applying        |
| CO-4 | Differentiate the plant tissue culture techniques such as callus and meristem culture.                               | 2,3,4          | Analyzing       |
| CO-5 | Compare the various bio-fertilizers.   | 1,3,4,5        | Evaluating      |

### Relationship Matrix

| Semester   | Course Code                        | Title of the Course   |       |       |       |                                    | Hours | Credit |       |       |
|--|------------------------------------|---|-------|-------|-------|------------------------------------|-------|--------|-------|-------|
| IV   | 21UABT4P<br>1                      | PLANT ANATOMY,<br>PHYSIOLOGY AND<br>BIOTECHNOLOGY<br>PRACTICALS |       |       |       |                                    | 30    | 1      |       |       |
| Course Outcomes (COs)                                    | Programme Learning Outcomes (PLOs) |   |       |       |       | Programme Specific Outcomes (PSOs) |       |        |       |       |
|  | PL O1                              | PLO 2   | PL O3 | PL O4 | PL O5 | PS O1                              | PS O2 | PS O3  | PS O4 | PS O5 |
| CO-1   | ☐                                  | ☐   | ☐     | -     | ☐     | ☐                                  | ☐     | ☐      | -     | -     |
| CO-2   | ☐                                  | ☐   | ☐     | ☐     | ☐     | ☐                                  | ☐     | ☐      | ☐     | -     |
| CO-3   | ☐                                  | ☐   | -     | ☐     | ☐     | ☐                                  | ☐     | -      | ☐     | -     |
| CO-4   | -                                  | ☐   | ☐     | ☐     | ☐     | -                                  | ☐     | ☐      | ☐     | -     |
| CO-5   | ☐                                  | ☐   | ☐     | ☐     | ☐     | ☐                                  | -     | ☐      | ☐     | ☐     |
| Number of matches (☐) = 39<br>Relationship = <b>High</b> |                                    |   |       |       |       |                                    |       |        |       |       |

Prepared by

Checked by

Name: Dr. M. SYED ALI FATHIMA

Head of the Department

Signature:



## Semester IV

|                     |                        |
|---------------------|------------------------|
| <b>Course Title</b> | <b>HERBAL MEDICINE</b> |
| <b>Total Hours</b>  | <b>30</b>              |
| <b>Hrs/Week</b>     | <b>2</b>               |
| <b>Sub.Code</b>     | <b>21USSS41</b>        |
| <b>Course Type</b>  | <b>SEC III</b>         |
| <b>Credits</b>      | <b>2</b>               |
| <b>Marks</b>        | <b>100</b>             |

### General Objectives:

To explore the uses of plants as medicine ranging from traditional to modern pharmaceutical methods in treating ailments besides creating awareness about the rich diversity of medicinal plants in India.

**Course Objectives:** The learners will be able to:

| <b>CO</b>   | <b>Course Objectives</b>  |
|-------------|---|
| <b>CO-1</b> | Discuss the history and relevance of medicinal plants in Indian system of medicine and subsequent marketing.        |
| <b>CO-2</b> | Understand the constraints in promotion and learning the therapeutical and pharmaceutical uses of medicinal plants. |
| <b>CO-3</b> | Categorize the plants according to the treatment of various diseases.   |
| <b>CO-4</b> | Experiment with the cultivation of some important medicinal plants.   |
| <b>CO-5</b> | Plan the cultivation of medicinal plants.   |

### UNIT I

Scope and importance of medicinal plants in the traditional systems of medicine and modern medicine- cultivation - harvesting - processing - storage - marketing and utilization of medicinal plants.

### UNIT II

Therapeutic and pharmaceutical uses of important plants used in the Ayurveda system of medicine. Concept of Rasayanadrugs.Siddha. Origin, concepts, therapeutic and pharmaceutical uses of important plants used in Siddha system of medicine. Unani: History, concept of Umoor-e-Tabiya (Fundamentals

### **UNIT III**

Plants used for the treatment of hepatic disorders, cardiac diseases, infertility, diabetes, blood pressure, cancer and skin diseases. Role of AYUSH in the promotion of medicinal plants.

### **UNIT IV**

Study of morphology, cultivation and medicinal uses of the following plants; Root- *Gloriosa*, Leaf -*Neem*.

### **UNIT V**

Study of morphology, cultivation and medicinal uses of the following plants; stem-turmeric, flower-catharanthus.

*Guest Lecturer on commercial utilization of herbal medicine.*

### **TEXT BOOKS:**

1. R.N.Chopra, S.L.Nayar and I.C.Chopra, 1956. Glossary of Indian medicinal plants, C.S.I.R, New Delhi.
2. Verma V 2009. Text book of Economic Botany. Ane Book.

### **REFERENCE BOOKS:**

1. Kanny, Lall, Dey and Raj Bahadur, 1984. The Indigenous Drugs of India. International Book Distributors.
2. V.V. Sivarajan and Balachandran Indra 1994, Ayurvedic Drugs and their Plant Source. Oxford IBH publishing Co.
3. Miller, Light and Miller, Bryan, 1998. Ayurveda and Aromatherapy. Banarsidass, Delhi.
4. Anne Green, 2000. Principles of Ayurveda. Thomsons, Lon.

**Course Outcomes:** The learners would have learnt to:

| CO   | Course Outcomes   | PSOs Addressed | Cognitive Level      |
|------|---|----------------|----------------------|
| CO-1 | Describe about the importance of medicinal plants in traditional and modern medicines.  | 1,2,3,4,       | <b>Understanding</b> |
| CO-2 | Explain the contribution of medicinal plants to traditional and modern medicine and the importance of holistic mode of treatment of the Indian traditional systems of medicine. | 1,2,3,4,5      | <b>Applying</b>      |
| CO-3 | Practice to cure diseases using medicinal plants.   | 1,3,5,         | <b>Applying</b>      |
| CO-4 | Prioritize to cultivate medicinal plants.   | 1,2,4          | <b>Analyzing</b>     |
| CO-5 | Assess the cultivation of medicinal plants.   | 1,2,3,4,5      | <b>Evaluating</b>    |

### Relationship Matrix

| Semester   | Course Code                        | Title of the Course |      |      |      |                                    | Hours | Credit |      |       |  |  |
|--|------------------------------------|---------------------|------|------|------|------------------------------------|-------|--------|------|-------|--|--|
| IV   | 21USBT62                           | HERBAL MEDICINE     |      |      |      |                                    | 30    | 2      |      |       |  |  |
| Course Outcomes (COs)                                    | Programme Learning Outcomes (PLOs) |                     |      |      |      | Programme Specific Outcomes (PSOs) |       |        |      |       |  |  |
|  | PLO1                               | PLO2                | PLO3 | PLO4 | PLO5 | PSO 1                              | PSO2  | PSO3   | PSO4 | PSO 5 |  |  |
| CO-1   | ☐                                  | ☐                   | ☐    | ☐    | ☐    | ☐                                  | ☐     | ☐      | ☐    | -     |  |  |
| CO-2   | ☐                                  | ☐                   | ☐    | ☐    | ☐    | ☐                                  | ☐     | ☐      | ☐    | ☐     |  |  |
| CO-3   | ☐                                  | ☐                   | ☐    | -    | ☐    | ☐                                  | -     | ☐      | -    | ☐     |  |  |
| CO-4   | ☐                                  | ☐                   | -    | ☐    | ☐    | ☐                                  | ☐     | -      | ☐    | -     |  |  |
| CO-5   | ☐                                  | ☐                   | ☐    | ☐    | ☐    | ☐                                  | ☐     | ☐      | ☐    | ☐     |  |  |
| Number of matches (☐) = 43<br>Relationship = <b>High</b> |                                    |                     |      |      |      |                                    |       |        |      |       |  |  |

Prepared by

Checked by

Name: Dr. M. SYED ALI FATHIMA

Head of the Department

Signature:

### Semester – IV

|                     |                     |
|---------------------|---------------------|
| <b>Course Title</b> | <b>DIET THERAPY</b> |
| <b>Total Hrs</b>    | <b>30</b>           |
| <b>Hrs/ Week</b>    | <b>2</b>            |
| <b>Sub.Code</b>     | <b>21USAN41</b>     |
| <b>Course Type</b>  | <b>SEC</b>          |
| <b>Credits</b>      | <b>2</b>            |
| <b>Marks</b>        | <b>100</b>          |

#### **General Objective:**

This course covers the planning and preparation of therapeutic diets for various disease condition.

Course Objectives: The learners will be able to

| <b>Co.No.</b> | <b>Course Objectives</b>  |
|---------------|---|
| CO-1          | Understand the responsibilities of a Dietician in a hospital.             |
| CO-2          | Establish the etiology and dietary management in Obesity and Underweight. |
| CO-3          | Classify the cause for diarrhoea and constipation.                        |
| CO-4          | Summarize the etiology and dietary modification for febrile condition.    |
| CO-5          | Modify the diet based on various disease conditions.                      |

#### **UNIT I Therapeutic Diet**

Definition of dietetics – purpose of diet therapy – factors considered in planning therapeutic diets

Routine hospital diets – Clear fluid diet, full fluid diet, soft diet, regular normal diet, Preoperative diet and postoperative diet

#### **UNIT II Obesity & Underweight**

Obesity - etiology, assessment, types of obesity and principles of dietary management.

Under weight- etiology, nutrition and food requirements

### **UNIT III Diarrhoea & Constipation**

Diarrhea- Etiology, types and dietary modification.

Constipation – Etiology, types and dietary modification.

### **UNIT IV Peptic Ulcer & Fever**

Peptic ulcer- Etiology, symptoms and dietary modification

Fever- etiology, types, symptoms and dietary modification

### **UNIT V Diabetes Mellitus & Hypertension**

Diabetic mellitus- causes, types, symptoms and dietary modification

Hypertension- causes, types, symptoms and dietary management

### **TEXT BOOK**

B. Srilakshmi, Dietetics, 7<sup>th</sup> Edition, 2014, New age International (P) limited publishers.

### **REFERENCE BOOKS:**

1. Krause's text book of nutrition and diet therapy, (2004), Macmillan Publishers.
2. Gopalan, C. Ramashasthri, B.V. and Balasubramanian-Nutritive Value of Indian Foods, NIN, ICMR, 1998.
3. Gu thrie and Boston, Introductory Nutrition, 1989, VIII Edition.
4. Robinson C.H. and Lawery M. Normal and therapeutic nutrition, Macmillan Publishing Co., New York, 1990.

### Course Outcomes

| CO. No. | Course Outcomes   | PSO     | Cognitive level |
|---------|---|---------|-----------------|
| CO-1    | Understanding the concepts of therapeutic diet.                               | 1,3,4,5 | Understanding   |
| CO-2    | Practice diet counselling for various disease conditions.                     | 3,4,5   | Applying        |
| CO-3    | Point out the principles of dietary management in diarrhoea and constipation. | 3,4,5   | Analyzing       |
| CO-4    | Recommend the dietary modification in peptic ulcer and fever.                 | 1,3,4,5 | Evaluating      |
| CO-5    | Plan the diet based on various disease conditions.                            | 1,3,4,5 | Creating        |

### Relationship Matrix

| Semester              | Code  | Title of the course       |      |      |      |                                    | Hours | Credit |       |       |  |  |
|-----------------------|---|---------------------------|------|------|------|------------------------------------|-------|--------|-------|-------|--|--|
| I                     | ---   | Medical Nutrition Therapy |      |      |      |                                    | 4     | 4      |       |       |  |  |
| Course Outcomes (COS) | Programme Out Come (POS)  |                           |      |      |      | Programme Specific Outcomes (PSOs) |       |        |       |       |  |  |
|                       | P O1  | P O2                      | P O3 | P O4 | P O5 | PS O1                              | PS O2 | PS O3  | PS O4 | PS O5 |  |  |
| CO-1                  | ☐   | ☐                         | ☐    | ☐    |      | ☐                                  |       | ☐      | ☐     | ☐     |  |  |
| CO-2                  | ☐   | ☐                         | ☐    | ☐    |      |                                    |       | ☐      | ☐     | ☐     |  |  |
| CO-3                  | ☐   | ☐                         | ☐    | ☐    |      |                                    |       | ☐      | ☐     | ☐     |  |  |
| CO-4                  | ☐   | ☐                         | ☐    | ☐    |      | ☐                                  |       | ☐      | ☐     | ☐     |  |  |
| CO-5                  | ☐   | ☐                         | ☐    | ☐    |      | ☐                                  |       | ☐      | ☐     | ☐     |  |  |
|                       |   |                           |      |      |      |                                    |       |        |       |       |  |  |
|                       | Number of matches (☐) = 38<br>Relationship = Low/Medium/ <b>High</b><br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                           |      |      |      |                                    |       |        |       |       |  |  |

Prepared by

Checked by

**F. Fathima Farzana**  
**Assistant Professor,**  
**Department of Applied Nutrition and Public Health**

## Semester – IV

|                     |                           |
|---------------------|---------------------------|
| <b>Course Title</b> | <b>HEALTH AND FITNESS</b> |
| <b>Total Hrs</b>    | 30                        |
| <b>Hrs/Week</b>     | 2                         |
| <b>Subject Code</b> | <b>21UNAN41</b>           |
| <b>Course Type</b>  | NME                       |
| <b>Credits</b>      | 2                         |
| <b>Marks</b>        | 100                       |

### General Objective:

This course covers the importance of diet in health and fitness.

The learners will be able to

| <b>Co. No.</b> | <b>Course Objectives</b>   |
|----------------|--|
| CO-1           | Define the concept of health and fitness                               |
| CO-2           | Understand the importance of physical activity and mental health.      |
| CO-3           | Focus on the importance of Nutritional Assessment in Physical Fitness. |
| CO-4           | Evaluate the importance of weight management                           |
| CO-5           | Construct the relationship between fitness and nutrition.              |

### UNIT I

Health-Definitions, concept of health, changing concepts, dimensions of health, concept of well being, determinants of health, ecology of health, right to health, responsibility for health and indicators of health.

### UNIT II

Physical, mental, social and positive health; Spectrum of health. Millennium development goals; Primary Health Care; Health situation in

India.

### UNIT III

Physical fitness- definition, factor affecting physical fitness, importance of physical fitness. Assessment of physical fitness- Body Weight, Height, BMI, Broka Index, Waist circumference, Hip Circumference, Waist to Hip Ratio.

### UNIT: IV

Techniques For Obtaining Relevant Information - General Profile, Medical History and Clinical Information; Dietary Diagnosis - Assessing food and nutrient intakes; Lifestyles-physical activity and stress,

### UNIT: V

The Counselor ethical Codes and Guidelines, The Counselor's legal Responsibility and dimensions of Confidentiality; Rights of Clients .

### TEXT BOOK

1. B. Srilakshmi, Nutrition Science, 6<sup>th</sup> Edition, 2018, New age International (P) limited publishers.
2. B.Srilakshmi, Dietetics, 7<sup>th</sup> Edition, 2014, New age International (P) limited publishers.

### References:

1. K. Park Text book of Preventive and social medicine, 15th edition, MIS Banarsidas Bhano Publishers, Jabalpur, 1997.
2. Guthrie, H.A., "Introductory Nutrition", 6th ed., Times Mirror/Mosby College Publ. – St Louis 1989.
3. Whitney E.N., Hamilton E.N. & Raffles S.R., "Understanding Nutrition", 5th ed. West Pub.Co. New York.

### Course Outcomes

| CO. No. | Course Outcomes  | PSOs Addressed | Cognitive level |
|---------|--|----------------|-----------------|
| CO-1    | Understand the significance of ethical codes and guidelines. | 1,3,5          | Understanding   |
| CO-2    | Apply knowledge to treat common health problems..            | 1,3,5          | Applying        |
| CO-3    | Explain the relationship between fitness and nutrition.      | 1,3,4,5        | Analyzing       |
| CO-     | Assess the physical fitness with food and nutrient intakes.  | 1,3,5          | Evaluating      |



|      |   |     |          |
|------|---|-----|----------|
| 4    |   |     |          |
| CO-5 | Organise camps to prevent public health problems in the society | 1,5 | Creative |

### Relationship Matrix

| Semester              | Course Code   | Title of the Course      |                          |                          |      |                                    | Hours | Credit                   |                          |                          |  |  |
|-----------------------|---|--------------------------|--------------------------|--------------------------|------|------------------------------------|-------|--------------------------|--------------------------|--------------------------|--|--|
| IV                    | 21UNAN41  | HEALTH AND FITNESS       |                          |                          |      |                                    | 2     | 2                        |                          |                          |  |  |
| Course Outcomes (COs) | Programme Learning Outcomes (PLOs)  |                          |                          |                          |      | Programme Specific Outcomes (PSOs) |       |                          |                          |                          |  |  |
|                       | PO 1  | PO 2                     | PO 3                     | PO 4                     | PO 5 | PSO 1                              | PSO 2 | PSO 3                    | PSO 4                    | PSO 5                    |  |  |
| CO-1                  | <input type="checkbox"/>  | <input type="checkbox"/> |                          | <input type="checkbox"/> |      | <input type="checkbox"/>           |       | <input type="checkbox"/> |                          | <input type="checkbox"/> |  |  |
| CO-2                  | <input type="checkbox"/>  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |      | <input type="checkbox"/>           |       | <input type="checkbox"/> |                          | <input type="checkbox"/> |  |  |
| CO-3                  | <input type="checkbox"/>  | <input type="checkbox"/> |                          | <input type="checkbox"/> |      | <input type="checkbox"/>           |       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  |  |
| CO-4                  | <input type="checkbox"/>  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |      | <input type="checkbox"/>           |       | <input type="checkbox"/> |                          | <input type="checkbox"/> |  |  |
| CO-5                  | <input type="checkbox"/>  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |      |                                    |       | <input type="checkbox"/> |                          |                          |  |  |
|                       | Number of matches ( <input type="checkbox"/> ) = 32<br>Relationship = Low/ <b>Medium</b> /High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                          |                          |                          |      |                                    |       |                          |                          |                          |  |  |

Prepared by  
Name: F. Fathima Farzana  
Signature:

Checked by  
Head of the Department

## Semester – V

|                     |                          |
|---------------------|--------------------------|
| <b>Course Title</b> | <b>ANIMAL PHYSIOLOGY</b> |
| <b>Total Hrs</b>    | <b>75</b>                |
| <b>Hrs/Week</b>     | <b>5</b>                 |
| <b>Sub.Code</b>     | <b>21UCZO51</b>          |
| <b>Course Type</b>  | <b>THEORY</b>            |
| <b>Credits</b>      | <b>4</b>                 |
| <b>Marks</b>        | <b>100</b>               |

### General Objectives:

To understand the importance of Bio molecules , structure and function of various organs in animals

**Course Objectives:** The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>                                      |
|---------------|---|
| CO-1          | Recognize the digestion and absorption of biomolecules.       |
| CO-2          | Identify different blood components and structure of heart    |
| CO-3          | Differentiate among the nitrogenous wastes                    |
| CO-4          | Evaluate the Physio - chemical properties of skeletal muscles |
| CO-5          | Integrate the types and functions of endocrine glands         |

### UNIT I - Nutrients and Digestion

Elements of Nutrition- Vitamins & Minerals.Digestion - Intracellular and Intercellular. Digestion and absorption of carbohydrate, protein and fat. Gastrointestinal Hormones.

### UNIT II - Respiratory System and Circulatory System

Types of respiratory organs, respiratory pigments, transport and exchange of gases – control of respiration, anaerobiosis – respiratory quotient –Basic,Standard and Active Metabolism.

Blood - composition, function and coagulation. - Structure and function of human heart – ECG – Heart diseases

### UNIT III - Excretory System

Types of nitrogenous wastes – Ammonotelism, Ureotelism and Uricotelism – Structure and function of human Kidney – Physiology of Urine formation .

Homeostasis - Osmoregulation in crustaceans (Astacus) and fishes (Marine and freshwater teleosts), .Mechanism of thermoregulation in ectotherms and endotherms.

### UNIT IV – Muscular and Nervous system

Types of muscles - Ultra structure of skeletal muscle ; physico - chemical properties – mechanism of muscle contraction.

Structure and types of neurons - nerve impulse - conduction of impulse through nerve – synapse – myoneural junction - reflex action.

**UNIT V - Endocrine systems and Chronobiology**Endocrine glands – Pituitary, Thyroid, Parathyroid, Adrenal and Pancreas. Menstrual cycle and Oestrous cycle – the role of hormones – Menopause, Pregnancy and Parturition.Biological rhythms – exogenous and endogenous rhythms – concept of biological clocks - survey of biological rhythms in animals and human.

**TEXT BOOKS**

Agarwal, V.K. and Verma .P.S. 2000 –Animal Physiology and Biochemistry, S. Chand & Company Limited.

**REFERENCE BOOKS**

1. Goel, K.A., Sastri, K.V. 1982. Text Book of Animal Physiology, Rastogi Publications.
2. Arora, M.P., 2018. Animal Physiology . Himalaya Publishing House
3. Richard, W.Hill Gordon. 2006 - Animal Physiology ANE Book Publishers

**Course Outcomes**

| CO No. | Upon completion of this course, students will be able to:                                | PSO addressed | Cognitive level |
|--------|--|---------------|-----------------|
| CO-1   | Classify the role and functions of different bio molecules.                              | 1,3,4,5       | Understanding   |
| CO-2   | Determine the physiology at cellular and system levels in vertebrates and invertebrates. | 2,4           | Applying        |
| CO-3   | Illustrate the physiology of respiratory, renal, endocrine and reproductive systems .    | 1,3,5         | Analysing       |
| CO-4   | Assess the physiological parameters measured in Mammals.                                 | 2,4,5         | Evaluating      |
| CO-5   | Report on the importance of proteins, carbohydrates and fats.                            | 1,3,4,5       | Creating        |

**Relationship Matrix**

| Semester  | Course Code                        | Title of the Course      |                          |                          |                          |                                    | Hours                    | Credit                   |                          |                          |  |  |
|---|------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--|--|
| V   | 21UCZO51                           | THEORY                   |                          |                          |                          |                                    | 75                       | 4                        |                          |                          |  |  |
| Course Outcomes (COs)   | Programme Learning Outcomes (PLOs) |                          |                          |                          |                          | Programme Specific Outcomes (PSOs) |                          |                          |                          |                          |  |  |
|   | PL O 1                             | PLO 2                    | PL O 3                   | PL O 4                   | PL O 5                   | PS O 1                             | PS O 2                   | PS O 3                   | PS O 4                   | PS O 5                   |  |  |
| CO-1  | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>           |                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  |  |
| CO-2  | <input type="checkbox"/>           |                          | <input type="checkbox"/> |                          | <input type="checkbox"/> |                                    | <input type="checkbox"/> |                          | <input type="checkbox"/> |                          |  |  |
| CO-3  |                                    | <input type="checkbox"/> |                          |                          |                          | <input type="checkbox"/>           |                          | <input type="checkbox"/> |                          | <input type="checkbox"/> |  |  |
| CO-4  | <input type="checkbox"/>           |                          | <input type="checkbox"/> |                          | <input type="checkbox"/> |                                    | <input type="checkbox"/> |                          | <input type="checkbox"/> | <input type="checkbox"/> |  |  |
| CO-5  | <input type="checkbox"/>           | <input type="checkbox"/> |                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>           |                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  |  |
| Number of matches ( <input type="checkbox"/> ) = ...32....<br>Relationship = Medium |                                    |                          |                          |                          |                          |                                    |                          |                          |                          |                          |  |  |

Prepared by  
Dr.S.Peer Mohamed  
Name and Signature

Checked by  
Head of the Department

### Semester – V

|                     |                 |
|---------------------|-----------------|
| <b>Course Title</b> | <b>GENETICS</b> |
| <b>Total Hrs</b>    | <b>60</b>       |
| <b>Hrs/Week</b>     | <b>4</b>        |
| <b>Sub.Code</b>     | <b>21UCZO52</b> |
| <b>Course Type</b>  | <b>THEORY</b>   |
| <b>Credits</b>      | <b>4</b>        |
| <b>Marks</b>        | <b>100</b>      |

#### General Objective:

The course focuses on to acquire knowledge on the basic principles of Mendelian inheritance, autosomal and allosomal anomalies.

#### Course Objectives: The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>   |
|---------------|--|
| CO-1          | Understand the pattern of inheritance and types of blood groups based on multiple alleles. |
| CO-2          | Apply the mathematical and computational tools in genetical studies.                       |
| CO-3          | Compare and contrast the types of twins.   |
| CO-4          | Evaluate the chromosomal and gene mutation.  |
| CO-5          | Develop the mapping of chromosome in various species of bacteria.                          |

#### UNIT I - Mendelian Inheritance

Genetics: scope and importance. Mendelian inheritance - Mendelian laws. Simple Mendelian traits in man. Multiple alleles - A, B, O blood groups, Rh factors in man. Multiple genic inheritance - skin colour in man. Phenotypic ratio-Co-dominance, Incomplete dominance, epistasis, lethal genes, Penetrance, Expressivity and Pleiotropism. Linkage, Crossing over.

#### UNIT II – Sex Linked Inheritance and Syndrome

Sex determination in man, Sex chromosomes and sex linked inheritance in man, sex influenced genes and sex limited genes. Non-disjunction in man (Klinefelter's syndrome, Turner's syndrome and Down's syndrome), Y linked inheritance – Holandric genes. Extra Chromosomal inheritance – Shell coiling in Snail and Kappa particles in Paramecium.

#### UNIT III – Human Genetics

**Pedigree analysis**, Human Chromosomes - Karyotype, ideogram, Human metabolic disorders & diseases- Phenyl ketonuria, Alkaptonuria, Albinism, Sickle cell anemia and Thalassaemia. One gene, one enzyme theory. Inbreeding and out breeding. Eugenics, Euthenics, Genetic Counseling, Twins – types and significance.

#### **UNIT IV – Aberration of Chromosomes**

Fine structure of gene –Cistron, Recon and Muton. Gene Mutation – types and effects (Deletion, Duplication, Inversion and Translocation) (Chronic Myeloid Leukemia) and deletion (“cry of cat” syndrome), Chromosomal mutation– Ploidy – Euploidy- Polyploidy and Aneuploidy. Chromosomal aberration - Structural aspects.

#### **UNIT V – Microbial Genetics**

Bacterial genetics, Conjugation, Transformation, Transduction and Sexduction, Mapping of Bacterial chromosome.

Viral Genetics –T<sub>4</sub>Phage - Lytic and lysogenic cycle

#### **TEXT BOOKS:**

1. Verma, P. S. and Agarwal V .K. Genetics ,S Chand Publishing; Ninth edition, 2010.
2. Bhamrah, H. S. A Text Book of Genetics. Anmol Publications Private Limited. 1997.

#### **REFERENCE BOOKS**

1. Singh B.D. Genetics, Kalyani publishers, 2019.
2. Gupta P. K. Elements of Genetics. Rastogi Publications, 2008.
3. Gardner, E.J. Principles of Genetics. 8<sup>th</sup> edition. John Wiley, 2015.
4. Verma, P.S. and Agarwal, V.K. Genetics. 9<sup>th</sup> revised edition S, Chand & Co Limited. 2010.
5. Carroll S.B.; Doebley J.; Griffiths, A.J.F. and Wessler, S.R. An Introduction to Genetic Analysis. W. H. Freeman and Co. Ltd. (2018)

#### **Course Outcomes**

| <b>CO No.</b> | <b>Course Outcomes</b>  | <b>PSOs Addressed</b> | <b>Cognitive Level</b> |
|---------------|---|-----------------------|------------------------|
| CO-1          | Trace the basic laws of heredity citing Mendelian laws.                 | 1,3,5                 | U                      |
| CO-2          | Discover the pattern of sex determination in humans and animals.        | 1,2,3,4               | AP                     |
| CO-3          | Explain the genetic background in human metabolic disorders and twins.  | 1,2,3,5               | AN                     |
| CO-4          | Assess the difference between the types of gene mutation.               | 1,3,5                 | E                      |
| CO-5          | Speculate on the consequences and impact of mutations on the community. | 1,2,3,5               | C                      |

### Relationship Matrix

| Semester              | Course Code   | Title of the Course |        |        |       |                                    | Hours  | Credit |        |        |  |
|-----------------------|---|---------------------|--------|--------|-------|------------------------------------|--------|--------|--------|--------|--|
| V                     | 21UCZO51  | GENETICS            |        |        |       |                                    | 60     | 4      |        |        |  |
| Course Outcomes (COs) | Programme Learning Outcomes (PLOs)  |                     |        |        |       | Programme Specific Outcomes (PSOs) |        |        |        |        |  |
|                       | PL O 1  | PLO 2               | PL O 3 | PL O 4 | PLO 5 | PSO 1                              | PS O 2 | PS O 3 | PS O 4 | PS O 5 |  |
| CO-1                  | ☐   |                     | ☐      | ☐      | ☐     | ☐                                  |        | ☐      |        | ☐      |  |
| CO-2                  | ☐   | ☐                   | ☐      |        | ☐     | ☐                                  | ☐      | ☐      | ☐      |        |  |
| CO-3                  | ☐   | ☐                   | ☐      | ☐      |       | ☐                                  | ☐      | ☐      |        | ☐      |  |
| CO-4                  |   | ☐                   | ☐      | ☐      | ☐     | ☐                                  |        | ☐      |        | ☐      |  |
| CO-5                  |   | ☐                   | ☐      |        | ☐     | ☐                                  | ☐      | ☐      |        | ☐      |  |
|                       | Number of matches (☐) = ...37....<br>Relationship = High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                     |        |        |       |                                    |        |        |        |        |  |

Prepared by

Dr.M.Sithi Jameela

Signature

Checked by

Head of the Department

## Semester - V

|                     |                    |
|---------------------|--------------------|
| <b>Course Title</b> | <b>Aquaculture</b> |
| <b>Total Hrs</b>    | <b>60</b>          |
| <b>Hrs/Week</b>     | <b>4</b>           |
| <b>Sub.Code</b>     | <b>21UCZO52A</b>   |
| <b>Course Type</b>  | <b>Theory</b>      |
| <b>Credits</b>      | <b>4</b>           |
| <b>Marks</b>        | <b>100</b>         |

### General Objective:

To familiarize students with different practices of aquaculture and develop entrepreneur skills in the respective field.

### Course Objectives: The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>  |
|---------------|---|
| CO-1          | Understand the varied practices in Aquaculture.                     |
| CO-2          | Apply Cryopreservation techniques in aquaculture.                   |
| CO-3          | Distinguish between the different types of integrated fish farming. |
| CO-4          | Predict the different types of fish diseases.                       |
| CO-5          | Propose innovative methods of fish Harvesting .                     |

### UNIT I - Introduction

Scope of Aquaculture - Aquaculture in India – Freshwater, Coastal and Marine aquaculture –Site selection- Pond construction - Maintenance of pond - Types of fish ponds- Nursery pond, Rearing pond and culture pond.

### UNIT – II - Culture Practices

Biology of Indian major carps –Fin fish culture: collection of seeds and transportation of seeds – natural breeding, induced breeding, Marine prawn culture –*Penaeus monodon* - Transgenic fish production – Ploidy and Induction – Cryopreservation. Culture practices in Edible oyster: collection of seeds – induced breeding.

### UNIT – III – Types of Culture

Types of culture: extensive - semi-intensive and intensive culture – monoculture - monosex culture – polyculture - cage culture - pen culture – seaweed culture - integrated fish farming – paddy cum fish culture - poultry cum fish culture - pig cum fish culture - sewage fed fish culture.

### UNIT- IV - Fish Feed and Diseases

Fish feed: artificial feed – feed formulation – need - ingredients ratio – square method– pellets. Live feeds and their culture: *Artemia* and Rotifer – Seaweed culture. Fish Diseases: bacterial, viral, fungal, ecto and endo-parasitic diseases and nutritional deficiency diseases.

## UNIT – V - Harvesting and Post-harvest Technology

Methods of fish harvesting – craft (Kattumaram and Trawlers) and gears (Gill net and trap net) used for inland and marine fisheries - Fish preservation – fishery by-products. Role of government organizations-CMFRI – CIFRI – FFDA - CIFT – CIFE - MPEDA – CIBA etc.

### TEXT BOOKS

1. Sandhu, G.S. 2010. A text book of fish and Fisheries of India. Wisdom Press, New Delhi.
2. N.Arumugam, Saras Publications, 114/35G, A.R.P. Camp Road, Periyavilai, Kottar Po, Nagercoil – 629002.

### REFERENCE BOOKS

1. Jhingran, V.G.(1997) Fish and fisheries of India. Hindustan Publishing Corporation (India), Delhi
2. Santhanam, R., N. Sukumaran and P. Natarajan.,(1990) A manual of freshwater aquaculture.Oxford & IBH Publishing Co. Pvt. Ltd., 66 Janpath, New Delhi – 110 001.
3. Sundararaj, V. and B. Srikrishnadhas,(2000) Cultivable aquatic organisms, Narendra Publishing House, 1417, Krishnan Dutt Street, Maliwara, Delhi – 110 006.
4. Pillai, T.V.R., Aquaculture and the environment. 1<sup>st</sup> edition, Fishing news Books, England, 1992.
5. Pandian, T.J., Sustainable indian fisheries, 2001
6. Samuel Paulraj., Shrimp farming techniques, problems and solutions-1995
7. Kurian, C.V and V.O. Sebastian. Prawns and prawn fisheries of India IV edition 1993
8. Victor, A.C., A. Chellam, S. Dharmaraj and T.S. Velayudhan, Manual on pearl oyster seed production, farming and pearl culture, CMFRI Special publication-1995
9. Vijayan, K.K. et al., 2007. Indian Fisheries: A progressive outlook. CMFRI Publications, Kochi.

### Course Outcomes

| CO No. | Course Outcomes   | PSOs Addressed | Cognitive Level |
|--------|---|----------------|-----------------|
| CO-1   | Describe the complete protocol of pond construction and management in freshwater Aquaculture. | 1,2,4,5        | Understanding   |
| CO-2   | Execute induced culture of breeding in Prawns.  | 1.2,3,4,5      | Applying        |
| CO-3   | Explain the diverse culture systems of inland fisheries.                                      | 1.2,4,5        | Analysing       |
| CO-4   | Assess the steps involved in artificial Fish Feed formulation.                                | 1,2,4          | Evaluating      |
| CO-5   | Devise suitable mechanism to use in fish harvesting.  | 1,2,4          | Creating        |



**Relationship Matrix**

| <b>Semester</b>              | <b>Course Code</b>                                    | <b>Title of the Course</b> |              |              |              |              |   | <b>Hours</b> |              | <b>Credit</b> |              |  |
|------------------------------|---|----------------------------|--------------|--------------|--------------|--------------|---|--------------|--------------|---------------|--------------|--|
| <b>I</b>                     | <b>21UCZ052</b>                                       | <b>AQUACULTURE</b>         |              |              |              |              |   | <b>60</b>    |              | <b>4</b>      |              |  |
| <b>Course Outcomes (COS)</b> | <b>Programme Learning Outcomes (PLOs)</b>             |                            |              |              |              |              | <b>Programme Specific Outcomes (PSOs)</b> |              |              |               |              |  |
|                              | <b>PLO 1</b>  | <b>PLO 2</b>               | <b>PLO 3</b> | <b>PLO 4</b> | <b>PLO 5</b> | <b>PLO 6</b> | <b>PSO 1</b>                              | <b>PSO 2</b> | <b>PSO 3</b> | <b>PSO 4</b>  | <b>PSO 5</b> |  |
| CO-1                         | □   | □                          | □            |              | □            |              | □   | □            |              | □             | □            |  |
| CO-2                         | □   | □                          |              | □            |              |              | □   | □            | □            | □             | □            |  |
| CO-3                         | □   | □                          |              | □            |              |              | □   | □            |              | □             | □            |  |
| CO-4                         | □   | □                          |              | □            |              |              | □   | □            |              | □             |              |  |
| CO-5                         | □   | □                          |              | □            | □            |              | □   | □            |              | □             |              |  |
|                              | Number of matches (□) = .....36<br>Relationship =High |                            |              |              |              |              |   |              |              |               |              |  |

Prepared by  
Dr.S.MohamedRamlath Sabura

Checked by

Signature

Head of the Department

## Semester – V

|                     |  |
|---------------------|--|
| <b>Course Title</b> | <b>ANIMAL PHYSIOLOGY AND GENETICS PRACTICALS</b> |
| <b>Total Hrs</b>    | <b>60</b>  |
| <b>Hrs/Week</b>     | <b>4</b>   |
| <b>Sub.Code</b>     | <b>21UCZO5P1</b>                                 |
| <b>Course Type</b>  | <b>THEORY</b>                                    |
| <b>Credits</b>      | <b>2</b>   |
| <b>Marks</b>        | <b>100</b>                                       |

### General Objectives:

To study and demonstrate the various experiments to detect Blood groups, Nitrogenous waste products and effects of temperature on functional activities of Animals.

### Course Objectives: The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>  |
|---------------|---|
| CO-1          | Identify the rate of oxygen consumption in fish.  |
| CO-2          | Interpret various qualitative tests for findout nitrogenous waste products present of fish and mammals. |
| CO-3          | Examine the monohybrid and dihybrid breedings   |
| CO-4          | Evaluate ABO blood grouping system  |
| CO-5          | Formulate Red blood cells and White blood cells in Humans   |

### ANIMAL PHYSIOLOGY

1. Rate of Oxygen consumption in a fish (to be done individually).
2. Effect of temperature on operculum movement of fresh water fish. Calculation of  $Q_{10}$ . (to be done individually).
3. Effect of temperature on salivary amylase activity.
4. Detection of Nitrogenous waste products of fish (ammonia), birds (uric acid)&mammals (urea) ( to be done individually).
5. Estimation of Hemoglobin by hemoglobinometer
6. Estimation of RBC using Haemocytometer
7. Estimation of WBC using Haemocytometer
8. Human blood smear (Preparation and Observation of different blood cells)
9. Demonstration of blood pressure with Sphygmomanometer.
10. Models, charts and photos:
  - a) Simplemuscletwitch
  - b) Sphygmomanometer
  - c) Haemoglobinometer
  - d) Haemocytometer
  - e) Reflex arc model
  - f) ECG model
  - g) Kymograph

### GENETICS

1. Observation of Simple Mendelian traits in man - to be recorded.

2. Blood group to be analyzed in a population with a minimum of 30 students.
3. Breeding experiments to be illustrated with beads
  - a) Monohybrid
  - b) Dihybrid
4. Observation and study of polygenic inheritance of quantitative traits to be interpreted in graphs.
  - a) Height of students
  - b) Weight of students
5. Spotters
  - a) Syndromes – Down's syndrome, Turner's syndrome & Klinefelter's Syndrome.
  - b) Sex linked Inheritance-Colour blindness, Hemophilia& Hypertrichosis
  - c) DNA model
  - d) Sickle cell anaemia
  - e) Types of twins
  - f) T<sub>4</sub>Phage - Lytic cycle
  - g) T<sub>4</sub>Phage - lysogenic cycle
  - h) Pedigree chart

### COURSE OUTCOMES

| CO No. | Upon completion of this course, students will be able to:  | PSO addressed | Cognitive level |
|--------|--|---------------|-----------------|
| CO-1   | Estimate the effect of temperature on opercular movement and the rate of oxygen consumption in a fish. | 1,2,4,5       | Understanding   |
| CO-2   | Examine various nitrogenous waste products of animals.   | 1,3,4         | Applying        |
| CO-3   | Experiment the Mendelian traits and blood group in Man.  | 2,3,4,5       | Analysing       |
| CO-4   | Evaluate RBC, WBC and Haemoglobin in man.  | 1,2,3,5       | Evaluating      |
| CO-5   | Collaborate the multiple procedures in Physiology and Genetics.  | 1,2,4         | Creating        |

### Relationship Matrix

| Semester              | Course Code  | Title of the Course  |                          |                          |                          |                                    | Hours                    | Credit                   |                          |                          |  |  |
|-----------------------|--|--|--------------------------|--------------------------|--------------------------|------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--|--|
| V                     | 21UCZO5P1  | <b>ANIMAL<br/>PHYSIOLOGY<br/>AND GENETICS<br/>PRACTICALS</b> |                          |                          |                          |                                    | 60                       | <b>4</b>                 |                          |                          |  |  |
| Course Outcomes (COs) | Programme Learning Outcomes (PLOs)   |  |                          |                          |                          | Programme Specific Outcomes (PSOs) |                          |                          |                          |                          |  |  |
|                       | PL O 1   | PLO 2  | PL O 3                   | PL O 4                   | PL O 5                   | PS O 1                             | PS O 2                   | PS O 3                   | PS O 4                   | PS O 5                   |  |  |
| CO-1                  | <input type="checkbox"/>   |  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>           | <input type="checkbox"/> |                          | <input type="checkbox"/> | <input type="checkbox"/> |  |  |
| CO-2                  | <input type="checkbox"/>   | <input type="checkbox"/>                                     | <input type="checkbox"/> |                          | <input type="checkbox"/> | <input type="checkbox"/>           |                          | <input type="checkbox"/> | <input type="checkbox"/> |                          |  |  |
| CO-3                  | <input type="checkbox"/>   | <input type="checkbox"/>                                     |                          | <input type="checkbox"/> |                          |                                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  |  |
| CO-4                  |  | <input type="checkbox"/>                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/> |  |  |
| CO-5                  |  | <input type="checkbox"/>                                     | <input type="checkbox"/> |                          | <input type="checkbox"/> | <input type="checkbox"/>           | <input type="checkbox"/> |                          | <input type="checkbox"/> |                          |  |  |
|                       | Number of matches ( <input type="checkbox"/> ) = ...36....<br>Relationship = High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |  |                          |                          |                          |                                    |                          |                          |                          |                          |  |  |

Prepared by

Checked by

Dr.S.Peer Mohamed

Signature

Head of the Department

## Semester – V

|                     |                               |
|---------------------|-------------------------------|
| <b>Course Title</b> | <b>Aquaculture Practicals</b> |
| <b>Total Hrs</b>    | <b>30</b>                     |
| <b>Hrs/Week</b>     | <b>2</b>                      |
| <b>Sub.Code</b>     | <b>21UCZO5P2</b>              |
| <b>Course Type</b>  | <b>Practicals</b>             |
| <b>Credits</b>      | <b>2</b>                      |
| <b>Marks</b>        | <b>100</b>                    |

### General Objective:

To acquire the skills in the field of aquaculture .

### Course Objectives: The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>   |
|---------------|--|
| CO-1          | Identify the salinity, alkalinity in water samples.                              |
| CO-2          | Classify the fishes that yield profits.  |
| CO-3          | Differentiate between freshwater and marine planktons present in aquatic medium. |
| CO-4          | Evaluate the COD and BOD in water samples.                                       |
| CO-5          | Propose methods to cure diseases in fishes.                                      |

1. Estimation of
  - a) Salinity
  - b) chlorinity
  - c) BOD
  - d) COD
  - e) Free CO<sub>2</sub>
  - f) Alkalinity
2. Collection and Identification of economically important fishes – Catla, Eel, Shark and Sardine.
3. Collection and Identification of economically important crustaceans (*Penaeus*, *Macrobrachium* and Crab)
4. Collection and Identification of economically important seaweed (*Eichornia*, *Pistia*, *Sargassam* and *Ulva*)
5. Mounting of marine and freshwater planktons.
6. Identification of fish scales - Cycloid, Ctenoid and Placoid.
7. Examination of fishes for diseases and their control –Bacterial (Abdominal dropsy, Furunculosis) - Viral (spring viremia) – Parasitic (*Argulus*) –Fungal (Rot disease)

8. Instruments used in Aquaculture (secchi disc, van dorn bottle, conductivity meter, Turbidity meter) and their significance.
9. Visit to aquaculture farm.

#### Course Outcomes

| CO No. | Course Outcomes  | PSOs Addressed | Cognitive Level |
|--------|--|----------------|-----------------|
| CO-1   | Identify the several methods practised in physical and chemical analysis of water. | 1,2,4,5        | Understanding   |
| CO-2   | Group the commercially beneficial fishes suitable for aquaculture.                 | 1,4,5          | Applying        |
| CO-3   | Distinguish between the freshwater and marine planktons.                           | 1,2,3,4,5      | Analysing       |
| CO-4   | Rank the economically important seaweeds.  | 1,2,4,5        | Evaluating      |
| CO-5   | Solve fish diseases pertaining to Aquaculture.                                     | 1,2,4,5        | Creating        |

#### Relationship Matrix

| Semester  | Course Code                        | Title of the Course |        |        |        |                                    | Hours  | Credit |        |        |  |
|---|------------------------------------|---------------------|--------|--------|--------|------------------------------------|--------|--------|--------|--------|--|
| V   | 21UEZO5B                           | Evolution           |        |        |        |                                    | 60     | 4      |        |        |  |
| Course Outcomes (COS)                                   | Programme Learning Outcomes (PLOs) |                     |        |        |        | Programme Specific Outcomes (PSOs) |        |        |        |        |  |
|   | PL O 1                             | PL O 2              | PL O 3 | PL O 4 | PL O 5 | PS O 1                             | PS O 2 | PS O 3 | PS O 4 | PS O 5 |  |
| CO-1  | ☐                                  | ☐                   | ☐      | ☐      |        | ☐                                  | ☐      |        | ☐      | ☐      |  |
| CO-2  | ☐                                  | ☐                   | ☐      |        |        | ☐                                  |        |        | ☐      | ☐      |  |
| CO-3  | ☐                                  | ☐                   | ☐      | ☐      | ☐      | ☐                                  | ☐      | ☐      | ☐      | ☐      |  |
| CO-4  | ☐                                  | ☐                   |        | ☐      | ☐      | ☐                                  | ☐      |        | ☐      | ☐      |  |
| CO-5  | ☐                                  | ☐                   |        | ☐      | ☐      | ☐                                  | ☐      |        | ☐      | ☐      |  |
| Number of matches (☐) = ...40....<br>Relationship =High |                                    |                     |        |        |        |                                    |        |        |        |        |  |

Prepared by

Checked

Dr.S.MohamedRamlath Sabura

Head of the Department

## Semester - V

|                     |                  |
|---------------------|------------------|
| <b>Course Title</b> | <b>Evolution</b> |
| <b>Total Hrs</b>    | <b>60</b>        |
| <b>Hrs/Week</b>     | <b>4</b>         |
| <b>Sub.Code</b>     | <b>21UEZO51A</b> |
| <b>Course Type</b>  | <b>Theory</b>    |
| <b>Credits</b>      | <b>4</b>         |
| <b>Marks</b>        | <b>100</b>       |

### General Objective:

The course aims at the physiological and cultural evolution of human.

### Course Objectives: The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>   |
|---------------|--|
| CO-1          | Define the Morphological, Anatomical, embryological, physiological and Biochemical evidences of evolution. |
| CO-2          | Discuss the trends in the evolution of humans.   |
| CO-3          | Determine the modern synthetic theory with classical evolutionary theories.                                |
| CO-4          | Evaluate the role of variation in Evolution.   |
| CO-5          | Investigate the significance of revolution in Reptiles.  |

### UNIT – I Origin of life

Chemical and biological evolution - Urey & Miller Experiment. Evidences in favour of evolution – Comparative Morphology, Anatomy, embryology, physiology and Biochemistry

### UNIT – II Palaentological evidences

Palaentological evidence – fossilization – dating of fossils. Geological time scale. Fossils in India - Zoogeographical realms.. Micro and Macro Evolution. Coevolution. Evolutionary trends.

### UNIT – III Theories of Evolution

Lamarckism, Darwinism, Neo-Lamarckism, Neo-Darwinism, Mutation theory of De Vries and Modern synthetic theory.

### UNIT – IV Variation and Human evolution

Variation-sources of variability – mutation, recombination & hybridization –Population genetics -Hardy-Weinberg law, isolating mechanisms: Speciation.) Mimicry and Colouration and Adaptive Radiation.

## UNIT V Evolution of higher forms

Evolutionary significance of Reptiles–major types of Dinosaurs and reason for extinction, Affinities of Archaeopteryx, outlines of evolution of horse and man. Important Fossils of Human Evolution. Cultural Evolution of Man, Future Evolution of Man,

### TEXT BOOKS:

1. N. Arumugam, (2020) ,Organic Evolution, Saras Publication
2. Veer Bala Rastogi (2017) Organic Evolution (Evolutionary Biology) Medtech; 13 th edition

### REFERENCE BOOKS:

1. B.L. Chaudhary (2018) Organic Evolution Scientific Publishers, India
2. Veer Bala Rastogi. Organic Evolution-2014. Kedar Nath Ram Nath Educational publications.
3. Arora (2013) . Text Book Of Organic evolution, M P Himalaya Pub. House.
4. Mandal (2005) Introduction to Evolutionary Biology Oxford & IBH Pub. Co
5. Kenneth Kardong (2005) Vertebrates: Comparative Anatomy, Function, Evolution, McGraw Hill Education; edition

### Course Outcomes

| CO No. | Course Outcomes   | PSOs Addressed | Cognitive Level |
|--------|---|----------------|-----------------|
| CO-1   | List out the evidences of evolution.                              | 1,3            | Remembering     |
| CO-2   | Discuss the numerous forms of trends in the process of evolution. | 1,3,5          | Understanding   |
| CO-3   |   |                | Applying        |
| CO-4   | Distinguish between Darwinism and Lamarckism.                     | 1,2,3,5        | Analysing       |
| CO-5   | Assess the role of Mimicry and Colouration in Evolution.          | 1,3,4,5        | Evaluating      |



### Relationship Matrix

| Semester  | Course Code                        | Title of the Course |       |       |       |        | Hours                              | Credit |        |        |        |        |  |
|---|------------------------------------|---------------------|-------|-------|-------|--------|------------------------------------|--------|--------|--------|--------|--------|--|
| I   | 21UEZO51A                          | Evolution           |       |       |       |        | 60                                 | 4      |        |        |        |        |  |
| Course Outcomes (COS)                                   | Programme Learning Outcomes (PLOs) |                     |       |       |       |        | Programme Specific Outcomes (PSOs) |        |        |        |        |        |  |
|   | P LO 1                             | PL O 2              | PL O3 | PL O4 | PL O5 | P LO 6 | PS O 1                             | PS O 2 | PS O 3 | PS O 4 | PS O 5 | PS O 6 |  |
| CO-1  | ☐                                  |                     | ☐     |       | ☐     |        | ☐                                  |        | ☐      |        |        |        |  |
| CO-2  | ☐                                  | ☐                   | ☐     |       | ☐     |        | ☐                                  |        | ☐      |        | ☐      |        |  |
| CO-3  | ☐                                  | ☐                   |       |       | ☐     |        | ☐                                  |        | ☐      |        |        |        |  |
| CO-4  | ☐                                  | ☐                   |       | ☐     | ☐     |        | ☐                                  | ☐      | ☐      |        | ☐      |        |  |
| CO-5  | ☐                                  | ☐                   | ☐     |       | ☐     |        | ☐                                  |        | ☐      | ☐      | ☐      |        |  |
| Number of matches (☐) = ...33....<br>Relationship =High |                                    |                     |       |       |       |        |                                    |        |        |        |        |        |  |

Prepared by

Checked by

Dr.S.MohamedRamlath Sabura

Head of the Department

## Semester – V

|                     |   |
|---------------------|---|
| <b>Course Title</b> | <b>Wildlife Conservation and Management</b> |
| <b>Total Hrs</b>    | <b>60</b>                                   |
| <b>Hrs/Week</b>     | <b>4</b>                                    |
| <b>Sub.Code</b>     | <b>21UEZO51B</b>                            |
| <b>Course Type</b>  | <b>DSE 1B Theory</b>                        |
| <b>Credits</b>      | <b>4</b>                                    |
| <b>Marks</b>        | <b>100</b>                                  |

### General Objective:

To equip students with adequate knowledge of various biodiversity monitoring methodologies and conservation and management of Wildlife.

### Course Objectives: The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>   |
|---------------|--|
| CO-1          | Define the conservation of wild life                                   |
| CO-2          | Discuss the impact of habitat destruction.                             |
| CO-3          | Determine the Damage caused by wildlife in India and its mitigation. . |
| CO-4          | Evaluate the exponential and logistic growth rates of wildlife.        |
| CO-5          | Investigate the population vulnerability.                              |

### Unit-I-Introduction to WildLife

Value of wildlife and its need for conservation. Definition and importance of wildlife, Causes of depletion of wildlife. Factors responsible for the extinction of animals; Types of protected areas. Wildlife Sanctuaries and National Parks in India-general strategies and issues.

### Unit-II- Importance of WildLife conservation

Wildlife conservation, ethics and importance of conservation, Impact of habitat destruction and fragmentation on wildlife, Biological parameters such

as food, cover, forage and their impact on wild life. Identification and estimation of wild animals by faecal sample analysis and census methods..

### **Unit-III-Wildlife conservation**

Objectives- strategies and issues; Captive breeding techniques and translocation and reintroduction- Inviolable area and critical habitats and their impact on wildlife; Different terrestrial habitats of wildlife in India- Restoration of degraded habitat- Damage caused by wildlife in India and its mitigation.

### **Unit-IV- Rehabilitation and management**

Type of wildlife management-manipulative and custodial- Management of over abundant wild animal populations causing damages to nearby inhabitants and their crops and animals, Tools and techniques to control the menace of wild animals; man wildlife conflict resolution and mitigation. Habitat manipulation- control and regulation of grazing. Weed eradication- Major diseases of domestic and wild animals and their control and impact of wild life tourism.

### **Unit-V - Population Attributes**

Theories of population dispersal, Population vulnerability analysis and its components Animal movement, concept of home range and territory; Tracking movement by remote sensing. Predator-prey models and impact of predation. Population attributes; concepts of exponential and logistic growth rates of wildlife, Density dependent and independent population regulation.

### **REFERENCE BOOKS:**

1. Caughley, G., and Sinclair, A.R.E. (1994) Wildlife Ecology and Management. Blackwell Science.
2. Woodroffe, R., Thirgood, S. and Rabinowitz, A. (2005) People and Wildlife, Conflict or Co-existence? Cambridge University.
3. Bookhout, T.A. (1996) Research and Management Techniques for Wildlife and Habitats (5th edition) The Wildlife Society, Allen Press.
4. Sutherland, W.J. (2000) The Conservation Handbook: Research, Management and Policy. Blackwell Sciences 95
5. Hunter M.L., Gibbs, J.B. and Sterling, E.J. (2008) Problem solving in Conservation Biology and Wildlife Management: Exercises for Class, Field, and Laboratory. Blackwell Publishing. P

### Course Outcomes

| CO No. | Course Outcomes  | PSOs Addressed | Cognitive Level |
|--------|--|----------------|-----------------|
| CO-1   | Highlighting the fundamental principles of Wildlife ecology Evidences of evolution.                  | 1,3            | R               |
| CO-2   | Commenting the modern scope of scientific inquiry in the field of wildlife.                          | 1,3,5          | U               |
| CO-3   | Presenting the analysis and interpretation of wildlife conservation management.                      | 1,3            | AP              |
| CO-4   | Distinguishing the local, regional and national conservation and management issue.                   | 1,2,5          | AN              |
| CO-5   | Reviewing the writing, speaking, and critical thinking skills needed to become a wildlife technician | 1,4,5          | E               |

### Relationship Matrix

| Semester  | Course Code                        | Hours | Credit |      |      |       |       |       |       |       |
|---|------------------------------------|-------|--------|------|------|-------|-------|-------|-------|-------|
| I   | 21UEZO51/B                         | 60    | 4      |      |      |       |       |       |       |       |
| Course Outcomes (COS)                                   | Programme Specific Outcomes (PSOs) |       |        |      |      | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|   | PO 1                               | PO 2  | PO 3   | PO 4 | PO 5 |       |       |       |       |       |
| CO-1  |                                    |       |        |      |      |       |       |       |       |       |
| CO-2  |                                    |       |        |      |      |       |       |       |       |       |
| CO-3  |                                    |       |        |      |      |       |       |       |       |       |
| CO-4  |                                    |       |        |      |      |       |       |       |       |       |
| CO-5  |                                    |       |        |      |      |       |       |       |       |       |
| Number of matches (☐) = ...35....<br>Relationship =High |                                    |       |        |      |      |       |       |       |       |       |

Prepared by

Dr.M.Sithi Jameela

Checked by

Dr.M.Sithi Jameela

Head of the Department

## Semester - V

| <b>Course Title</b> | <b>ANIMAL<br/>HUSBANDRY AND ITS MANAGEMENT</b> |
|---------------------|--|
| <b>Total Hrs</b>    | <b>60</b>                                      |
| <b>Hrs/Week</b>     | <b>4</b>                                       |
| <b>Sub.Code</b>     | <b>21UEZO52C</b>                               |
| <b>Course Type</b>  | <b>DSE 1C</b>                                  |
| <b>Credits</b>      | <b>4</b>                                       |
| <b>Marks</b>        | <b>100</b>                                     |

### General Objective:

The course provides intensive study in livestock production and management and conservation practices.

### Course Objectives: The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>                               |
|---------------|--|
| CO-1          | Define the Scope and Issues in Animal husbandry        |
| CO-2          | Discuss the Nutritional requirements in livestock      |
| CO-3          | Determine the Common Feed stuffs Systems in animals.   |
| CO-4          | Evaluate the method of Selecting the live stocks.      |
| CO-5          | Investigate the Basic tools for genetic improvement. . |

### Unit I: Animal products and breeding systems

Scope of Livestock Industry; Livestock Enterprises; Issues in Animal Agriculture. Animal Products: Importance of Animal Products; Beef; Pork; Lamb; Poultry Products. Advanced Reproduction and Breeding: Reproductive Systems, Common Breeding Systems including cattle Breeding, Swine, Sheep and Goat Breeding, Hormones and Cycles and effect of environment. Reproductive Technologies.

### Unit II: Energy requirements

Nutritional requirements: Energy requirements for maintenance, growth, milk,

egg, wool, and meat production. Carbohydrates & Fats, Protein, Minerals & Vitamins, Water etc.

### **Unit III Common Feed stuffs**

Common Feed stuffs Systems for expressing energy value of foods in ruminants, pigs and poultry. Direct and indirect calorimetry. Advanced Ration Formulations

### **Unit IV: Maintenance of breeds**

Common Breeds of Livestock: Breeds of Cattle, swine, sheep, goat and poultry: Selecting live stocks; Facilities and Equipment; Housing, Maintenance and health care; Management of breeding stocks and products. Vaccination programmes and Deworming programmes.

### **Unit V: Marketing and related issues**

Planning and Marketing; Culling, Forward Contracting, Backgrounding. Quality control; Future prospects. Basic principles of Genetics and tools for genetic improvement. Current issues affecting the livestock industry.

### **Recommended readings**

1. Taylor, R.E and Field, T.G. (2004).Scientific Farm Animal Production: An Induction to Animal Science. Prentice-Hall
2. Acker, D. and Cunningham, M. (1998). Animal Science & Industry. Prentice-Hall.
3. Blakely, J. and Bade, D. (1985). The Science of Animal Husbandry. Prentice-Hall.
4. Cambell, J. and Lasley, J. (1975).The Science of Animals that Serve Mankind. McGraw-Hill.
5. Cooper, E. L. (1990). Agriscience: Fundamentals & Applications Delmer: Albany.
6. American Youth Horse Council (1999) Handbook: A Guide to Equine Care and Management.
7. Morrison, F. (1949). Feeds and Feeding (8<sup>th</sup> edition) Morrison: Ithaca.

### Course Outcomes

| CO No. | Course Outcomes  | PSOs Addressed | Cognitive Level |
|--------|--|----------------|-----------------|
| CO-1   | Highlighting the Importance of Animal Products                 | 1,2            | R               |
| CO-2   | Commenting the Energy requirements for maintenance and growth. | 1,5            | U               |
| CO-3   | Presenting the energy value of foods in various live stocks.   | 1,4            | AP              |
| CO-4   | Distinguishing the Breeds of Cattle and poultry                | 1,2,3,4        | AN              |
| CO-5   | Reviewing the Marketing and Quality control                    | 1,4,5          | E               |

### Relationship Matrix

| Semester  | Course Code                        | Hours  | Credit |       |      |        |       |        |        |        |
|---|------------------------------------|--------|--------|-------|------|--------|-------|--------|--------|--------|
| I   | 21UEZO51/B                         | 60     | 4      |       |      |        |       |        |        |        |
| Course Outcomes (COS)                                   | Programme Specific Outcomes (PSOs) |        |        |       |      |        |       |        |        |        |
|   | PL O 1                             | PL O 2 | PLO 3  | PL O4 | PLO5 | PS O 1 | PSO 2 | PS O 3 | PS O 4 | PS O 5 |
| CO-1  |                                    |        | ☐      | ☐     | ☐    | ☐      |       | ☐      | ☐      |        |
| CO-2  |                                    | ☐      | ☐      |       | ☐    | ☐      |       | ☐      |        | ☐      |
| CO-3  | ☐                                  |        |        | ☐     | ☐    | ☐      |       | ☐      | ☐      |        |
| CO-4  | ☐                                  | ☐      |        | ☐     | ☐    | ☐      | ☐     | ☐      |        | ☐      |
| CO-5  | ☐                                  |        | ☐      |       | ☐    | ☐      |       | ☐      | ☐      | ☐      |
| Number of matches (☐) = ...33....<br>Relationship =High |                                    |        |        |       |      |        |       |        |        |        |

Prepared by Dr.M.Sithi Jameela

Checked by Dr.M.Sithi Jameela

Head of the Department





## Semester – V

| Course Title | FUNDAMENTALS OF BIOTECHNOLOGY |
|--------------|-------------------------------|
| Total Hrs    | 60                            |
| Hrs/Week     | 4                             |
| Sub.Code     | 21UEZO52A                     |
| Course Type  | DSE                           |
| Credits      | 4                             |
| Marks        | 100                           |

### General Objective:

1. To be trained at the basic principles, scope and importance of biotechnology.

Course Objectives: The learner will be able to

| CO   | Course Objectives   |
|------|---|
| CO-1 | Observe the forms of cloning vectors  |
| CO-2 | Describe the gene cloning by a choice of methods  |
| CO-3 | Interpret several cell culture techniques   |
| CO-4 | Distinguish between the techniques of Hybridization, PCR and DNA sequencing                                     |
| CO-5 | Create an awareness on intellectual property rights and safety issues involved in handling transgenic organisms |

### UNIT I - Tools of Biotechnology

History, Scope and Importance of Biotechnology - Basic concepts of Genetic Engineering, Restriction enzymes, Cloning vectors: Bacterial plasmid vector (pBR<sup>322</sup>), phage vector (Lambda and M 13 ) -Plant Vector (T<sub>1</sub>Plasmid)Animal vector (SV40) -Cosmids -Transposons as vectors -Yeast Artificial Chromosomes (YAC) – Bacterial Artificial Chromosomes (BAC).

### UNIT II- Gene cloning

Gene cloning: - Integration of DNA fragments into the vector – Gene transfer methods, Transformation and Transfection - Biolistics transformation - Protoplast fusion - Liposome mediated transfer - Electroporation - DNA transfer by calcium phosphate method – Microinjection. Screening and Selection of recombinants- Replica plating method - Blue and white method - Insertional inactivation -Antibiotic resistance -Hybridization techniques.

### UNIT III -Cell culture

Animal cell culture: Cell types – Requirements for animal cell culture - substrate, media and gases - Cell culture techniques - primary cell culture, basic technique of mammalian cell culture - sterilization and prevention of contamination. Stem cell culture: embryonic stem cell culture - Methods to produce differentiated cells – Application of stem cells.

### UNIT IV - Techniques in Biotechnology

Hybridoma technology - monoclonal antibody production. Blotting technique –Southern blotting, Western blotting and Northern blotting. Construction of DNA library, DNA probe, DNA sequencing, PCR.

### UNIT V- Transgenesis

Transgenesis - Technique of transgenic animal production- Gene targeting, Gene knockout. Applications of transgenic animals- transgenic

sheep, fish, mosquito and Cow. Bioethics: Bio safety and Patenting of Biotech product and IPR.

**TEXT BOOKS**

1. Sathiyarayanan U., (2017). Biotechnology. Book and Allied (P) Ltd, Kolkata.
2. R. C. Dubey, 2014. A text book of Biotechnology, S. Chand & Co. New Delhi

**REFERENCE BOOKS**

1. Arora. M. Biotechnology (2<sup>nd</sup> Edition), Himalaya Publishing House, Ramdoot, Dr. Bhalero Marg, Giraon, Mumbai. – 400 004.
2. Gupta, P.K. Elements of Biotechnology. Rastogi Publications, Gangotri, Shivaji Road, Meerut - 250 002.
3. Jogdand, S. N. Gene Biotechnology (5<sup>th</sup> Edition) Himalaya Publishing House, Ramdoot, Dr. Bhalero Marg, Giraon, Mumbai. – 400 004.
4. Joshi, P. Genetic Engineering, Student Edition., Agrobios (India), Behind Nasrani Cinema, Chopasani Road, Jodpur – 342 002.
5. Kumar, H. D. Modern Concept of Biotechnology, Vikas Publishing House Private Ltd. 576, Maszid Road, Jangpura, New Delhi – 100 014.
6. Sambamurty. A.V.S.S. Molecular Biology, Narosa Publishing Home, India Singh, B.D. Biotechnology Expanding horizon, Kalyani Publishers, India.

**Course Outcomes**

| CO   | Course Outcomes   | PSOs Addressed | Cognitive Level |
|------|---|----------------|-----------------|
| CO-1 | Define the fundamental concepts of genetic engineering            | 1,2,3,4        | Remembering     |
| CO-2 | Compare the multiple methods involved in gene cloning             | 2,3,4          | Understanding   |
| CO-3 | Examine the significance of animal cell and the stem cell culture | 2,3,4,5        | Applying        |
| CO-4 | Distinguish among the different blotting techniques               | 2,4,5          | Analysing       |
| CO-5 | Adapt recent means in biotechnology                               | 2,3,4,5        | Creating        |

**Relationship Matrix**

| Semester | Course Code                               | Title of the Course           | Hours                                     | Credit |
|----------|---|-------------------------------|---|--------|
| V        | 21UEZO52                                  | FUNDAMENTALS OF BIOTECHNOLOGY | 60  | 4      |
|          | <b>Programme Learning Outcomes (PLOs)</b> |                               | <b>Programme Specific Outcomes (PSOs)</b> |        |

| <b>Course Outcomes (COs)</b> | <b>PL O1</b>   | <b>PL O2</b> | <b>PL O3</b> | <b>PL O4</b> | <b>PL O5</b> | <b>PS O1</b> | <b>PS O2</b> | <b>PS O3</b> | <b>PS O4</b> | <b>PS O5</b> |
|------------------------------|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| CO-1                         | □  | □            | □            |              | □            | □            | □            | □            | □            |              |
| CO-2                         | □  | □            | □            |              | □            |              | □            | □            | □            |              |
| CO-3                         | □  | □            | □            |              | □            |              | □            | □            | □            | □            |
| CO-4                         | □  | □            | □            |              | □            |              | □            |              | □            | □            |
| CO-5                         | □  | □            | □            | □            | □            |              | □            | □            | □            | □            |
|                              | Number of matches (□) = 39<br>Relationship = High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |              |              |              |              |              |              |              |              |              |

Prepared by

Checked by

Name :Dr.M.I.Zahir Hussain

Head of the Department

Signature :

## Semester – V

|                     |                                 |
|---------------------|---------------------------------|
| <b>Course Title</b> | <b>ENVIRONMENTAL TOXICOLOGY</b> |
| <b>Total Hrs</b>    | <b>60</b>                       |
| <b>Hrs/Week</b>     | <b>4</b>                        |
| <b>Sub.Code</b>     | <b>21UEZO52B</b>                |
| <b>Course Type</b>  | <b>core</b>                     |
| <b>Credits</b>      | <b>4</b>                        |
| <b>Marks</b>        | <b>100</b>                      |

### General Objectives:

- To equip students with the skills to critically evaluate and understanding of the effects of chemicals on human health and environment.

Course Objectives: The learner will be able to

| CO   | Course Objectives   |
|------|---|
| CO-1 | To define the basic concept of toxicology                               |
| CO-2 | To discuss the process of eco-toxicology.                               |
| CO-3 | To interpret the acute and chronic toxicity                             |
| CO-4 | To distinguish the impact of various toxic chemicals in the Environment |
| CO-5 | To evaluate the toxic effect on human and environment                   |

### Unit 1. Toxicology

Introduction- History of toxicants - Principles of toxicology – toxicants and toxicity, factors affecting toxic substances- their types – degradable and non-degradable toxicants.

## **Unit 2. Eco-toxicology**

Introduction to eco-toxicology- the route and transport of toxicants by air, water and food- chain- biotransformation, bioconcentration and biomagnification; Influence of ecological factors on the effects of toxicology. Global dispersion of toxic substances – dispersion and circulating mechanisms of pollutants.

## **Unit 3. Acute and chronic toxicity**

Lethal and sub-lethal doses; Analysis of NOEL, LD50 and MLD; Dose-response relationship; Detoxification process –mechanisms – organs of detoxification. Carcinogens, mutagens and teratogens; Toxicity testing procedures.

## **Unit 4. Chemical toxicology :**

Toxic chemicals in the Environment; Impact of Toxic chemicals on enzymes and biochemical effect of arsenic, cadmium, lead, mercury, carbon monoxide, nitrogen oxides, sulphur dioxide and cyanide.

## **Unit 5. Man and Environmental Toxins**

Routes of toxicants to human body – inhalation, skin absorption, oral, injection; ADME – adsorption, distribution, metabolism and excretion; Response to toxin exposures – dose-response relationship, frequency and cumulative response. Environmental diseases: Asbestosis, silicosis, synopsia, asthma, fluorosis and allergies and epidemiological issues – Malaria, Kala azar, water borne diseases

## **References**

1. Calow.P. 1994. Handbook of Ecotoxicology. Blackwell Scientific Publications, London
2. Chatterji,M., M.Munasinghe and R.Ganguly. 1998. Environment and Health in Developing Countries. A.P.H.Publishing House, New Delhi.
3. Forbes,V.E. and T.L.Forbes. 1994. Ecotoxicology in Theory and Practice. Chapman & Hall, London.
4. Hayes, W.A. 2001. Principles and Methods of Toxicology, CRC, USA.
5. Jacobson-Kram,D. 2006. Toxicological testing handbook: Principles, Applications and Data Interpretation, Taylor and Francis, New York.
6. Klaassen,C.D. and Watkins,J.B. 2003. Essentials of Toxicology, McGrawHill Professional, New Delhi.
7. Levin,S.A. and M.A.Harwell, J.R.Kelley and K.D.Kemball. 1989. Ecotoxicology: Problems and Approaches. Springer-Verlag, New York.
8. Manahan,S.E. 2000. Environmental Chemistry, Lewis Publishers, New York.
9. Pery,G. 1980. Introduction to Environmental Toxicology, Elsevier, Amsterdam.
10. Walker,C.H., R.M.Sibly, S.P.Hopkin and D.B.Peakall. 2012. Principles of Ecotoxicology, CRC Press, New York.

11. Wright,D.A. and Welbourn,P. 2002. Environmental Toxicology, Cambridge University Press, London.

### Course Outcomes

| CO   | Course Outcomes  | PSOs Addressed | Cognitive Level |
|------|--|----------------|-----------------|
| CO-1 | Highlighting the importance of toxicology                  | 1,2,4,5        | R               |
| CO-2 | Relating the biotransformation of toxin on environment     | 1,2,5          | U               |
| CO-3 | Explaining the acute and chronic process of toxin          | 1,3,5          | AP              |
| CO-4 | Correlating the toxic effects of chemicals                 | 1,2,3,5        | AN              |
| CO-5 | Commenting the mechanism of toxin on human and environment | 1,2,3,5        | E               |

### Relationship Matrix

| Semester   | Course Code                        | Title of the Course      | Hours                    | Credit                   |                          |                                    |                          |                          |                          |                          |
|--|------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| III  | 21UCZO                             | ENVIRONMENTAL TOXICOLOGY | 60                       | 4                        |                          |                                    |                          |                          |                          |                          |
| Course Outcomes (COs)  | Programme Learning Outcomes (PLOs) |                          |                          |                          |                          | Programme Specific Outcomes (PSOs) |                          |                          |                          |                          |
|  | PL O1                              | PLO 2                    | PL O3                    | PL O4                    | PL O5                    | PS O1                              | PS O2                    | PS O3                    | PS O4                    | PS O5                    |
| CO-1   | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/> | <input type="checkbox"/>           | <input type="checkbox"/> |                          | <input type="checkbox"/> | <input type="checkbox"/> |
| CO-2   | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/>           | <input type="checkbox"/> |                          |                          | <input type="checkbox"/> |
| CO-3   | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/> | <input type="checkbox"/>           |                          | <input type="checkbox"/> |                          | <input type="checkbox"/> |
| CO-4   | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/> |
| CO-5   | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> |                          |                          | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/> |
| Number of matches ( $\square$ ) = 37<br>Relationship = High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                                    |                          |                          |                          |                          |                                    |                          |                          |                          |                          |

Prepared by

Checked by

Name :Dr.M.I.Zahir Hussain

Head of the Department

Signature :

### Semester – V

|                     |                      |
|---------------------|----------------------|
| <b>COURSE TITLE</b> | <b>ENDOCRINOLOGY</b> |
| <b>TOTAL HOURS</b>  |                      |
| <b>HOURS/WEEK</b>   | 4                    |
| <b>SUBJECT CODE</b> | 21UEZO52C            |
| <b>COURSE TYPE</b>  | DSE                  |
| <b>CREDITS</b>      |                      |
| <b>MARKS</b>        | 100                  |

#### GENERAL OBJECTIVES

- ❖ To make the students to learn the objectives and scope of endocrinology and their functions.

**Course Objectives:** The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>   |
|---------------|--|
| CO-1          | Understand the concepts and scope of Endocrinology.              |
| CO-2          | Sketch the thyroid and parathyroid glands.                       |
| CO-3          | Analyse the biological Actions of Adrenalilne and Noradrenaline  |
| CO-4          | Evaluate the Endocrine disorders of Islets of Langerhans.        |
| CO-5          | Develop the ways to cure different diseases of endocrine glands. |

**Objective :** To learn about the hormonal regulations and their defects in Man.

#### **Unit I:INTRODUCTION TO ENDOCRINOLOGY AND PITUITARY**

Introduction, objectives and scope of endocrinology- Classification and characteristic features of Hormones , Structure of Hypothalamus and pituitary Gland – Hormones of pituitary Gland Adenohypophysis . Pars Intermedia, Neurohypophysis , Hypothalamic Regulation for Release of pituitary Hormones. endocrine disorders pituitary Gland

## **Unit II: THYROID GLANDS**

Structure of Thyroid Gland – Biosynthesis of Thyroid Hormones Biological functions of Thyroxine , Regulation of Thyroid Secretion Thyroid Dysfunction- parathyroid Glands Biological Action of parathyroid Hormones – parathyroid Dysfunction.

## **Unit- III:ADRENAL GLANDS**

Structural features – Hormones of Adrenal Cortex Biological Action of Adrenaline and Noradrenaline – Emergency Hormones. Endocrine disorders of Adrenal glands.

## **UNIT- IV : ISLETS OF LANGERHANS**

Islets of Langerhans – Insulin-Biosynthesis of Insulin Regulation of the secretion of Insulin-Biological Action of Insulin Mechanism of Action of Insulin , Endocrine disorders of Islets of Langerhans.

## **Unit V : REPRODUCTIVE ENDOCRINOLOGY**

Structure of mammalian testis and ovary - male and female sex accessory organs - hormones of testis and ovary - Oestrous and menstrual cycle – hormones of pregnancy - Placental Hormones- parturition - hormonal control of lactation.

### **References :**

1. Mac E Hadley, 1992 Endocrinology, Third edition, prentice Hall, New Jersey
2. Matsumoto A. and Ishi S., 1992 (eds). Atlas of endocrine organs, vertebrates and Invertebrates springer verlag, Germany
3. Wilson J.D and Foster D.W 1992, William's textbook of endocrinology, 8th edition, WB saunders company, Philadelphia
4. World health organization, Technical report series, 1992, oral contraceptives and neoplasia WHO, Geneva
5. Turner, C.D and Bagnarr, J.T., 1994, General Endocrinology, 6th Edition, WB Saunder's company, Philadelphia (Saunder's International Students edition)
6. Lamming, G.E. 1984. Marshall's physiology of Reproduction ; Reproductive cycles of vertebrates. Churchill livingstone, Edinburgh.



7. Prakash S Lohar Endocrinology, Hormones and Human Health.

**Course Outcomes**

| CO No. | Course Outcomes   | PSOs Addressed | Cognitive Level |
|--------|---|----------------|-----------------|
| CO-1   | Understanding the characteristic features of Hormones.                  | 1,2,3,5        | U               |
| CO-2   | Integrating the features of Thyroid Gland.                              | 1,2,3          | AP              |
| CO-3   | Categorizing the features of Adrenaline and Noradrenaline.              | 1,2,3,4,       | AN              |
| CO-4   | Commenting the features of different disorders of Islets of Langerhans. | 1,2,3          | E               |
| CO-5   | Solving the diseases pertaining to endocrine glands.                    | 1,2,3,4,5      | C               |

**Relationship Matrix**

| Semester   | Course Code                        | Title of the Course  |       |       |       |                                    | Hours     |       |       |       | Credit   |
|--|------------------------------------|----------------------|-------|-------|-------|------------------------------------|-----------|-------|-------|-------|----------|
| I  |                                    | <b>Endocrinology</b> |       |       |       |                                    | <b>60</b> |       |       |       | <b>4</b> |
| Course Outcomes (COS)                                  | Programme Learning Outcomes (PLOs) |                      |       |       |       | Programme Specific Outcomes (PSOs) |           |       |       |       |          |
|  | PO 1                               | PO 2                 | PLO 3 | PLO 4 | PLO 5 | PSO 1                              | PSO 2     | PSO 3 | PSO 4 | PSO 5 |          |
| CO-1   | ☐                                  | ☐                    |       | ☐     |       | ☐                                  | ☐         | ☐     |       |       |          |
| CO-2   | ☐                                  | ☐                    |       | ☐     |       | ☐                                  | ☐         | ☐     |       |       |          |
| CO-3   | ☐                                  | ☐                    |       | ☐     |       | ☐                                  |           | ☐     | ☐     | ☐     |          |
| CO-4   | ☐                                  | ☐                    | ☐     | ☐     |       | ☐                                  | ☐         | ☐     | ☐     |       |          |
| CO-5   | ☐                                  | ☐                    | ☐     | ☐     | ☐     | ☐                                  | ☐         | ☐     | ☐     | ☐     |          |
| Number of matches (☐) = .....37.<br>Relationship =High |                                    |                      |       |       |       |                                    |           |       |       |       |          |

Prepared by

Dr.S.Mohamed Ramlath Sabura

Checked

Signature

Head of the Department

## Semester - VI

|                     |                                      |
|---------------------|--------------------------------------|
| <b>Course Title</b> | <b>IMMUNOLOGY &amp; MICROBIOLOGY</b> |
| <b>Total Hrs</b>    | <b>60</b>                            |
| <b>Hrs/Week</b>     | <b>4</b>                             |
| <b>Sub.Code</b>     | <b>21UCZO61</b>                      |
| <b>Course Type</b>  | <b>THEORY</b>                        |
| <b>Credits</b>      | <b>4</b>                             |
| <b>Marks</b>        | <b>100</b>                           |

### General Objective:

To understand the significance of Immune system, Lymphoid organs, Lymphocytes, Sterilization and Culture techniques

### Course Objectives: The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>                                     |
|---------------|--|
| CO-1          | Define the innumerable forms of Immunity and Lymphoid organs |
| CO-2          | Interpret the Immunocytes and Immune response                |
| CO-3          | Differentiate amongst a variety of Immunoglobulins           |
| CO-4          | Evaluate the procedures in the process of staining           |
| CO-5          | Formulate culture techniques                                 |

### UNIT I – Introduction

History and scope of Immunology - Immunity - Types of Immunity - Innate and acquired, Passive and Active. Lymphoid organs - Primary and secondary lymphoid organs - Thymus, Bone marrow, Bursa of Fabricius, Spleen, Tonsil, Lymph node, Peyer's patches.

### UNIT II – Lymphocyte and Immune Response

Lymphocyte as unit of immune system – Stem cells, T cells and its types - B cells and macrophages. Immune response :Primary and secondary response – Humoral immune response(B cell activation) – Cell mediated immune response ( T cell activation ) .

### UNIT III – Immunoglobulin and Immune Diseases

Immunoglobulin - Structure, function and biological properties of Immunoglobulin classes. Interaction of antigen and anti body interactions- Auto immune diseases – Causes, Classification with one example each, Diagnosis and Treatment. Hypersensitivity-factors,symptoms and types. Tumour Immunology- Causes,properties and types- Immune response to tumour, factors involved in tumour immunity,Diagnosis and treatment of tumours.

### UNIT IV – Introduction to Microbiology

Definition and Scope. History of Microbiology,Importance and Application of Microbiology. General structure of bacteria and viruses- Ultra structure of Eubacteria. Motility of bacteria-Hanging drop method Morphology and structure of TMV, HIV and lambda bacteriophage. Types of stains-simple stains, negative stains and Differential stains.

### UNIT V – Sterilization and culture techniques of Microbes

Bacterial growth, Sterilization techniques, Culture media-General Purpose Media, Selective and Differential media. Isolation of microbes-Pure culture techniques-Dilution plating, Streak plate and spread plate. Continuous and Batch culture techniques. **Methods of bacterial identification- morphological, physiological, biochemical and serological properties.**

**TEXT BOOKS:**

1. Rao, C. V. 2017-An Introduction to Immunology, Narosa Publishing House.
2. Purohit, S.S., 2005. A Text Book of Microbiology, Agrobios Publishers

**REFERENCE BOOKS – IMMUNOLOGY**

1. Berry A. K. A 2016 -Text Book of Immunology, EMKEY Publications.
2. Cazenave, P. A. and G.P. Talwar. 1991- Immunology–Pauster’s heritage, New Age International Publishers.
3. George Pinchuk ,2002. Immunology, Tata Mc .Graw – Hill Publishing Company
4. Joshi, K. R. and N. O. Osamo. 2002 - Immunology and Serology, Agrobios Publishers
5. Kuby .2007- Text Book of Immunology, W.H. Freeman & company pvt Ltd

**REFERENCE BOOKS – MICROBIOLOGY .**

1. Powar and Dagainawala. 2019- General Microbiology, Himalaya Publishinh House
2. Ananthanarayanan R and Panickar. J (2010). Textbook of Microbiology, Universities Press Publishers
3. Kalaiselvan, P .T .2004 –Microbiology and Biotechnology, A Laboratory Manual, MJP Publishers

**Course Outcomes (CO)**

**COs of the course “IMMUNOLOGY AND MICROBIOLOGY”**

| <b>CO No.</b> | <b>Upon completion of this course, students will be able to:</b> | <b>PSO addresssed</b> | <b>Cognitive level</b> |
|---------------|--|-----------------------|------------------------|
| CO-1          | Identify Active and Passive immunity                             | 1,2,4,5               | Remembering            |
| CO-2          | Generalize primary and secondary immune response                 | 1,3,5                 | Understanding          |
| CO-3          | Illustrate Anti-gen and Anti-body interactions                   | 1,3,4                 | Applying               |
| CO-4          | Analyse the Hanging -drop technique and staining procedures      | 2,3,5                 | Analysing              |
| CO-5          | Managing Pure culture and Batch culture techniques               | 1,2,4,5               | Creating               |

### Relationship matrix

| Semester              | Course Code   | Title of the Course                | Hours  | Credit |        |                                    |        |        |        |        |
|-----------------------|---|------------------------------------|--------|--------|--------|------------------------------------|--------|--------|--------|--------|
| VI                    | 21UCZO61  | IMMUNOLOGY<br>&AND<br>MICROBIOLOGY | 60     | 4      |        |                                    |        |        |        |        |
| Course Outcomes (COs) | Programme Learning Outcomes (PLOs)  |                                    |        |        |        | Programme Specific Outcomes (PSOs) |        |        |        |        |
|                       | PL O 1  | PLO 2                              | PL O 3 | PL O 4 | PL O 5 | PS O 1                             | PS O 2 | PS O 3 | PS O 4 | PS O 5 |
| CO-1                  | ☐   |                                    |        | ☐      | ☐      | ☐                                  | ☐      |        | ☐      | ☐      |
| CO-2                  | ☐   | ☐                                  | ☐      |        | ☐      | ☐                                  |        | ☐      |        | ☐      |
| CO-3                  | ☐   | ☐                                  | ☐      | ☐      |        | ☐                                  | ☐      |        | ☐      |        |
| CO-4                  |   |                                    |        | ☐      | ☐      |                                    | ☐      | ☐      |        | ☐      |
| CO-5                  |   | ☐                                  | ☐      |        | ☐      | ☐                                  | ☐      |        | ☐      | ☐      |
|                       | Number of matches (☐) = ...33....<br>Relationship = High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                                    |        |        |        |                                    |        |        |        |        |

Prepared by

Dr.S.Peer Mohamed

Signature

Checked by

Head of the Department

## Semester – VI

|                     |  |
|---------------------|--|
| <b>Course Title</b> | <b>BIOSTATISTICS &amp; COMPUTER APPLICATIONS</b> |
| <b>Total Hrs</b>    | <b>60</b>  |
| <b>Hrs/Week</b>     | <b>4</b>   |
| <b>Sub.Code</b>     | <b>21UCZO62</b>                                  |
| <b>Course Type</b>  | <b>Core</b>                                      |
| <b>Credits</b>      | <b>4</b>   |
| <b>Marks</b>        | <b>100</b>                                       |

### General Objectives:

The course centers on the concepts and scope of biostatistics and basics of computer applications.

**Course Objectives:** The learner will be able to

| <b>CO. No.</b> | <b>Course Objectives</b>                              |
|----------------|---|
| CO-1           | List the primary, secondary and data-sampling methods |
| CO-2           | Classify the grouped and ungrouped data               |
| CO-3           | Interpret the data into table and graph               |
| CO-4           | Differentiate between the types of computer           |
| CO-5           | Develop computer- aided statistical techniques        |

### UNIT I – Introduction

Introduction -Scope of Biostatistics -Collection of Data – primary and secondary data-sampling methods - Variables - Discrete and continuous presentation of Data – Classification and Tabulation – Parts and types of tables - Diagrams and Graph: diagrams -Line diagram, Bar diagram, Pie diagram, graphs –Histogram, Frequency polygon and frequency curve.ogives

### UNIT II - Measures of central tendency and Dispersion

Calculation for grouped and ungrouped data -measures of central tendency-Mean, median, mode, measures of dispersion – range, standard deviation and standard error, coefficient of variation and Variance. Test of Independence- Chi – square test and goodness of fit.

### UNIT III – Probability and Correlation

Probability-definition-theories-Binominal, poisson and normal distribution, students' t ' test and applications - correlation and Karl Pearson's correlation coefficient – rank correlation-simple regression. One way and two-way ANOVA

### UNIT IV - Introduction to Computer

Types of computer, generation of computer, components of computer – input devices, output devices, DSCPU and memory units.

### UNIT V - Introduction to M.S.Office

Basic concepts of internet – E-mail, browsing, Web applications of computer. Microsoft excel – spreadsheet and presentation software- tool bars- cell character format – cell filling – worksheet – alignment of data and summation – calculation of average and percentage- graphic representation- line graph and bar diagram.

### TEXT BOOKS

1. Gurumani, N. (2015) –An Introduction to Biostatistics (Computer Application included) MJP Publishers, Tamil Nadu Book House, 47, Nallathambi Street, Triplicane, Chennai

2. Arumugam, N. 2010. Biostatistics, Computer Applications, Bioinformatics and Instrumentation, Saras Publication, Nagercoil

**REFERENCE BOOKS - BIOSTATISTICS**

1. Palanisamy. S. and M. Manoharan 1990 Statistical Methods for Biologists, Palani Paramount Publications, Palani

2. Gurumani, N. 2005. An Introduction to Biostatistics, 2nd edition, MJP Publishers, Chennai

3. Agarwal S.K. 2008. Biostatistics, APH Publishing Corporation. New Delhi

**REFERENCE BOOKS - COMPUTER APPLICATIONS**

1. Rajaram, V. NEEHARIKA ADABALA–(2014) Fundamental of computers, Kindle Edition

2. Krishnamoorthy, R.- Computer programming and applications

3. Ram, B. – Computer structure and architecture

**Course Outcomes**

| <b>CO</b> | <b>Course Outcomes</b>  | <b>PSOs Addressed</b> | <b>Cognitive Level</b> |
|-----------|---|-----------------------|------------------------|
| CO-1      | Tabulate the data and create graphical and diagrammatic representation for the data | 1,3,4,5               | Remembering            |
| CO-2      | Express the formulae of measures of central tendency                                | 1,4,5                 | Understanding          |
| CO-3      | Examine the test of significance using, 't' test and ANOVA                          | 3,4,5                 | Applying               |
| CO-4      | Explain the basic components of computer  | 4,5                   | Analysing              |
| CO-5      | Create innovative presentations using software tools                                | 4,5                   | Creating               |

### Relationship Matrix

| Semester              | Course Code  | Title of the Course                   | Hours | Credit |       |                                    |       |       |       |       |
|-----------------------|--|---------------------------------------|-------|--------|-------|------------------------------------|-------|-------|-------|-------|
| VI                    | 21UCZO62   | Biostatistics & Computer Applications | 60    | 4      |       |                                    |       |       |       |       |
| Course Outcomes (COs) | Programme Learning Outcomes (PLOs)   |                                       |       |        |       | Programme Specific Outcomes (PSOs) |       |       |       |       |
|                       | PL O1  | PLO 2                                 | PL O3 | PL O4  | PL O5 | PS O1                              | PS O2 | PS O3 | PS O4 | PS O5 |
| CO-1                  | ☐  | ☐                                     | ☐     | ☐      | ☐     | ☐                                  |       | ☐     | ☐     | ☐     |
| CO-2                  | ☐  | ☐                                     |       | ☐      | ☐     | ☐                                  |       |       | ☐     | ☐     |
| CO-3                  | ☐  | ☐                                     | ☐     |        | ☐     |                                    |       | ☐     | ☐     | ☐     |
| CO-4                  | ☐  | ☐                                     |       |        | ☐     |                                    |       |       | ☐     | ☐     |
| CO-5                  | ☐  | ☐                                     |       | ☐      | ☐     |                                    |       |       | ☐     | ☐     |
|                       | Number of matches (☐) = 34<br>Relationship = High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                                       |       |        |       |                                    |       |       |       |       |

Prepared by

Checked by

Name :M.I.Zahir Hussain

Head of the Department

Signature :

## Semester - VI

|                     |                        |
|---------------------|------------------------|
| <b>Course Title</b> | <b>Applied Zoology</b> |
| <b>Total Hrs</b>    | <b>60</b>              |
| <b>Hrs/Week</b>     | <b>4</b>               |
| <b>Sub.Code</b>     | <b>21UCZO61</b>        |
| <b>Course Type</b>  | <b>Theory</b>          |
| <b>Credits</b>      | <b>4</b>               |
| <b>Marks</b>        | <b>100</b>             |

### General Objective:

To develop entrepreneur skills in the fields of Sericulture, Apiculture, Poultry, Vermiculture and Dairy farming.

### Course Objectives: The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>  |
|---------------|---|
| CO-1          | Understand the concepts of apiculture and methods of Bee keeping.         |
| CO-2          | Apply novel technological methods in Silkworm rearing and Cocoon reeling. |
| CO-3          | Compare the Indigenous and exotic dairy Cattle Breeds.                    |
| CO-4          | Consider Poultry- farming as a Self-Employment venture.                   |
| CO-5          | Propose new techniques in vermiculture.                                   |

### UNIT I: Apiculture

Apiculture: Classification of bees, Members of Bee colony – queen, drones and worker- functions of the members. Bee keeping – primitive and modern methods – artificial hives - Langstroth hive and Newton’s hive – their advantages - appliances used in apiaries. Extraction of honey- preservation and storage of honey – nutritive value- medicinal value .Bee wax Bee venom – – method of extraction – characteristics and uses. Importance of bee colonies in crop pollination. Enemies of bees – greater wax moth, lesser wax moth, ants, wasps, lice, beetles and birds – their control.

### UNIT II Sericulture

Sericulture: Types of silk; Silkworms and their host plants; Mulberry silkworm culture; Life history of silkworm; Structure of silk gland and secretion of silk

Silkworm rearing technology, appliances used, Spinning, harvesting and storage of cocoons and Reeling mulberry plant diseases and their control. Natural enemies of silk worm and their control.

### UNIT III: Dairy Management

Introduction to common dairy animals. Techniques of dairy management. Milk and milk products. Dairy Cattle Breeds – Indigenous and exotic – Dairy



Cattle – Nutrition – Physiology –Breeding Techniques – Artificial insemination, Frozen Semen technology. Common Cattle Diseases.

#### **UNIT IV: Poultry farming**

Classification of Fowls based on their use – Broilers and Commercial layers. Principles of poultry breeding, Management of breeding stock and broilers, Processing and preservation of eggs. Feed formulations for chicks. Nutritive value of egg and meat. Incubation and hatching of eggs. Poultry diseases - Viral, Bacterial, Fungal, Protozoan. Management of a modern Poultry Farm, progressive plans to promote Poultry as a Self-Employment venture

#### **UNIT V: Vermiculture; Maintenance of reared animals**

Introduction of Vermiculture . Vermiculture techniques. Biology of *Eisenia foetida*. Rearing of earthworms, Equipments , used in vermiculture, Bedding, Essential parameters for Vermiculture and Management. Methods of Harvesting (Manual & Mechanical). Vermiwash Collection, Composition and use. Economic Importance of Vermicomposting.

#### **Text books**

1. Banerjee(2016) Applied Zoology, New Central Book Agency;
2. Shukla, G.S and V.B. Upadhyay(2010) Economic Zoology, Rastogi Publications.
3. Vasantharaj David, B.(2012) Elements of Economic Entomology, 7th edition. Namrutha publications

#### **REFERENCE BOOKS**

1. Rhonda Sherman(2018), The worm farmers handbook, Chelsea green publishing company
2. S. Sarkar, G Kundu, K K Chaki(2016) Introduction To Economic Zoology, 1st edition, New Central Book Agency (NCBA);
3. S Chaudhuri (2017), Economic Zoology, 1st edition , New Central Book Agency (NCBA);
4. Banerjee(2016) Applied Zoology New Central Book Agency; Mary Violet Christy,(2014) Vermitechnology, MJP Publisher
5. B.S. Tomar,(2007) A Textbook Of Applied Zoology, Emkay Publications

### Course Outcome

| CO. NO. | COURSE OUTCOMES   | PSO'S addressed | COGNITIVE LEVEL               |
|---------|---|-----------------|-------------------------------|
| CO-1    | Summarize the primitive and modern methods of Bee keeping.                  | 1,2,4,5         | Remembering/<br>Understanding |
| CO-2    | Establish the practices in rearing silkworms.                               | 1,2,4,5         | Applying                      |
| CO-3    | Analyse the process of Artificial Insemination and Frozen Semen technology. | 1,2,4,5         | Analysing                     |
| CO-4    | Consider the Poultry farming as a category of entrepreneurship              | 1,2,4           | Evaluating                    |
| CO-5    | Develop a project for vermicompost.   | 1,4,5           | Creating                      |

### Relationship Matrix

| Semester   | Course Code                        | Title of the Course      |                          |                          |                          |                                    | Hours                    | Credit                   |                          |                          |  |  |
|--|------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--|--|
| VI   | 21UEZO6B                           | Applied Zoology          |                          |                          |                          |                                    | 60                       | 4                        |                          |                          |  |  |
| Course Outcomes (COs)  | Programme Learning Outcomes (PLOs) |                          |                          |                          |                          | Programme Specific Outcomes (PSOs) |                          |                          |                          |                          |  |  |
|  | PL O 1                             | PLO 2                    | PL O 3                   | PL O 4                   | PL O 5                   | PS O 1                             | PS O 2                   | PS O 3                   | PS O 4                   | PS O 5                   |  |  |
| CO-1   | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  |  |
| CO-2   | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  |  |
| CO-3   | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  |  |
| CO-4   | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  |  |
| CO-5   | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  |  |
| Number of matches ( <input type="checkbox"/> ) = ...40....<br>Relationship = High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                                    |                          |                          |                          |                          |                                    |                          |                          |                          |                          |  |  |

Prepared by  
Dr.S.Mohamed Ramlath Sabura  
Signature

Checked by  
Head of the Department.

## Semester - VI

|                     |   |
|---------------------|---|
| <b>Course Title</b> | <b>IMMUNOLOGY AND MICROBIOLOGY AND APPLIED ZOOLOGY PRACTICALS</b> |
| <b>Total Hrs</b>    | <b>60</b>   |
| <b>Hrs/Week</b>     | <b>4</b>  |
| <b>Sub.Code</b>     | <b>21UCZO6P1</b>  |
| <b>Course Type</b>  | <b>PRACTICAL</b>  |
| <b>Credits</b>      | <b>2</b>  |
| <b>Marks</b>        | <b>100</b>  |

### General Objective:

To examine the Lymphoid organs, Immuno - diffusion, Blood grouping, Sterilization techniques and life cycle of Honey bees and Silk worms

### Course Objectives: The learners will be able to:

| <b>CO No.</b> | <b>Course Objectives</b>                                      |
|---------------|---|
| CO-1          | List the Lymphoid organs in Rat and immune diffusion          |
| CO-2          | Differentiate simple staining and gram staining               |
| CO-3          | Practice serial dilution techniques                           |
| CO-4          | Experiment in the process of grouping Rh and ABO blood        |
| CO-5          | Reorganize the mouth parts of Honey Bee by mounting technique |

### IMMUNOLOGY & MICROBIOLOGY

- 1) Lymphoid organs in Rat (Demonstration) – Model/ chart/ CD. Students have to draw the diagram and write a detailed account of the lymphoid organs in rat in the observation note book.
- 2) Double immunodiffusion and radial immuno diffusion. (Demonstration)
- 3) Rh and ABO blood grouping.
- 4) Cleaning and sterilization.
- 5) Preparation of culture media for microbes (Nutrient agar, broth)
- 6) Serial dilution technique. (Demonstration)
- 7) Distribution of microbes in soil, water and air. (Demonstration)
- 8) Aseptic transfer of microbes and pureculture of bacteria, preservation and maintenance (Demonstration)
- 9) Simple staining of Bacteria.
- 10) Gram staining of Bacteria.
- 11) WIDAL Slide Test (Demonstration)
- 12) Microscopic counting of microbes using Haemocytometer (Demonstration only).
- 13) Spotters-Colony counter, Inoculation loop, Petri dishes, Laminar air flow chamber, Autoclave.

### APPLIED ZOOLOGY PRACTICAL

1. Mounting of mouth parts of honey bee
2. Identification of queen bee, worker bee and drone
3. Dissection of silk gland in silkworm.
4. Life cycle of mulberry silkworm, *Bombyx mori* (model/chart/specimens)

5. Identification of different breeds of cattles (model/chart/specimens)
6. Determination of the specific gravity of milk by using a mercury lactometer.
7. Test for good quality eggs (Floating test, cracking test) and
8. Test for fertilized and unfertilized eggs (Light test, Cracking test).
9. External morphology of poultry birds (model).
10. Identification of diseases of fowls (model/chart/specimens)
11. Project report on visit to dairy farm / Poultry farm

#### COURSE OUTCOMES

| CO No. | Upon completion of this course, students will be able to:  | PSO addressed | Cognitive level |
|--------|--|---------------|-----------------|
| CO-1   | Identify lymphoid organs of rat.                           | 1,2,4,5       | Remembering     |
| CO-2   | Classify between Simple and Gram staining.                 | 2,3,4,5       | Understanding   |
| CO-3   | Examine the viable cell count by serial dilution technique | 1,3,4         | Applying        |
| CO-4   | Experiment among Human blood groups                        | 2,3,5         | Analysing       |
| CO-5   | Collaborating the queen ,drone and worker bee              | 1,2,4         | ?               |

\*PSO-Program Specific outcome; CO-Course Outcome;

#### Relationship Matrix

| Semester              | Course Code   | Title of the Course   |                          |                          |                          |                                    | Hours                    | Credit                   |                          |                          |  |  |
|-----------------------|---|---|--------------------------|--------------------------|--------------------------|------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--|--|
| VI                    | 21UCZO6P1   | <b>IMMUNOLOGY AND MICROBIOLOGY AND APPLIED ZOOLOGY PRACTICALS</b> |                          |                          |                          |                                    | 60                       | 4                        |                          |                          |  |  |
| Course Outcomes (COs) | Programme Learning Outcomes (PLOs)  |   |                          |                          |                          | Programme Specific Outcomes (PSOs) |                          |                          |                          |                          |  |  |
|                       | PL O 1  | PLO 2   | PL O 3                   | PL O 4                   | PL O 5                   | PS O 1                             | PS O 2                   | PS O 3                   | PS O 4                   | PS O 5                   |  |  |
| CO-1                  | <input type="checkbox"/>  |   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>           | <input type="checkbox"/> |                          | <input type="checkbox"/> | <input type="checkbox"/> |  |  |
| CO-2                  | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |                          | <input type="checkbox"/> |                                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  |  |
| CO-3                  | <input type="checkbox"/>  |   |                          | <input type="checkbox"/> |                          | <input type="checkbox"/>           |                          | <input type="checkbox"/> | <input type="checkbox"/> |                          |  |  |
| CO-4                  | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |                                    | <input type="checkbox"/> | <input type="checkbox"/> |                          | <input type="checkbox"/> |  |  |
| CO-5                  |   | <input type="checkbox"/>  | <input type="checkbox"/> |                          | <input type="checkbox"/> | <input type="checkbox"/>           | <input type="checkbox"/> |                          | <input type="checkbox"/> |                          |  |  |
|                       | Number of matches (□) = ...35....<br>Relationship = High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |   |                          |                          |                          |                                    |                          |                          |                          |                          |  |  |

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Dr.S.Peer Mohamed  
Signature

Checked by  
Head of the Department

## Semester – VI

|                     |  |
|---------------------|--|
| <b>Course Title</b> | <b>BIostatistics &amp; Computer Applications<br/>Practicals<br/>Core Zoology Practicals – VIII</b> |
| <b>Total Hrs</b>    | <b>30</b>  |
| <b>Hrs/Week</b>     | <b>2</b>   |
| <b>Sub.Code</b>     | <b>21UCZO6P2</b>   |
| <b>Course Type</b>  | <b>Core practical</b>  |
| <b>Credits</b>      | <b>1</b>   |
| <b>Marks</b>        | <b>100</b>   |

### General Objective:

To acquire knowledge in biostatistics through collection, classification and tabulation of data

### Course Objectives: The learner will be able to

| <b>CO</b> | <b>Course Objectives</b>  |
|-----------|---|
| CO-1      | <b>Define the measure of central tendency</b>                                   |
| CO-2      | <b>Understand the concept of correlation and co-efficient of the given data</b> |
| CO-3      | <b>Illustrate the collected data in graphical mode</b>                          |
| CO-4      | <b>Evaluate the goodness of fit using coin tossing</b>                          |
| CO-5      | <b>Develop the skills in computer integrated statistical methods</b>            |

### BIostatistics & Computer Applications Practicals

1. Study of probability with 2 coins tossing experiments.
2. Calculation of Mean, Median, Mode, Variance, Standard deviation and Standard error using Neem leaves.
3. Calculation of Correlation Co efficient - Height and weight of students
4. Testing goodness of fit using coin toss (Chi square test)
5. Preparation of a questionnaire and collection of primary data by survey method.
6. Diagrammatic presentation of data - simple bar diagram and pie diagram (using given data)
7. Graphical presentation of data - histogram, frequency polygon and frequency curve (using given data).
8. Preparation of slides using M.S PowerPoint.
9. Spotters
  - 1) Bar diagrams,
  - 2) Pie diagrams,
  - 3) Histogram.
  - 4) Input devices – Key board, Mouse
  - 5) Output devices – Monitor, printer,

## 6) CPU – Central Processing Unit

**Course Outcomes**

| CO   | Course Outcomes   | PSOs Addressed | Cognitive Level |
|------|---|----------------|-----------------|
| CO-1 | <b>Find the mean, median, mode, SD, SE and variance</b> | 1,2,3          | Remembering     |
| CO-2 | <b>Estimate the chi-square test using coin toss</b>     | 1,2,3          | Understanding   |
| CO-3 | <b>Determine the probability using coins</b>            | 1,2,3          | Applying        |
| CO-4 | <b>Organize slides using Microsoft PowerPoint</b>       | 5              | Analysing       |
| CO-5 | <b>Devise the input and output devices.</b>             | 5              | C               |

**Relationship Matrix**

| Semester  | Course Code                        | Title of the Course           |       |       |       |                                    | Hours | Credit |       |       |  |  |
|---|------------------------------------|-------------------------------|-------|-------|-------|------------------------------------|-------|--------|-------|-------|--|--|
| VI  | 21UCZO3P1                          | CORE ZOOLOGY PRACTICALS – III |       |       |       |                                    | 30    | 1      |       |       |  |  |
| Course Outcomes (COs)   | Programme Learning Outcomes (PLOs) |                               |       |       |       | Programme Specific Outcomes (PSOs) |       |        |       |       |  |  |
|   | PL O1                              | PLO 2                         | PL O3 | PL O4 | PL O5 | PS O1                              | PS O2 | PS O3  | PS O4 | PS O5 |  |  |
| CO-1  | ☐                                  | ☐                             | ☐     |       |       | ☐                                  | ☐     | ☐      |       |       |  |  |
| CO-2  | ☐                                  | ☐                             | ☐     |       |       | ☐                                  | ☐     | ☐      |       |       |  |  |
| CO-3  | ☐                                  | ☐                             | ☐     |       |       | ☐                                  | ☐     | ☐      |       |       |  |  |
| CO-4  |                                    |                               | ☐     |       | ☐     |                                    |       |        |       | ☐     |  |  |
| CO-5  |                                    |                               | ☐     |       | ☐     |                                    |       |        |       | ☐     |  |  |
| Number of matches (☐) = 24<br>Relationship = Low<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                                    |                               |       |       |       |                                    |       |        |       |       |  |  |

Prepared by

Checked by

Name :Dr.M.I.Zahir Hussain  
Signature :

Head of the Department

## Semester – VI

|                     |                              |
|---------------------|------------------------------|
| <b>Course Title</b> | <b>APPLIED BIOTECHNOLOGY</b> |
| <b>Total Hrs</b>    | <b>60</b>                    |
| <b>Hrs/Week</b>     | <b>4</b>                     |
| <b>Sub.Code</b>     | <b>21UEZO61</b>              |
| <b>Course Type</b>  | <b>DSE</b>                   |
| <b>Credits</b>      | <b>4</b>                     |
| <b>Marks</b>        | <b>100</b>                   |

### General Objective:

To understand and apply the biotechnological methods in the protection of environment, genetic improvement of agricultural plants, aquatic resources and livestock for the welfare of human beings

### Course Objectives: The learner will be able to

| <b>1</b> | <b>Course Objectives</b>  |
|----------|---|
| CO-1     | State the scope and applications of biotechnology                     |
| CO-2     | Observe the modern practices of biotechnology                         |
| CO-3     | Establish the process of primary and secondary metabolites production |
| CO-4     | Distinguish between the types of vaccine and biosensor                |
| CO-5     | Grade the sources of bioinformatics and nanotechnology                |

### UNIT I - Environmental Biotechnology

Introduction – solid and liquid wastes, Bio-technological methods for waste water treatment – Preliminary, Primary, Secondary, Tertiary treatment (Aerobic & anaerobic treatment). Bioremediation: Definition – types of Xenobiotics, Bio-degradation of pesticide, Role of genetically engineered microorganisms in bioremediation- super bug. Biotechnological methods for pollution detection.

### UNIT II - Agricultural and Live stock Biotechnology

Somatic cell hybridization and Micro-propagation - Genetic manipulation of 'nif' gene and 'nod' gene for nitrogen fixation. Transgenic plants – their advantages & disadvantages. Biofertilizers – Rhizobium and Azotobacter. Single Cell Protein (SCP)

### UNIT III - Bioprocess Technology

Bioreactors, Fermentation Process – Metabolites – Primary Metabolites – Ethanol Production – Secondary Metabolites – Enzyme Production – Galactosidase. Biogas – production, Advantages & disadvantages.

#### **UNIT IV - Biotechnology and health care**

Human Genome Project- principle and application. Vaccines - Recombinant Vaccines, DNA Vaccines. Gene therapy- types – vectors used in gene therapy. DNA finger printing technique and applications. Bio sensors – Types – applications.

#### **UNIT V – Bioinformatics and Nanotechnology**

Introduction, Definition, History – Biological databases- National Center for Biotechnology and Informatics (NCBI); European Bioinformatics Institute ( EBI) sequence alignment and database searching- protein database – SWISSPORT & PIR – Sequencing similarity search tools– BLAST and FASTA – applications.

Nano technology – definition, classification. methods of synthesis – solgel method and bacterial synthesis, application in biology.

#### **TEXT BOOKS**

1. Sathyanarayana U., (2017). Biotechnology. Book and Allied (P) Ltd, Kolkata.
2. Singh B .D (2015), Biotechnology Kalyani Publishers. Mahalakshmi street, T.Nagar, Chennai – 600017.
3. Dubey R.C. (2014), A Text book of Biotechnology. S.Chand & Co Ltd . 7361, Ramnagar, New Delhi – 110055.

#### **REFERENCE BOOKS**

1. Arora M.P.-Biotechnology ( IInd Edition ) Himalaya Publishing House, Ramdoot. Dr. Bhalerao Mar g, Girgaon Mumbai – 400004.
2. Gupta P.K - Elements of Biotechnology. Rastogi Publications, Gangotri, Shivaji Road, Meerut – 250002
3. Herren, R.V. -Introduction to Biotechnology, Thomson Learning, Alps Buildings, Ist Floor, 56 Janpath, New Delhi – 110001.
4. Joshi.P- Genetic Engineering. Student Edition, Agrobios (India) Behind Nasrani Cinema, Chopasani Road, Jodhpur – 342002
5. Prakash S. Lohar- Biotechnology, M.J.P.Publishers, Tamilnadu Book house 47, Nallathambi Street Triplicane – 600005.
6. Trivedi P.C - Advances in Bio-technology, Agrobios( India ) Behind Nasrani Cinema, Choprasani Road Jodhpur – 342002.
7. Vikaspruthi - Basic Biotechnology, ANE Books India, Avantika Nivas, 19, Doraisamy Road T.Nagar Chennai – 600017.
8. Yount.L –Genetics & Genetic Engineering, Orient Longman Limited PostBox No : 310, 160 Anna Salai, Chennai – 600002.
9. Shanmugam - Nanobiotechnology – MJP publication, Chennai



### Course Outcomes

| 1    | Course Outcomes   | PSOs Addressed | Cognitive Level |
|------|---|----------------|-----------------|
| CO-1 | Identify the principles of waste water treatment and bioremediation | 2,3,4,5        | Remembering     |
| CO-2 | Compare the techniques of somatic hybridization and trans-genesis   | 3,4,5          | Understanding   |
| CO-3 | Practice the use of bio-fuel and biogas                             | 2,3,4,5        | Applying        |
| CO-4 | Explain the principle and application of human genome project       | 1,3,4,5        | Analysing       |
| CO-5 | Assess the application of bioinformatics and nanotechnology         | 4,5            | Evaluating      |

### Relationship Matrix

| Semester   | Course Code                        | Title of the Course   |       |       |       |                                    | Hours | Credit |       |       |  |  |
|--|------------------------------------|-----------------------|-------|-------|-------|------------------------------------|-------|--------|-------|-------|--|--|
| VI   | 21UEZO61                           | APPLIED BIOTECHNOLOGY |       |       |       |                                    | 60    | 4      |       |       |  |  |
| Course Outcomes (COs)  | Programme Learning Outcomes (PLOs) |                       |       |       |       | Programme Specific Outcomes (PSOs) |       |        |       |       |  |  |
|  | PL O1                              | PLO 2                 | PL O3 | PL O4 | PL O5 | PS O1                              | PS O2 | PS O3  | PS O4 | PS O5 |  |  |
| CO-1   | ☐                                  | ☐                     | ☐     | ☐     |       |                                    | ☐     | ☐      | ☐     | ☐     |  |  |
| CO-2   | ☐                                  | ☐                     | ☐     |       | ☐     |                                    |       | ☐      | ☐     | ☐     |  |  |
| CO-3   | ☐                                  | ☐                     | ☐     |       |       |                                    | ☐     | ☐      | ☐     | ☐     |  |  |
| CO-4   | ☐                                  | ☐                     | ☐     | ☐     |       | ☐                                  |       | ☐      | ☐     | ☐     |  |  |
| CO-5   | ☐                                  | ☐                     | ☐     |       | ☐     |                                    |       |        | ☐     | ☐     |  |  |
| Number of matches (☐) = 36<br>Relationship = High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |                                    |                       |       |       |       |                                    |       |        |       |       |  |  |

Prepared by

Checked by

Name :Dr.M.I.Zahir Hussain

Head of the Department

Signature :

### Semester – VI

|                     |                             |
|---------------------|-----------------------------|
| <b>Course Title</b> | <b>MEDICAL MICROBIOLOGY</b> |
| <b>Total Hrs</b>    | 60                          |
| <b>Hrs/Week</b>     | 4                           |
| <b>Sub.Code</b>     | 21UEZO61B                   |
| <b>Course Type</b>  | ELECTIVE                    |
| <b>Credits</b>      |                             |
| <b>Marks</b>        | 100                         |

#### General Objective:

The course teaches normal microflora, infection, types and its transmission, epidemiology, pathogenesis, diagnosis, prevention and treatment of bacterial and viral infections, fungal and parasite diseases.

**Course Objectives:** The learners will be able to:

| <b>CO</b> | <b>Course Objectives</b>  |
|-----------|---|
| CO-1      | Explain the normal flora and its importance.  |
| CO-2      | Demonstrate on epidemiology, pathogenesis, diagnosis and treatment of bacterial diseases. |
| CO-3      | Apply the diagnostic methods and the treatment for viral diseases.                        |
| CO-4      | Classify the superficial, subcutaneous systemic mycoses, and opportunistic mycoses.       |
| CO-5      | Interpret the parasitic infections including amoebiasis, giardia and malaria.             |

#### UNIT I: BASICS OF MEDICAL MICROBIOLOGY

Introduction- Importance of Medical Microbiology, Koch's postulates. Normal flora of the human body - Normal microflora of skin, throat, gastrointestinal tract, Host pathogen interaction: Infection, Invasion, Pathogenicity, Virulence and Toxigenicity. Nosocomial infections. Collection, transport and culturing of clinical samples.

#### UNIT II: MEDICAL BACTERIOLOGY

Introduction - Epidemiology, pathogenesis, laboratory diagnosis, prevention and treatment of the following bacteria- *Streptococcus pyogenes*, *E.coli*, *Shigella*, *Salmonella*, *Vibrio cholerae*, *Mycobacterium tuberculosis*, *Treponema palladium*, *Neisseria gonorrhoeae*

#### UNIT III: MEDICAL VIROLOGY

Introduction- Epidemiology, Pathogenesis, Laboratory diagnosis, Prevention and treatment of the following virus – Hepatitis B virus , Influenza Virus, HIV, COVID- 19, Rabies virus-Polio virus- Dengue fever

#### UNIT IV: MEDICAL MYCOLOGY

Introduction- Epidemiology, pathogenesis, laboratory diagnosis, prevention and treatment of the following fungal infections—

Dermatophytosis, Cutaneous mycoses (*Tinea pedis*), Superficial mycosis, Subcutaneous and Systemic mycosis (Candidiasis) and opportunistic mycosis.

### **UNIT V: MEDICAL PARASITOLOGY**

Introduction- Epidemiology, Pathogenesis, Laboratory diagnosis, Prevention and treatment of the following parasitic infections-*Entamoeba histolytica*, Giardiasis, *Plasmodium malariae*, *Trichomonas vaginalis* Leishmaniasis.

#### **Textbooks:**

1. Pelczar, J. *et al.*, *Microbiology*- McGraw- Hill Inc, New York. 1993
2. Anathanarayanan, R., and Panicker, J. *Text book of microbiology*. Orient Longmans, India. 2000.
3. Pasha C., and Muthenna, P. *A text book of medical microbiology*, KedarNath Ram Nath, Meerut. 2019.
4. Mukherjee, K.L. *Medical Laboratory Technology Vol I-III*. McGraw Hill Publishing Co, Ltd, New Delhi. 2010.
5. Rajan, S. *Medical microbiology*. MJP publisher, Chennai. 2007.

#### **Reference Books:**

- 1) Sherris, K.J.R. *Medical Microbiology 7th edition*. McGraw- Hill Inc, New York. 2018.
- 2) Prescott, L.M. *et al.*, *Microbiology 7th edition*. McGraw- Hill Inc, New York. 2008.

#### **Course Outcome (CO)**

| <b>CO No</b> | <b>Upon completion of this course, students will be able to:</b>                           | <b>PSO addressed</b> | <b>Cognitive level</b> |
|--------------|--|----------------------|------------------------|
| CO-1         | Outline the importance of medical microbiology.  | 1, 3,5               | Understanding          |
| CO-2         | Demonstrate the epidemiology, pathogenesis, diagnosis and treatment of bacterial diseases. | 1, 4,5               | Applying               |
| CO-3         | Apply the diagnostic methods and the treatment for viral diseases.                         | 1, 2,4,5             | Applying               |
| CO-4         | Analyze the superficial, subcutaneous systemic mycoses, and opportunistic mycoses.         | 1, 2,3,4,5           | Analyzing              |
| CO-5         | Intrepret the parasitic infections including amoebiasis, giardia and malaria.              | 1, 3,4,5             | Evaluating             |

#### **Relationship Matrix**

| Semester              | Course Code                                       | Title of the Course  |       |       |       |                                    | Hours | Credit |        |       |
|-----------------------|---|----------------------|-------|-------|-------|------------------------------------|-------|--------|--------|-------|
| VI                    | 21UCMB61  | Medical Microbiology |       |       |       |                                    | 75    | 4      |        |       |
| Course Outcomes (COS) | Programme Learning Outcomes (PLOs)                |                      |       |       |       | Programme Specific Outcomes (PSOs) |       |        |        |       |
|                       | PLO 1   | PLO 2                | PL O3 | PLO 4 | PL O5 | PS O 1                             | PSO 2 | PS O 3 | PS O 4 | PSO 5 |
| CO-1                  | ☐   |                      | ☐     | ☐     | ☐     | ☐                                  |       |        | ☐      | ☐     |
| CO-2                  | ☐   | ☐                    | ☐     | ☐     |       |                                    |       |        | ☐      | ☐     |
| CO-3                  | ☐   | ☐                    | ☐     |       | ☐     | ☐                                  | ☐     | ☐      | ☐      |       |
| CO-4                  | ☐   | ☐                    | ☐     | ☐     | ☐     | ☐                                  | ☐     | ☐      | ☐      | ☐     |
| CO-5                  | ☐   | ☐                    | ☐     | ☐     | ☐     | ☐                                  | ☐     | ☐      | ☐      | ☐     |
|                       | Number of matches (☐) = 41<br>Relationship = High |                      |       |       |       |                                    |       |        |        |       |

Prepared by  
Dr.S.PEER MOHAMED

Checked by  
Dr.M.SITHI JAMEELA  
Head of the Department

## Semester – VI

|                     |                                    |
|---------------------|------------------------------------|
| <b>Course Title</b> | <b>ENVIRONMENTAL BIOTECHNOLOGY</b> |
| <b>Total Hrs</b>    | <b>60</b>                          |
| <b>Hrs/Week</b>     | <b>4</b>                           |
| <b>Sub.Code</b>     | <b>21UEZO61C</b>                   |
| <b>Course Type</b>  | <b>core</b>                        |
| <b>Credits</b>      | <b>4</b>                           |
| <b>Marks</b>        | <b>100</b>                         |

### General Objectives:

1. To gain knowledge and applications of biotechnology with reference to environment

Course Objectives: The learner will be able to

| <b>CO</b> | <b>Course Objectives</b>  |
|-----------|---|
| CO-1      | To define the fundamentals of environmental biotechnology         |
| CO-2      | To describe the process of fermentation.                          |
| CO-3      | To experiments the environmental biomonitoring                    |
| CO-4      | To value the transgenic plants                                    |
| CO-5      | To design the production of products by the biotechnology process |

## **Environmental Biotechnology**

### **Unit I: Environmental Biotechnology**

Introduction, Scope and role of Environmental Biotechnology, Integrated approach in environmental biotechnology - Immobilization, Degradation and Monitoring of Pollutants from water, air and soil origin.

### **Unit II: Fermentation in environmental biotechnology**

Introduction and Importance of fermentation-Types of bioreactor, design of bioreactor; Types of fermentation: Batch, Continuous and Fed-batch system; Batch culture and kinetics; Continuous culture – types, multistage systems, feedback systems; Comparison of batch and continuous culture – biomass productivity, metabolite productivity, continuous culture and biomass productivity, Fed-batch culture – types and applications Strain improvement: Methods of strain improvement in fermentation.

### **Unit :III Environmental monitoring**

Definition and environmental monitoring process; Sampling – land (site) sampling, water sampling, air sampling, Analysis – physical, chemical and biological analysis methods and process Use of microbial population for environmental monitoring – recombinant DNA technology and proteomics Monitoring pollution; Bioindicators; Biomarkers – biochemical indicators, immunochemistry, genetic indicators; Biosensors – mechanism, principle and Environment Impact Assessment

### **Unit :IV Agricultural biotechnology**

Application of biotechnology in agriculture – Detection and diagnostics, Micropropagation; Somatic cell genetics – production of callus and suspension cultures, production of protoplasts, somaclonal variation, protoplast fusion, haploid production Transgenic plants: Production of transgenic plants – complete process, vectors used, transformation methods used; Types of GM Plants and Products obtained from GM Plants.

### **Unit : V Industrial Biotechnology**

Introduction, history, Isolation and screening, Primary and Secondary screening, Production strains, Production media, Inoculum preparation and inoculum Development, Introduction to Fermenter, Industrial sterilization, Scale up fermentations, Types of fermenters, Acetator and cavitator, product recovery, Industrial production of penicillin, production of microbial insecticides, production of Biopolymers, Biofuels, biogas, production of Bioplastics, Biosurfactants, and Biofertilizers,

## References

1. Evans, G.G. & Furlong, J. 2010. Environmental Biotechnology: Theory and Application (2nd edition). Wiley-Blackwell Publications.
  2. Scagg, A.H. 2005. Environmental Biotechnology. Oxford University Press. Reference Books:
  3. Jordening, H.J. & Winter J. 2005. Environmental Biotechnology: Concepts and Applications. John Wiley & Sons.
  4. Lodish, H.F., Baltimore, D., Berk, A. Zipursky, S.L. Matsudaira, P. & Darnell, J. 1995. Molecular Cell Biology. W.H. Freeman.
  5. Nelson, D.L. & Cox, M.M. 2013. Lehninger's Principles of Biochemistry. W.H. Freeman.
  6. Rittman, B.E. & McCarty, P.L. 2001. Environmental Biotechnology. Principles and Applications. McGraw-Hill, New York.
  7. Snustad, D.P. & Simmons, M.J. 2011. Principles of Genetics (6th edition). John Wiley & Sons.
- Wainwright, M. 1999. An Introduction to Environmental Biotechnology, Springer.

## Course Outcomes

| CO   | Course Outcomes   | PSOs Addressed | Cognitive Level |
|------|---|----------------|-----------------|
| CO-1 | Defining integrated approach in environmental biotechnology | 1,2,4,5        | R               |
| CO-2 | Relating the fermentation in fermentor                      | 1,2,5          | U               |
| CO-3 | Explaining the monitoring of pollution                      | 1,3,5          | AN              |
| CO-4 | Assessing the application of biotechnology in agriculture   | 1,2,3,5        | E               |
| CO-5 | Devising the industrial biotech products                    | 1,2,3,5        | C               |

## Relationship Matrix

| Semester              | Course Code                        | Title of the Course      |       |       |       |                                    | Hours | Credit |       |       |  |  |
|-----------------------|------------------------------------|--------------------------|-------|-------|-------|------------------------------------|-------|--------|-------|-------|--|--|
| III                   | 18UCZO31                           | Cell & Molecular Biology |       |       |       |                                    | 60    | 4      |       |       |  |  |
| Course Outcomes (COs) | Programme Learning Outcomes (PLOs) |                          |       |       |       | Programme Specific Outcomes (PSOs) |       |        |       |       |  |  |
|                       | PL 01                              | PLO 2                    | PL 03 | PL 04 | PL 05 | PS 01                              | PS 02 | PS 03  | PS 04 | PS 05 |  |  |

|      |  |   |   |   |   |   |   |   |   |   |
|------|--|---|---|---|---|---|---|---|---|---|
| CO-1 | □  | □ | □ |   | □ | □ | □ |   | □ | □ |
| CO-2 | □  | □ | □ | □ |   | □ | □ |   |   | □ |
| CO-3 | □  | □ | □ |   | □ | □ |   | □ |   | □ |
| CO-4 | □  | □ | □ | □ |   | □ | □ | □ |   | □ |
| CO-5 | □  | □ | □ |   |   | □ | □ | □ |   | □ |
|      | Number of matches (□) = 37<br>Relationship = High<br>Low (If the No. of matches are less than 25)<br>Medium (If the No. of matches are between 25 and 33)<br>High (If the No. of matches are more than 33) |   |   |   |   |   |   |   |   |   |

Prepared by

Checked by

Name :Dr.M.I.Zahir Hussain

Head of the Department

Signature :



## Semester – VI

|                     |                 |
|---------------------|-----------------|
| <b>Course Title</b> | <b>PROJECT</b>  |
| <b>Total Hrs</b>    | <b>90</b>       |
| <b>Hrs/Week</b>     | <b>6</b>        |
| <b>Sub.Code</b>     | <b>21UEZO62</b> |
| <b>Course Type</b>  | <b>DSE</b>      |
| <b>Credits</b>      | <b>6</b>        |
| <b>Marks</b>        | <b>100</b>      |

### Objectives:

At the end of the semester the students should be able to:

1. Identify the possible areas of research in his/her field;
2. Collect data from various sources including the internet, analyze them, make new connections and link them to life.
3. Read and write originally and usefully.

### GUIDELINES:

1. The project may be done individually or in groups not exceeding five per group.
2. The minimum length of the project should be 30 pages in A4 size.
3. Marks for the project report will be 100 divided as 60% for the project and 40% for viva – voce.

### Evaluation scheme:

The project will be evaluated by both Internal and External Examiners. Each Examiner will evaluate for 100 marks. The allocation of marks for project is as follows:

| <b>Project</b>                                | <b>Internal</b> | <b>External</b> |
|---|-----------------|-----------------|
| Word of title                                 | 5               | 5               |
| Objectives / Formulation including Hypothesis | 5               | 5               |
| Review of literature                          | 10              | 10              |
| Relevance of project to social needs          | 5               | 5               |
| Methodology / Technique / Procedure adopted   | 20              | 20              |
| Summary / Findings / Summation                | 5               | 5               |
| Works cited / Annexure / Footnotes            | 10              | 10              |
| <b>Total</b>                                  | <b>60</b>       | <b>60</b>       |

## Semester VI

|                     |                                    |
|---------------------|------------------------------------|
| <b>Course Title</b> | <b>MUSHROOM CULTURE TECHNOLOGY</b> |
| <b>Total Hours</b>  | <b>30</b>                          |
| <b>Hrs/Week</b>     | <b>2</b>                           |
| <b>Sub.Code</b>     | <b>21USBT63</b>                    |
| <b>Course Type</b>  | <b>SEC V</b>                       |
| <b>Credits</b>      | <b>2</b>                           |
| <b>Marks</b>        | <b>100</b>                         |

### General Objectives:

To make students aware of the growing techniques, medicinal, nutritional, national and international market value of mushrooms.

**Course Objectives:** The learners will be able to:

| <b>CO</b>   | <b>Course Objectives</b>   |
|-------------|--|
| <b>CO-1</b> | Recall the various types and categories of mushrooms.  |
| <b>CO-2</b> | Understand the ways to cultivate mushrooms.  |
| <b>CO-3</b> | Practice and use the available technologies of mushroom cultivation.   |
| <b>CO-4</b> | Relate the nutritional and medicinal value associated with mushrooms besides explaining the storage methods. |
| <b>CO-5</b> | Measure the preparation of various mushroom dishes with medicinal and nutritional value.                     |

### UNIT – I

Introduction and history of mushroom cultivation in India. Medicinal value of Mushrooms; Edible & Poisonous Mushrooms in India. Research centers-- National level and regional level.

### UNIT – II

Cultivation technology, spawn preparation, mushroom bed preparation. Factors affecting the mushroom bed preparation -- low cost technology, composting technology in mushroom production- spent mushroom substrate (SMS).

### **UNIT – III**

Cultivation technology of Oysters, Button and Milky mushrooms.

### **UNIT – IV**

Nutrition of mushroom- proteins, amino acids, mineral elements nutrition- carbohydrates, crude fibre content- vitamins. Storage - short term storage, long term storage drying.

### **UNIT – V**

Food preparation, Types of food prepared from mushroom - Mushroom sabji, Mushroom Achar, Mushroom soup, Mushroom Cutlet, Samosa, Curry, Soup Powder and Idly chutney powder.

**Field visit to Mushroom farm and One day Training on Mushroom cultivation.**

**Guest Lecturer on Mushroom Cultivation**

### **TEXT BOOK:**

1.Nita Bahl (1984-1988) Hand book of Mushrooms, II Edition, Vol. I & Vol. II.

### **REFERENCES:**

1. Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R (1991) Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
2. Swaminathan, M. (1990) Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
3. Paul Stamets, J.S. and Chilton, J.S. (2004). Mushroom Cultivator: A practical guide to growing mushrooms at home, Agarikon Press.
4. Shu-Ting Chang, Philip G. Miles, Chang, S.T. (2004). Mushrooms: Cultivation, nutritional value, medicinal effect and environmental impact, 2nd ed, CRC press.
5. Tewari, Pankaj Kappor, S.C. (1998) Mushroom cultivation, Mittal Publications, Delhi.

### **Course Outcomes: The learners would have learnt to:**

| <b>CO</b> | <b>Course Outcomes</b>                                       | <b>PSOs Addressed</b> | <b>Cognitive Level</b> |
|-----------|--|-----------------------|------------------------|
| CO-1      | Differentiate the various types and categories of mushrooms. | 2,3,4,5               | <b>Understanding</b>   |

|      |   |         |                      |
|------|---|---------|----------------------|
| CO-2 | Understand the process involving the cultivation of mushrooms.              | 1,2,3,4 | <b>Understanding</b> |
| CO-3 | Practice the cultivation of different types of mushrooms.                   | 2,3,4   | <b>Applying</b>      |
| CO-4 | Evaluate the nutritional value of mushrooms.                                | 2,3,4,5 | <b>Evaluating</b>    |
| CO-5 | Recommend themselves and others about mushroom farming for self-employment. | 2,3,4,5 | <b>Evaluating</b>    |

### Relationship Matrix

| Semester   | Course Code                        | Title of the Course                |      |      |      |                                    | Hours     | Credit   |      |       |  |  |
|--|------------------------------------|------------------------------------|------|------|------|------------------------------------|-----------|----------|------|-------|--|--|
| <b>IV</b>  | <b>21UEBT4A</b>                    | <b>MUSHROOM CULTURE TECHNOLOGY</b> |      |      |      |                                    | <b>30</b> | <b>2</b> |      |       |  |  |
| Course Outcomes (COs)  | Programme Learning Outcomes (PLOs) |                                    |      |      |      | Programme Specific Outcomes (PSOs) |           |          |      |       |  |  |
|  | PLO1                               | PLO2                               | PLO3 | PLO4 | PLO5 | PSO 1                              | PSO2      | PSO3     | PSO4 | PSO 5 |  |  |
| CO-1   | □                                  | □                                  | □    | □    | -    | -                                  | □         | □        | □    | □     |  |  |
| CO-2   | □                                  | □                                  | □    | □    | □    | □                                  | □         | □        | □    | -     |  |  |
| CO-3   | □                                  | □                                  | □    | □    | -    | -                                  | □         | □        | □    | -     |  |  |
| CO-4   | □                                  | □                                  | □    | □    | -    | -                                  | □         | □        | □    | □     |  |  |
| CO-5   | □                                  | □                                  | □    | □    | □    | -                                  | □         | □        | □    | □     |  |  |
| Number of matches (□) = 41<br>Relationship = Low/Medium/ <b>High</b> |                                    |                                    |      |      |      |                                    |           |          |      |       |  |  |

Prepared by  
Name: Dr. M. SYED ALI FATHIMA

Checked by  
Head of the Department

Signature:

### SCHEME OF EXAMINATIONS UNDER CBCS (2021 - 2024)

The medium of instruction in all UG and PG courses is English, and students must write the CIA Tests and Semester Examinations in English.

#### DISTRIBUTION OF MARKS FOR CIA AND SEMESTER EXAMINATIONS UNDERGRADUATE, CERTIFICATE & DIPLOMA COURSES

| SUBJECT                  | TOTAL MARKS | CIA TEST | SEMESTER EXAMINATION                     | PASSING MINIMUM |            |          |
|--------------------------|-------------|----------|--|-----------------|------------|----------|
|                          |             |          |  | CIA TEST        | SEM. EXAM. | OVER ALL |
| <b>Theory</b>            | 100         | 25       | 75                                       | Nil             | 30         | 40       |
| <b>Practical (4 hrs)</b> | 100         | 40       | 60                                       | Nil             | 24         | 40       |
| <b>Practical (2 hrs)</b> | 50          | 20       | 30                                       | Nil             | 12         | 20       |
| <b>Project</b>           | 100         | Nil      | Report - 60 marks<br>Viva Voce - 40marks | Nil             | Nil        | 40       |

### DIVISION OF MARKS FOR CIA TEST

| <b>SUBJECT</b>               | <b>MARKS</b> | <b>ASSIGNMENT FOR UG /<br/>ASSIGNMENT OR SEMINAR FOR PG</b> | <b>RECORD<br/>NOTE</b> | <b>TOTAL<br/>MARKS</b> |
|------------------------------|--------------|---|------------------------|------------------------|
| <b>Theory</b>                | 20           | 5   | --                     | <b>25</b>              |
| <b>Practical<br/>(4 hrs)</b> | 30           | --  | 10                     | <b>40</b>              |
| <b>Practical<br/>(2 hrs)</b> | 15           | --  | 5                      | <b>20</b>              |

1. The duration of each CIA Test is ONE hour and the Semester Examination is THREE hours.
2. Three CIA tests of 20 marks each will be conducted and the average marks of the best two tests out of the three tests will be taken.
3. The I test will be based on the first 1.5 units of the syllabus, the II test will be based on the next 1.5 units of the syllabus and the III test will be based on the next 1.5 units of the syllabus.
4. Two assignments for Undergraduate, Certificate, Diploma and Advanced Diploma Courses and two assignments OR two seminars for Postgraduate Courses has to be submitted.
5. The duration and the pattern of question paper for practical examination may be decided by the respective Boards of Studies. However, out of 60 marks in the semester practical examination, 10 marks may be allotted for record and 50 marks for practical.
6. Two internal practical tests of 30/15 marks each will be conducted for science students in the respective semester and the average will be taken. The record marks allotted for the above practical are 10 and 5 respectively.

**QUESTION PAPER PATTERN FOR CIA TEST (THEORY)**

| <b>Duration: 1 Hr</b> |  | <b>Maximum Marks: 20</b>            |                 |
|-----------------------|--|-------------------------------------|-----------------|
| <b>Section</b>        | <b>Question Type</b>   | <b>No. of Questions &amp; Marks</b> | <b>Marks</b>    |
| <b>A</b>              | No Choice<br>Answer should not exceed 75 words                                   | 2 Questions<br>2 marks each         | 2 x 2 = 4       |
| <b>B</b>              | Internal choice<br>(Either or type)<br>Answer should not exceed 200 words        | 2 Questions<br>4 marks each         | 2 x 4 = 8       |
| <b>C</b>              | Open Choice<br>(Answer ANY ONE out of Two)<br>Answer should not exceed 400 words | 1 Question<br>8 marks               | 1 x 8 = 8       |
| <b>TOTAL</b>          |  |                                     | <b>20 MARKS</b> |

**QUESTION PAPER PATTERN FOR SEMESTER EXAMINATION (THEORY)**

| <b>Duration: 3 Hrs</b> |   | <b>Maximum Marks: 75</b>   |                 |
|------------------------|---|--|-----------------|
| <b>Section</b>         | <b>Question Type</b>  | <b>No. of Questions &amp; Marks</b>  | <b>Marks</b>    |
| <b>A</b>               | No Choice<br>Answer should not exceed 75 words                                      | 10 Questions - 2 marks each<br>(2 Questions from each unit)                              | 10 x 2 = 20     |
| <b>B</b>               | Internal choice<br>(Either or type)<br>Answer should not exceed 200 words           | 5 Questions with internal choice. Each carries 5 marks<br>(Two questions from each unit) | 5 x 5 = 25      |
| <b>C</b>               | Open Choice<br>(Answer ANY THREE out of FIVE)<br>Answer should not exceed 400 words | 3 Questions out of 5 - 10 marks each<br>(1 Question from each unit)                      | 3 x 10 = 30     |
| <b>TOTAL</b>           |   |  | <b>75 MARKS</b> |

## Semester – I

|              |              |
|--------------|--------------|
| Course Title | FOOD SCIENCE |
| Total Hrs    | 60           |
| Hrs/Week     | 4            |
| Subject Code | 21UAAN11     |
| Course Type  |              |
| Credits      | 3            |
| Marks        | 100          |

**UNIT I - INTRODUCTION TO FOOD SCIENCE**

Human health: Definition, food and nutrition- Classification of food according to functions, Food groups: Basic IV, V-Food pyramid.

Preliminary preparation of food, Different methods of cooking and their influence on nutrient retention.

**UNIT II - CEREALS AND PULSES**

Cereals and millets – Structure of wheat and nutritive value of rice, wheat and ragi; Parboiling of rice – Advantages.

Pulses, – Nutritive value–Germination of pulses and its advantages; Factors influencing cooking quality of pulses.

**UNIT III FATS AND OIL**

Nuts and oil seeds – Nutritive value of groundnuts, soybeans, sesame, coconut.

Kinds of fats and oils- Mustard oil, sunflower oil, Safflower oil and its importance.

Stages of sugar cookery.

## UNIT IV- PLANT FOODS

Vegetables –Classification, Nutritive value, pigments in vegetables and changes during cooking.

Fruits – Classification, nutritive value and browning reaction

Types of beverages.

## UNIT V - ANIMAL FOODS

Milk – Nutritive value- different types of milk and milk products.

Egg – Structure and nutritive value –uses of egg in cookery.

Flesh foods- Nutritive value – methods of selection of fish, poultry, and meat.

Food Adulteration –common food adulterants and its harmful effects.

### Semester – I

|                     |                                |
|---------------------|--------------------------------|
| <b>Course Title</b> | <b>FOOD SCIENCE PRACTICALS</b> |
| <b>Total Hrs</b>    | <b>30</b>                      |
| <b>Hrs/Week</b>     | <b>2</b>                       |
| <b>Subject Code</b> | <b>21UAAN1P1</b>               |
| <b>Course Type</b>  |                                |
| <b>Credits</b>      | <b>1</b>                       |
| <b>Marks</b>        | <b>100</b>                     |

### FOOD SCIENCE PRACTICALS-I

1. Identification of food groups.
2. Tests for detecting food adulteration.
3. Identification of different stages of sugar cooking.
4. Preparation of
  - a. Cereals
  - b. Pulses
  - c. Milk products
  - d. Meat and fish and poultry
  - e. Egg



## Semester – II

|                     |                   |
|---------------------|-------------------|
| <b>Course Title</b> | APPLIED NUTRITION |
| <b>Total Hrs</b>    | 60                |
| <b>Hrs/Week</b>     | 4                 |
| <b>Subject Code</b> | 21UAAN21          |
| <b>Course Type</b>  |                   |
| <b>Credits</b>      | 3                 |
| <b>Marks</b>        | 100               |

### **UNIT I MENU PLANNING**

Menu planning- Principles of planning diet, points to be considered in planning a diet.

Assessment of Nutritional status – Methods- Anthropometric measurements, biochemical examination, clinical examination and diet surveys.

### **UNIT II ENERGY & CARBOHYDRATES**

Energy – Unit of energy - Bomb calorimeter, Physiological energy value of food.

BMR- Definition and Factors affecting BMR

Carbohydrates – Classification, functions and sources.

### **UNIT III LIPIDS & PROTEINS**

Lipids – Classification, functions and sources.

Proteins – Classification, functions, and sources.

## **UNIT IV VITAMINS**

Fat soluble Vitamins A,D,E,K – Functions, Sources requirements and deficiency

Water soluble Vitamins C, B group vitamins- B1,B2,B3,B5,B6,B12 and folic acid-  
Functions, Sources, requirements and deficiency

## **UNIT V MINERALS**

Minerals- Macro minerals- Calcium and Phosphorus- Functions, Sources, requirements and deficiency; Micro minerals- Iron, Fluorine and Iodine- Functions, Sources, requirements and deficiency.

Role of fibre in preventing and managing diseases, Sources of fibre.

Water –functions and dehydration

### **TEXT BOOKS**

1. Srilakshmi, Nutrition Science, 6<sup>th</sup> Edition, 2018, New age International (P) limited publishers.
2. Srilakshmi, Dietetics, 7<sup>th</sup> Edition, 2014, New age International (P) limited publishers.

### **REFERENCE BOOKS:**

1. Dr.M. Swaminathan, Advanced Text – Book on Food & Nutrition, Bappco, Bangalore. 1985
2. Foundation of Food Preparation, peck am, McMillan Company, London 1994.
3. Krause's Food, Nutrition and Diet Therapy, Mahan W.B Saunders Company, 10<sup>th</sup> edition, 2000.
4. Normal and therapeutic nutrition, Robinson C.H. and Lawler, McMillan Publications Co. Inc., New York, 1990, Revised Edition.
5. Introductory Nutrition, Guthrie & Boston, 8<sup>th</sup> Edition. 1989.

## Semester – II

|                     |                                     |
|---------------------|-------------------------------------|
| <b>Course Title</b> | <b>APPLIED NUTRITION PRACTICALS</b> |
| <b>Total Hrs</b>    | 30                                  |
| <b>Hrs/Week</b>     | 2                                   |
| <b>Sub.Code</b>     | 21UAAN2P1                           |
| <b>Course Type</b>  |                                     |
| <b>Credits</b>      | 1                                   |
| <b>Marks</b>        | 100                                 |

1. Principles of Nutrition practicals
  1. Qualitative estimation of Carbohydrate
  2. Qualitative estimation of protein
  3. Estimation of vitamin C in foods
2. Planning menu for the following age groups
  - a. Adult women
  - b. Pregnant mothers
  - c. Lactating women
  - d. Vitamin A deficient school child
  - e. College going girl – diet for Anaemia
3. Visit to (ANY ONE) milk factory, food analysis institute, CFTRI, observing school lunch program and ICDS programme.

Semester – IV

|              |                                |
|--------------|--------------------------------|
| Course Title | DIET THERAPY                   |
| Total Hrs    | 30                             |
| Hrs/ Week    | 2hrs                           |
| Sub.Code     | 2IUSAN41                       |
| Course Type  | SEC – Skill Enhancement Course |
| Credits      | 2                              |
| Marks        | 100                            |

**UNIT I Therapeutic Diet**

Definition of dietetics – purpose of diet therapy – factors considered in planning therapeutic diets

Routine hospital diets – Clear fluid diet, full fluid diet, soft diet, regular normal diet, Preoperative diet and postoperative diet

**UNIT II Obesity & Underweight**

Obesity - etiology, assessment, types of obesity and principles of dietary management.

Under weight- etiology, nutrition and food requirements

**UNIT III Diarrhoea & Constipation**

Diarrhea- Etiology, types and dietary modification.

Constipation – Etiology, types and dietary modification.

**UNIT IV Peptic Ulcer & Fever**

Peptic ulcer- Etiology, symptoms and dietary modification

Fever- etiology, types, symptoms and dietary modification



## **UNIT V Diabetes Mellitus & Hypertension**

Diabetic mellitus- causes, types, symptoms and dietary modification

Hypertension- causes, types, symptoms and dietary management

### **TEXT BOOK**

B. Srilakshmi, Dietetics, 7<sup>th</sup> Edition, 2014, New age International (P) limited publishers.

### **REFERENCE BOOKS:**

1. Krause's text book of nutrition and diet therapy, (2004), Macmillan Publishers.
2. Gopalan, C. Ramashastri, B.V. and Balasubramanian-Nutritive Value of Indian Foods, NIN, ICMR, 1998.
3. Guthrie and Boston, Introductory Nutrition, 1989, VIII Edition.
4. Robinson C.H. and Lawery M. Normal and therapeutic nutrition, Macmillan Publishing Co., New York, 1990.

### Semester – IV

|              |                    |
|--------------|--------------------|
| Course Title | HEALTH AND FITNESS |
| Total Hrs    | 30                 |
| Hrs/Week     | 2                  |
| Subject Code | 21UNAN41           |
| Course Type  | NME                |
| Credits      | 2                  |
| Marks        | 100                |

#### UNIT I

Health-Definitions, concept of health, changing concepts, dimensions of health, concept of well being, determinants of health, ecology of health, right to health, responsibility for health and indicators of health.

#### UNIT II

Physical, mental, social and positive health; Spectrum of health. Millennium development goals; Primary Health Care; Health situation in India.

#### UNIT III

Physical fitness- definition, factor affecting physical fitness, importance of physical fitness. Assessment of physical fitness- Body Weight, Height, BMI, Broka Index, Waist circumference, Hip Circumference, Waist to Hip Ratio.

#### UNIT: IV

Techniques For Obtaining Relevant Information - General Profile, Medical History and Clinical Information; Dietary Diagnosis - Assessing food and nutrient intakes; Lifestyles-physical activity and stress,

## **UNIT: V**

The Counselor ethical Codes and Guidelines, The Counselor's legal Responsibility and dimensions of Confidentiality; Rights of Clients .

### **TEXT BOOK**

1. B. Srilakshmi, Nutrition Science, 6<sup>th</sup> Edition, 2018, New age International (P) limited publishers.
2. B.Srilakshmi, Dietetics, 7<sup>th</sup> Edition, 2014, New age International (P) limited publishers.

### **References:**

1. K. Park Text book of Preventive and social medicine, 15th edition, MIS Banarsidas Bhano Publishers, Jabalpur, 1997.
2. Guthrie, H.A., "Introductory Nutrition", 6th ed., Times Mirror/Mosby College Publ. – St Louis 1989.
3. Whitney E.N., Hamilton E.N. & Raffles S.R., "Understanding Nutrition", 5th ed. West Pub.Co. New York.

| III SEMESTER |                      |            |            |
|--------------|----------------------|------------|------------|
| SEC          | PUBLIC HEALTH        |            | 21USAN41   |
| Hrs/Week: 2  | Hrs/Sem: 2 x 15 = 30 | Hrs/UNIT:6 | Credits :4 |

#### UNIT I

Hygiene- Definition and personal hygiene. Public health- Scope and importance and **Future Projects.**

#### UNIT II

##### **Nutritional Problems**

- Protein Energy Malnutrition- Prevalance, Causes of PEM
- Micronutrient Deficiencies-Iodine Deficiency Disease(IDD), Iron Deficiency Anaemia(IDA)

#### UNIT III

##### Nutritional monitoring and surveillances

- Nutritional assessment- Definition, types
- Nutritional education- Definition and methods- steps in planning, evaluation and implementation

#### UNIT IV

##### Agencies related to combat Nutrition

- National agencies- NIN, ICMR, CFTRI
- International agencies- FAO,WHO, UNICEF

#### UNIT V

- National Programme: Vitamin A Prophylaxis Programme, National Anemia control Programme, National Leprosy control Programme
- School lunch Programme: Mid-day meal Programme, ICDS, Supplementary feeding Programme.

#### TEXT BOOK

B. Srilakshmi, Nutrition Science, 6<sup>th</sup> Edition, 2018, New age International (P) limited publishers.

#### REFERENCE BOOK

- Park's text book of Preventive and Social Medicine, 2009. 20<sup>th</sup> edition.
- Suryatapa Das 2016, Text Book of Community Nutrition, Second Edition, Academic Publications, Kolkatta, ISBN :978-83420-69-8
- LaithaIshwarn Punnya 2017, Health Education and Sports Nutrition, Khel Shahiya Kendra Publications, New Delhi, ISBN : 978-81-7524-889-2
- The Educational Planning Group 2007, Food and Nutrition for Nurses, Arya Publishing Group New Delhi, ISBN:81-7064-070-9