**ANNAMALAI UNIVERSITY**

(Affiliated Colleges)

**207 - B.Sc. Environmental Management**

Programme Structure and Scheme of Examination (under CBCS)

(Applicable to the candidates admitted from the academic year 2023 -2024 onwards)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Part** | **Course Code** | **Study Components & Course Title** | **Credit** | **Hours/ Week** | **Maximum Marks** |
| **CIA** | **ESE** | **Total** |
|  |  | **SEMESTER - I** |  |  |  |  |  |
| I | 23UTAMC11/23UHINL11/23UFREL11 | Language - I – **பொது தமிழ் - I**Hindi-I/ French-I | 3 | 6 | 25 | 75 | 100 |
| II | 23UENGL12 | General English – I | 3 | 6 | 25 | 75 | 100 |
| III | 23UEVMC13 | Core – I : Environmental Ecology  | 5 | 5 | 25 | 75 | 100 |
| 23UEVMP14 | Core – II : Practical – I: Environmental Ecology Practical | 5 | 4 | 25 | 75 | 100 |
| 23UBOTE1523UBOTEP1 | Elective - I: (General/Discipline Specific)Botany - IBotany Practical - I | 21 | 32 | 2525 | 7575 | 100100 |
| IV | 23UTAMB1623UTAMA16 | Skill Enhancement Course – 1 (NME-I) /\*Basic Tamil – I /Advanced Tamil - I | 2 | 2 | 25 | 75 | 100 |
| 23UEVMF17 | Foundation Course:Environmental Education and Awareness | 2 | 2 | 25 | 75 | 100 |
|  |  | Total | 23 | 30 |  |  | 800 |
|  |  | SEMESTER – II |  |  |  |  |  |
| I | 23UTAMC21/23UHINL21/23UFREL21 | Language – II: **பொது தமிழ் - II**Hindi-II/ French-II | 3 | 6 | 25 | 75 | 100 |
| II | 23UENCL22 | General English – II | 3 | 6 | 25 | 75 | 100 |
| III | 23UEVMC23 | Core – III : Aquaculture and Environment | 5 | 5 | 25 | 75 | 100 |
| 23UEVMP24 | Core – IV : Practical – II: Aquarium Keeping and Management Practical | 5 | 4 | 25 | 75 | 100 |
| 23UBOTE2523UBOTEP2 | Elective - II: (General/Discipline Specific)Botany - IIBotany Practical – II | 21 | 32 | 2525 | 7575 | 100100 |
| IV | 23UTAMB2623UTAMA26 | Skill Enhancement Course – 2 (NME-II) /\*Basic Tamil – II /Advanced Tamil - II | 2 | 2 | 25 | 75 | 100 |
| 23USECG27 | Skill Enhancement Course – 3Internet and its Applications (Common Paper) | 2 | 2 | 25 | 75 | 100 |
|  |  | Total | 23 | 30 | 200 | 600 | 800 |

**Non-Major Elective Courses (NME) to other Departments)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| IV | 23UEVMN16 | Global Environmental Issues and Management | 2 | 2 | 25 | 75 | 100 |
| 23UEVMN26 | Occupational Safety, Health and Management | 2 | 2 | 25 | 75 | 100 |

\* PART-IV: NME / Basic Tamil / Advanced Tamil (Any one)

Students who have not studied Tamil upto 12th Standardand have taken any Language other than Tamil in Part-I, must choose Basic Tamil-I in First Semester & Basic Tamil-II in Second Semester.

Students who have studied Tamil upto 10th & 12th Standardand have taken any Language other than Tamil in Part-I, must choose Advanced Tamil-I in First Semester and Advanced Tamil-II in Second Semester.

**Elective Courses offered to other Science Department in I and II Semesters**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| III | 23UEVME1523UEVMEP1 | Elective - I: (General/Discipline Specific)Environmental Zoology - I Environmental Zoology Practical - 1 | 21 | 32 | 2525 | 7575 | 100100 |
| 23UEVME2523UEVMEP2 | Elective - II: (General/Discipline Specific)Environmental Zoology - IIEnvironmental Zoology Practical - II | 21 | 32 | 2525 | 7575 | 100100 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester** | **Core – I****COURSE CODE: 23UEVMC13****COURSE TITLE: Environmental Ecology** | **H/W** | **C** |
| **I** | **5** | **5** |

**Course Objectives**

1. To learn the concept, principles of ecology and ecosystem
2. To understand the structure and functions of ecosystem
3. To impart knowledge about population ecology
4. To understand the community ecology.
5. To study the ecological relationships among organism.

**UNIT I: Ecology**

Definition - Scope and importance of Ecology - Sub divisions of Ecology - Autecology- Synecology - Branches of Ecology - Environmental Factors- Abiotic - Water- Air - Soil – Temperature – Light - Biotic Factors.

**UNITI II: Ecosystem**

Structure of Ecosystem - Principle steps and components of an Ecosystem - Ecosystem Types- Aquatic Ecosystem - Pond Ecosystem - Functions of Ecosystem - Energy - Food Chain- Food Web- Ecological Pyramids - Pyramid of Number, Biomass and Pyramid of Energy- Inverted Pyramids.

**UNIT III: Population ecology**

Characteristics of Population - Natality - Mortality - Age Distribution - Age Pyramids - Survivorship Curves - Population Dispersal - Population Growth Forms - Carrying Capacity- Ecological Adaptations - Hydrophytes - Morphology and Anatomy - Mesophytes - Morphology and Anatomy - Xerophytes - Morphology and Anatomy - Halophyte.

**UNIT IV: Community Ecology**

Definition - Ecological Dominance - Ecotone and Edge Effect - Ecological Niche - Ecological Equivalence - Ecological Indicators - Ecological Succession - Types - Primary and Secondary Succession - Process of Succession- Nudation-Invasion – Establishment – Competition- Reaction – Stabilization .

**UNIT V: Animal Association**

Inter-Specific Relationship - Neutralism - Symbiosis - Mutualism- Commensalism Antagonism- Competition, Predation, Antibiosis, Exploitation, Parasitism- parasitic adaptations – Intra specific relationship.

**Expected Course Outcomes**

After completion of this course, students will be able to gain knowledge in

1. The scope and importance of ecology.

2. The structure and functions of Ecosystem.

3. The characteristics of population ecology.

4. The community ecology, ecological succession, ecotone and ecological niche.

5. The inter and intra specific relationship of animals.

**Text Books**

1. Verma, P.S., Agarwal, V.K. (1983) Principles of Ecology, S Chand & Company Limited, New Delhi.

2. Jeyaraj, Veerbalarastogi, (1988) Fundamentals of Ecology, S Chand and Company, New Delhi.

3. Smith, T.M., Smith, R.L. (2007) Elements of Ecology, Pearson Education.

**Supplementary Reading**

1. [https://www.environment-ecology.com](https://www.environment-ecology.com/).

2. [https://www.britannica.com](https://www.britannica.com/).

3. <https://esj.Journalsonlinelibrary.wiley.com>.

#### Outcome Mapping

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO/PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
| **CO1** | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 2 | 3 | 3 | 3 |
| **CO3** | 2 | 3 | 3 | 2 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 |

\*3 - Strong; 2 - Medium; 1- Low

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester** | **Core – II: Practical - I****COURSE CODE: 23UEVMP14****COURSE TITLE: Environmental Ecology** | **H/W** | **C** |
| **I** | **4** | **5** |

**Course Objectives**

1. To know about the morphology and anatomical adaptations of hydrophytes.
2. To know morphological adaptations of Xerophytes. Mesophytes and Halophytes.
3. To identify the biodiversity hotspots in India
4. To learn about IUCN Red list categories.
5. To learn the Biosphere reserves.

**PRACTICAL**

1. Study on the morphology and anatomy of Hydrophytes
2. Study on the morphology and anatomy of Xerophytes.
3. Study on the morphology and anatomy of Mesophytes.
4. Study on the morphology and anatomy of.
5. Squash preparation of onion root tip for Mitosis.
6. Mapping of biodiversity hotspots in India.
7. IUCN Red list categories.
8. List of 10 most World endangered animals.
9. List of 10 most World endangered birds.
10. CITES
11. Location of Biosphere reserves of Tamilnadu.

**Expected Course Outcome:**

After completion of this course,

students will be able to gain knowledge

1. About the morphology and anatomical adaptations of hydrophytes.
2. On the morphological adaptations of Xerophytes. Mesophytes and Halophytes.
3. To identify the biodiversity hotspots in India
4. About the IUCN Red list categories.
5. In learn the Biosphere reserves.

#### Outcome Mapping

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO/PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
| **CO1** | 3 | 3 | 2 | 3 | 3 |
| **CO2** | 3 | 2 | 3 | 3 | 2 |
| **CO3** | 2 | 3 | 3 | 2 | 3 |
| **CO4** | 3 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 2 |

\*3 - Strong; 2 - Medium; 1- Low

**ELECTIVE I**

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester** | **elective - i****Course Code : 23UBOTE15****Course Title: Botany - I** | **H/W** | **C** |
| **I** | **3** | **2** |

**Course Objective**

|  |  |
| --- | --- |
| **1** | To study morphological and anatomical adaptations of plants of various habitats. |
| **2** | To demonstrate techniques of plant tissue culture. |
| **3** | To familiarize with the structure of DNA, RNA.  |
| **4** | To carryout experiments related with plant physiology.  |
| **5** | To perform biochemistry experiments.  |

**Unit – 1: Algae:**

General characters of algae - Structure, reproduction and life cycle of the following genera - *Anabaena* and *Sargassum* and economic importance of algae.

**Unit – 2 : Fungi, Bacteria and Virus:**

General characters of fungi, structure, reproduction and life cycle of the following genera – *Penicillium* and *Agaricus* and economic importance of fungi.

Bacteria - general characters, structure and reproduction of *Escherichia coli* and economic importance of bacteria. Virus - general characters, structure of TMV, structure of bacteriophage.

**Unit – 3 : Bryophytes, Pteridophytes and Gymnosperms:**

General characters of Bryophytes, Structure and life cycle of *Funaria*.

General characters of Pteridophytes, Structure and life cycle of *Lycopodium*.

General characters of Gymnosperms, Structure and life cycle of *Cycas*.

**Unit – 4: Cell Biology:**

Prokaryotic and Eukaryotic cell-structure/ organization. Cell organelles - ultra structure and function of chloroplast, mitochondria and nucleus. Cell division - mitosis and meiosis.

**Unit – 5: Genetics and Plant Biotechnology:**

Mendelism - Law of dominance, Law of segregation, Incomplete dominance. Law of independent assortment. Monohybrid and dihybrid cross - Test cross - Back cross. Plant tissue culture - *In vitro* culture methods.Plant tissue culture and its application in biotechnology.

**Expected Course Outcomes (CO)**

At the end of the course, the student will be able to

|  |  |
| --- | --- |
| **1** | Increase the awareness and appreciation of human friendly algae and their economic importance.  |
| **2** | Develop an understanding of microbes and fungi and appreciate their adaptive strategies.  |
| **3** | Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.  |
| **4** | Compare the structure and function of cells and explain the development of cells.  |
| **5** | Understand the core concepts and fundamentals of plant biotechnology and genetic engineering.  |

**Recommended Texts**

1. Singh,V., Pande,P.C and Jain,D.K. 2021. A Text Book of Botany. Rastogi Publications, Meerut.
2. Bhatnagar, S.P and Alok Moitra. 2020. Gymnosperms, New Age International (P) Ltd., Publishers, Bengaluru.
3. Sharma,O.P.2017. Bryophyta, MacMillan India Ltd. Delhi.
4. Lee, R.E. 2008. Phycology, IV Edition, Cambridge University Press, New Delhi.
5. Rao, K., Krishnamurthy, K.V and Rao, G.S. 1979. Ancillary Botany, S.

 Viswanathan Pvt. Ltd., Madras.

**Reference books:**

1. Parihar, N.S. 2012. An introduction to Bryophyta –Pteridophytes- Surjeet Publications, Delhi.
2. Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd.
3. Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand & Company Ltd, Delhi.
4. Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surjeet Publications, Delhi.
5. Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand & Company Ltd, Delhi.
6. Parihar, N.S. 2013. An introduction to Bbryophyta –Bryophytes -, Surjeet Publications, Delhi.

7. Pandey B.P. 1986, Text Book of Botany (College Botany) Vol I &II,

S.Chand and Co. New Delhi.

**Web Resources**

1. <https://www.kobo.com/us/en/ebook/the-algae-world>
2. [http://www.freebookcentre.net/biology-books-download/Fungi-(PDF-15P).html](http://www.freebookcentre.net/biology-books-download/Fungi-%28PDF-15P%29.html)
3. <http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm>
4. <https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/>
5. <https://arboretum.harvard.edu/wp-content/uploads/2013-70-4-beyond-pine-cones-an-introduction-to-gymnosperms.pdf>
6. <https://www.us.elsevierhealth.com/medicine/cell-biology>
7. <https://www.us.elsevierhealth.com/medicine/genetics>
8. <https://www.kobo.com/us/en/ebook/plant-biotechnology-1>

**MappingwithProgrammeOutcomes:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** |
| **CO1** | S | S | S | S | S | S | S | S | S | S |
| **CO2** | S | S | S | S | S | S | S | S | S | S |
| **CO3** | M | S | S | S | S | L | S | S | S | S |
| **CO4** | S | S | M | S | S | S | M | S | M | S |
| **CO5** | S | M | M | M | M | M | M | L | M | L |

**S – Strong; M – Medium; L-Low**

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester** | **elective - i****Course Code : 23UBOTEP1****Course Title: Botany Practical - I** | **H/W** | **C** |
| **I** | **2** | **1** |

**Course Objectives**

1. To enhance information on the identification of each taxonomical group by developing the skill-based detection of the morphology and microstructure of microorganisms, algae, and fungi
2. To comprehend the fundamental concepts and methods used to identify Bryophytes, Pteridophytes and Gymnosperms through morphological changes and evolution, anatomy and reproduction.
3. To be familiar with the basic concepts and principles of cell biology.
4. Understanding of laws of inheritance, genetic basis of loci and alleles.
5. To learn about the principles and applications of Biotechnology

**EXPERIMENTS**

1. Make suitable micro preparation of the types prescribed in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.
2. Micro photographs of the cell organelles ultra structure.
3. Simple genetic problems.
4. Spotters - Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms Cell biology and Biotechnology.

**Bonafide record of practical work done should be submitted for the practical examination**

**Course outcomes:**

On completion of this course, the students will be able to:

1. To study the internal organization of algae .
2. To study the structure and organization of fungi, bacteria and viruses
3. Develop critical understanding on morphology, anatomy and reproduction of

Bryophytes, Pteridophytes and Gymnosperms.

1. To study the cell structure and function.
2. Understand the fundamental concepts of genetics and Biotechnology

**Recommended texts**

1. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd, New Delhi.

2. Sharma, O.P. 2012. Pteridophyta, Tata McGraw-Hills Ltd, New Delhi.

3. Subramaniam, N.S. 1996. Laboratory Manual of Plant Taxonomy. Vikas Publishing House Pvt. Ltd., New Delhi.

4. Benjamin, A. Pierce. 2012. Genetics- A conceptual Approach. W.H. Freeman and Company, New York, England.

5.Noggle G.R and G.J. Fritz. 2002. Introductory Plant Physiology. Prentice Hall of India, New Delhi.

**Reference books**

1. Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India.
2. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.
3. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing.
4. Aler Gingauz. 2001. Medicinal Chemistry. Oxford University Press & Wiley Publications.
5. Steward, F.C. 2012. Plant Physiology Academic Press, US

**Web Resources**

1. https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883
2. [https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gy](https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gymnosperms&printsec=frontcover) [mnosperms&printsec=frontcover](https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gymnosperms&printsec=frontcover)
3. <https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4>

OUTCOME MAPPING

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
| **CO1** | 2 | 3 | 1 | 3 | 2 |
| **CO2** | 2 | 3 | 2 | 2 | 3 |
| **CO3** | 2 | 1 | 3 | 2 | 3 |
| **CO4** | 1 | 3 | 3 | 2 | 2 |
| **CO5** | 2 | 2 | 3 | 1 | 3 |

**BOTANY PRACTICAL I**

Time : 3 Hours Max. Marks : 75

**PRACTICAL QUESTION PAPER**

1. Make suitable micro preparations of the given specimens A, B and C.

Submit the slides for valuation. Identify the specimens, draw diagrams and give reasons.

(Identification – 1, diagram – 2, Reasons – 2, Slide -2) (7 X 3) (21)

2. Make suitable micro preparations of the given specimens D.

Submit the slides for valuation. Identify the specimens, draw diagrams and give reasons.

(Identification – 1, diagram – 2, Reasons – 2, Slide -2) (08)

3. Identify the given electron micrograph –E, describe and draw diagrams

 (Identification – 2, Diagram – 3, description – 3) (08)

4. Spotters – F, G, H, I, J, K and L.

(Identification – 1, diagram – 1, Reasons – 2) (7 X 4) (28)

Total = 65

Record = 10

 \_\_\_\_\_\_\_\_\_\_\_\_

Grand Total = 75

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**BOTANY PRACTICAL I**

**KEY & SCHEME OF VALUATION**

1. A – Algae / Fungi : *Sargassum/Agaricus*

 B – Bryophytes : *Funaria*

 C – Pteridophytes : *Lycopodium*

(Identification – 1, diagram – 2, Reasons – 2, Slide -2) (7 X 3) (21)

2. Gymnopserms - D : *Cycas* – rachis and leaflet

(Identification – 1, diagram – 2, Reasons – 2, Slide -3) (08)

3. Cell biology - E – Electron Micrograph of organelles- Chloroplast, Mitochondria, Nucleus, Mitosis, Giant Chromosomes

– (Identification – 2, Diagram – 3, description – 3) (08)

4. Spotters – F, G, H, I, J and L(any seven of the following)

(Algae, Fungi, Bacteria, Virus, Bryophytes, Pteridophytes and Gymnosperms –permanent slides, book diagrams or wet preserved jar specimens, mentioned in the syllabus)

Cytology – photographs of cell organelles

Genetics – simple genetics problems

Plant biotechnology – tissue culture techniques : explants, callus, hardening

 (Identification – 1, diagram – 1, Reasons – 2) (7 X 4) (28)

Total = 65

Record = 10

 \_\_\_\_\_\_\_\_\_\_\_\_

 Grand Total = 75

 \_\_\_\_\_\_\_\_\_\_\_\_

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| **Semester** | **Foundation Course**  **COURSE CODE: 23UEVMF17****COURSE TITLE: Environmental Education and Awareness**  | **H/W** | **C** |
| **I** | **2** | **2** |

**Course objectives:**

* + - 1. To understand the importance, need and methodologies of environmental education.
			2. To acquire skills to conduct environmental awareness programs.

**UNIT - I: Basics of Environmental Education**

Objectives and Concepts of Environmental Education; National and Global Environmental organizations (IUCN, UNEP, WII, CSE, and IPCC), Major Environmental Movements in India – Chipko, Bishnoi, and Silent Valley.

**UNIT - II: Methodology**

Forms of Environmental Education, Concepts of education for childhood, higher education and adult, Present methods in India.

**UNIT - III: Environmental Awareness for rural children**

Environmental Awareness for rural children, Planning, preparation and Implementation.

**UNIT - IV: Environmental Awareness for urban children**

Environmental Awareness for urban school / college community, Planning, preparation, Implementation.

**UNIT – V: Practice:** Environmental Awareness forgeneral public, Environmental Awareness for general public, Planning, preparation and Implementation

**Expected Course Outcomes**

After the completion of this course the students will be able to:

1. Recall the history of environmental education
2. Summarize the concept of environmental education
3. List and analyze the different environmental organizations
4. Categorize the different forms of education
5. Plan and design the environmental education programs for various target groups

**Text Books**

1. UNEP. Public Environmental Awareness and Education, 2007

2. MOEF. Ministry of Environment & Forests. Government of India Paryavaran Bhawan Cgo Complex Lodhi Road, New Delhi, 110003, National Environment Awareness Campaign.2011-2012.

**Reference Books**

1. Early Childhood Environmental Education Programs: Guidelines for Excellence, North American Association for Environmental Education, 2000, USA, www.naaee.org [www.eelink.net](http://www.eelink.net).
2. Joyce Meredith. A Project of Ohio. EE 2000: A Strategic Plan for Environmental Education in Ohio. Published by: Environmental Education Council of Ohio P.O. Box 2911 Akron, OH 44309-2911, 2000.
3. Non-formal Environmental Education Programs: Guidelines for Excellence. North American Association for Environmental Education. 2000 P Street, NW - Suite 540 Washington, DC 20036, USA.

#### Outcome Mapping

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO/PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
| **CO1** | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 2 | 3 | 3 | 3 |
| **CO3** | 2 | 3 | 3 | 2 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 |

\*3 - Strong; 2 - Medium; 1- Low

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester** | **Core - III****COURSE CODE: 23UEVMC23****COURSE TITLE: AQUACULTURE AND ENVIRONMENT** | **H/W** | **C** |
| **II** | **5** | **5** |

**Course Objectives**

1. To learn about culture system.

2. To impart knowledge of aquatic pollution.

3. Learn the impact of weeds and predators.

4. To Study about preservation.

5. To learn about Pearl culture.

**UNIT-1 CULTURE SYSTEM**

 Culture system- freshwater-. Brackish water-. Extensive- intensive -semi -. Intensive. Pokkali – Cage- Pen culture- mono –monosex culture, -Poly Paddy cum fish-. Fish cum dairy- fish cum pig. Fish cum duck-Fish ponds- breeding- nursery-rearing- stocking -dry and wet bundh- Construction and maintenance of fish farm.

**UNIT –2 AQUATIC POLLUTION**

 Aquatic pollution- definition- pollutants- marine pollution- causes- ecological effects effects of aquatic pollution on fishers- water quality management- physical, chemical, biological parameters- assessment of a water quality.

**UNIT –3 WEED & PREDATOR CONTROL**

 Weed control- harmful effects of weed control, aquatic weeds- control of aquatic weeds- predator control--definition- predatory insects - Predatory vertebrates.

**UNIT –4 PRESERVATION OF FISHES**

 Preservation of fishes- fish spoilage- chemical action- autolysis- microbial action- principles of fish preservation- cleaning-low temperature-high temperature- dehydration- salts.- methods of preservation- curing- drying - freezing- fish diseases- white spot disease- costiasis - whirling disease- knot disease- gill rot- pinhead- rickets.- Causes- symptoms- treatment.

**UNIT- 5 PEARL CULTURE**

 Pearl Culture-definition- Types -composition of pearl -Pearl producing animals- cultivable species- biology of Pearl oysters, Pearl formation, culture of pearls, freshwater Pearl culture.

**Expected Course outcome**

After completion of this course, students will be able to gain knowledge in

1. Different types of culture system.

2. Causes and effect of aquatic pollution.

3. Weed and Predator control.

4. Preservation of Fishes

5. Pearl culture.

**Text Books**

1. Jhingaran, C.G. 1981. Fish and Fisheries of India, Hindustan Publishing Corporation.

2. Talwar, P.K. and Jhingaram, A.G. 1991. Inland Fisheries of India and adjacent

countries, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

3. N. Arumugam. 2008. Aquaculture, Saras Publications, Nagercoil, Tamilnadu.

**Supplementary reading**

1. [Https://www.sciencedirect.com](https://www.sciencedirect.com/)

2. [https://www.fao.org](https://www.fao.org/)

3. [https://oceanservice.noaa.gov](https://oceanservice.noaa.gov/)

#### Outcome Mapping

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO/PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
| **CO1** | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 2 | 3 | 3 | 3 |
| **CO3** | 2 | 3 | 3 | 2 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 |

\*3 - Strong; 2 - Medium; 1- Low

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester** | **Core – IV: PRACTICAL II:****COURSE CODE: 23UEVMP24****COURSE TITLE: AQUARIUM KEEPING AND MANAGEMENT PRACTICAL**  | **H/W** | **C** |
| **II** | **4** | **5** |

Course Objectives

1. To identify Freshwater and Marine aquarium fishes
2. To get knowledge on identification of fish diseases
3. To know the water salinity
4. To learn the LC50 and LD50
5. To know the method of fish transport

Practicals

1. Identification of Marine aquarium fishes.
2. Identification of common Aquarium fresh water fishes.
3. Identification and treatment of common ornamental fish diseases.
4. Estimation of oxygen consumption in fish by Winkler’s method.
5. Estimation of salinity.
6. Estimation of LC50 and LD50 with heavymetals using fish.
7. Effect of temperature and salinity on respiration of fish.
8. Demonstration of setting up of High-Tech aquarium tank.
9. Methods and transport of seeds and breeders.
10. Visit to aquaculture farm and submission of report.

Expected Course Outcome

After the completion of this practical course , the students are able to

1. Identify Freshwater and Marine water aquarium fishes
2. Identify and treat fish diseases
3. Know the water salinity and its impact
4. Estimate LC50 and LD50
5. Method of setting up of High-tech aquarium tank

#### Outcome Mapping

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO/PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
| **CO1** | 3 | 3 | 2 | 3 | 3 |
| **CO2** | 3 | 2 | 3 | 3 | 2 |
| **CO3** | 2 | 3 | 3 | 2 | 3 |
| **CO4** | 3 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 |

\*3 - Strong; 2 - Medium; 1- Low

**ELECTIVE II**

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester** | **elective - ii** **Course Code: 23UBOTE25****course title: Botany - II** | **H/W** | **C** |
| **II** | **3** | **2** |

**Course Objective (LO):**

|  |  |
| --- | --- |
| **1** | To be familiar with the basic concepts and principles of plant systematics.  |
| **2** | Learn the importance of plant anatomy in plant production systems. |
| **3** | Understand the mechanism underling the shift from vegetative to reproductive phase. |
| **4** | To learn about the physiological processes that underlie plant metabolism.  |
| **5** | To know the energy production and its utilization in plants.  |

**Unit – 1: MORPHOLOGY OF FLOWERING PLANTS**

Plant and its parts. Structure and function of root and stem. Leaf and its parts. Leaf types- simple and compound. Phyllotaxy and types. Inflorescence - Racemose, Cymose and Special types. Terminology with reference to flower description.

**Unit – 2 :TAXONOMY**

Study of the range of characters and plants of economic importance in the following families: Rutaceae, Caesalpiniaceae, Asclepiadaceae, Euphorbiaceae and Cannaceae

**Unit – 3: ANATOMY**

Tissue and tissue systems: Simple and complex tissues. Anatomy of monocot and dicot roots - anatomy of monocot and dicot stems - anatomy of dicot and monocot leaves.

**Unit – 4: EMBRYOLOGY**

Structure of mature anther and ovule - Types of ovules, structure of embryo sac, pollination -double fertilization, structure of dicotyledonous and monocotyledonous seeds.

**Unit – 5: PLANT PHYSIOLOGY**

Absorption of water, photosynthesis - light reaction - Calvin cycle; respiration - Glycolysis - Krebs cycle - electron transport system. Growth hormones - auxins and cytokinins and their applications.

**Expected Course Outcomes (CO)**

At the end of the course, the student will be able to

|  |  |
| --- | --- |
| **1** | Understand the fundamental concepts of plant anatomy and embryology.  |
| **2** | Analyze and recognize the different organs of plants and secondary growth.  |
| **3** | Understand water relation of plants with respect to various physiological processes |
| **4** | Classify aerobic and anaerobic respiration.  |
| **5** | Classify plant systematics and recognize the importance of herbarium and virtual herbarium. |

**Recommended Texts**

1. Sharma, O.P. 2017. Plant Taxonomy. (II Edition).The McGraw Hill Companies.
2. Bhojwani, S.S. Bhatnagar, S.P and Dantu, P.K. 2015. The Embryology of Angiosperms

(6th revised and enlarged edition).Vikas Publishing House, New Delhi.

1. Maheshwari, P. 1963. Recent Advances in Embryology of Angiosperms. Intl. Soc.

Plant Morphologists, New Delhi.

1. Salisbury, F. B.C.W. Ross.1991. Plant Physiology. Wassworth Pub. Co. Belmont.
2. Ting, I.P. 1982. Plant Physiology. Addison Wesley Pb. Philippines.

**Reference books**

1. Lawrence.G.H.M. 1985. An Introduction to Plant Taxonomy, Central Book Depot, Allahabad.
2. Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms (4th revised and

enlarged edition). Vikas Publishing House, New Delhi.

1. Pandey, B.P. 2012. Plant Anatomy. S Chand Publishing.
2. Jain, VK. 2006. Fundamentals of Plant Physiology, S. Chand and Company Ltd.
3. [Rajni Gupta](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=Rajni+Gupta&search-alias=stripbooks). 2012. Plant Taxonomy: Past, Present and Future.  [Vedams (P) Ltd. New Delhi.](https://www.abebooks.com/vedams-ebooks-p-ltd-new-delhi/573945/sf%22%20%5Co%20%22Vedams%20eBooks%20%28P%29%20Ltd)
4. Jain, V.K. 2006. Fundamentals of Plant Physiology, S.Chand and Company Ltd., New Delhi.
5. Verma, S.K. 2006. A Textbook of Plant Physiology, S.K.Chand& Co., New Delhi.

**Web Resources**

1. <https://books.google.co.in/books/about/Plant_Taxonomy.html?id=0bYs8F0Mb9gC&redir_esc=y>
2. <https://books.google.co.in/books/about/PLANT_TAXONOMY_2E.html?id=Roi0lwSXFnUC&redir_esc=y>

##### [https://archive.org/EXPERIMENTS/plantanatomy031773mbp](https://archive.org/details/plantanatomy031773mbp)

1. <https://www.amazon.in/Embryology-Angiosperms-6th-S-P-Bhatnagar-ebook/dp/B00UN5KPQG>
2. <https://www.crcpress.com/Plant-Physiology/Stewart-Globig/p/book/9781926692692>

**MappingwithProgrammeOutcomes:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** |
| **CO1** | S | S | S | S | S | S | S | S | S | S |
| **CO2** | S | S | S | S | S | S | S | S | S | S |
| **CO3** | M | S | S | S | S | L | S | S | S | S |
| **CO4** | S | S | M | S | S | S | S | M | S | M |
| **CO5** | S | M | M | M | M | M | M | L | M | M |

**S – Strong; M – Medium; L – Low**

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester** | **Course Code: 23UBOTEP2****course title: Botany Practical - II** | **H/W** | **C** |
| **II** | **2** | **1** |

**Course Objectives**

1. To enhance information on the identification of taxonomical plant
2. To be familiar with the basic concepts and principles of plant systematics.
3. Understanding of reproduction and development of angiosperms
4. To understand the internal organization of Angiopserms
5. To learn about the physiological processes that underlie plant metabolism.

**EXPERIMENTS**

1. To identify Angiosperm root, stem, leaf, flowers and fruits based on morphology
2. To describe in technical terms, plants belonging to any of the family prescribes and to identify the family.
3. To dissect a flower, construct floral diagram and write floral formula.
4. Demonstration experiments
	1. Ganong’s Light screen
	2. Ganong’s respiroscope
5. To make suitable micro preparations of anatomy materials prescribed in the syllabus.
6. Spotters - Angiosperm morphology, anatomy, Embryology and Physiology

**Bonafide record of practical work done should be submitted for the practical examination**

**Course outcomes:**

On completion of this course, the students will be able to:

1. Understand external structure of angiosperms
2. To study the classical taxonomy with reference to different parameters.
3. Understand the fundamental concepts of plant anatomy and embryology
4. To study the effect of various physical factors on photosynthesis.
5. Understand simple experiments in plant Physiology

**Recommended texts**

1. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd, New Delhi.
2. Sharma, O.P. 2012. Pteridophyta, Tata McGraw-Hills Ltd, New Delhi.
3. Subramaniam, N.S. 1996. Laboratory Manual of Plant Taxonomy. Vikas Publishing House Pvt. Ltd., New Delhi.
4. Benjamin, A. Pierce. 2012. Genetics- A conceptual Approach. W.H. Freeman and Company, New York, England.
5. Noggle G.R and G.J. Fritz. 2002. Introductory Plant Physiology. Prentice Hall of India, New Delhi.

**Reference books**

1. Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India.
2. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.
3. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing.
4. Aler Gingauz. 2001. Medicinal Chemistry. Oxford University Press & Wiley Publications.
5. Steward, F.C. 2012. Plant Physiology Academic Press, US

**Web Resources**

1. https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883
2. [https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gy](https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gymnosperms&printsec=frontcover) [mnosperms&printsec=frontcover](https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gymnosperms&printsec=frontcover)
3. <https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4>

OUTCOME MAPPING

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
| **CO1** | 2 | 3 | 1 | 3 | 2 |
| **CO2** | 2 | 3 | 2 | 2 | 3 |
| **CO3** | 2 | 1 | 3 | 2 | 3 |
| **CO4** | 1 | 3 | 3 | 2 | 2 |
| **CO5** | 2 | 2 | 3 | 1 | 3 |

**BOTANY PRACTICAL II**

Time : 3 Hours Max. Marks : 75

**PRACTICAL QUESTION PAPER**

1. Identify the given specimens –A to its respective family, draw MLS of the flower and describe it in technical terms.

 (Identification of family – 2, MLS diagram – 3, technical description – 4) (09)

2. Identify the given specimen –B, to its respective family, construct the floral diagram and write the floral formula.

 (Identification of family – 2, floral diagram – 3, floral formula – 2) (07)

3. Make suitable micro preparations of the given specimens C.

Submit the slides for valuation. Identify the specimens, draw diagrams and give reasons. (Identification – 1, diagram – 2, Reasons – 2, Slide -2) (07)

4. Comment on the Physiology setup – D Write the aim, materials required , Procedure, Results and Inference

( Aim-1, Materials required -1, Procedure -2 , Results and Inference -3) (07)

4. Spotters – E, F, G, H, I, J, K and L.

(Identification – 1, diagram – 2, Reasons – 2) (7 X 5) (35) \_\_\_\_\_\_\_\_\_\_\_\_

 Total = 65

 Record = 10

 \_\_\_\_\_\_\_\_\_\_\_\_

 Grand Total = 75

 \_\_\_\_\_\_\_\_\_\_\_\_

BOTANY PRACTICAL II

KEY & SCHEME OF VALUATION

1. Taxonomy - A – MLS of the flower (from any one family mentioned in the syllabus)

(Identification of family – 2, MLS diagram – 3, technical description – 4) (09)

2. Taxonomy - B – Floral diagram and floral formula (from any one family mentioned in the syllabus) (Identification of family – 2, floral diagram – 3, floral formula – 2) (07)

3.. Anatomy - C : Dicot and monocot – stem, root and leaf.

(Identification – 1, diagram – 2, Reasons – 2, Slide -2) (07)

4. Physiology Set up D - Osmosis – thistle funnel experiment, Photosynthesis – Beaker and Funnel experiment, Ganong’s light screen and Ganong’s respire scope

 ( Aim-1, Materials required -1, Procedure -2 , Results and Inference -3) (07)

5. Spotters –E, F, G, H, I, J , and K (any seven of the following) (08)

Morphology – vegetative and reproductive morphological parts

Anatomy – simple and complex tissues, dicot, monocot root and leaf

Embryology – ovules, anther T.S.

Physiology - Osmosis – thistle funnel experiment, Photosynthesis – Beaker and Funnel experiment, Ganong’s light screen and Ganong’s respire scope experimental setup.

(Identification – 1, diagram – 2, Reasons – 2) (7 X 5) (35)

 \_\_\_\_\_\_\_\_\_\_

 Total = 65

 Record = 10

 \_\_\_\_\_\_\_\_\_

 Grand Total = 75

 \_\_\_\_\_\_\_\_\_

**Elective Courses offered to other Science Department in I and II Semesters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester** | **Elective – I** **COURSE CODE: 23UEVME15****COURSE TITLE: ENVIRONMENTAL ZOOLOGY – I** | **H/W** | **C** |
| **I** | **3** | **2** |

**Course Objectives**

1. To know about the distribution of animals in the universe

2. To understand the evolutionary history of animals

3. To learn about economic importance of animals

4. To understand the breeding phenomenon in fishes

5. To learn about ornamental fish culture

**UNIT - I: ZOO GEOGRAPHY**

 Animal Distribution – Definition - Classification of Animal Distribution - Patterns of Distribution - Cosmopolitan Distribution - Discontinuous Distribution - Bipolar Distribution - Isolated Distribution - With Examples - Factors Affecting Distribution - Factors Influencing Distribution.

**UNIT - II: EVOLUTION**

 Origin of Life - Theories of Evolution - Lamarck - Theory of Use and Disuse - Theory of Inheritance of Acquired Characters - Neo-Lamarckism - Darwin’s Theory of Natural Selection – Variation - Geometric Ratio of Increase in Production - Struggle for Existence - Survival of the Fittest - Sexual Selection - Neo-Darwinism.

**UNIT - III: ECONOMIC ZOOLOGY**

 Productive Insects - Honey bee Culture - Production of Honey - Economic Importance of Honey - Silkworm Culture - Production of Silk - Economic Importance of Silk, Lac Insect – Culture - Production of Lac - Economic Importance of Lac.

**UNIT - IV: INDUCED BREEDING IN FISHES**

 Hypophysation - Principles of Hypophysation - Procedure - Collection, Preparation and Injection of Pituitary extract - Mechanism of Pituitary Action - Advantages - Seed Collection - Collection from Natural Habitat - Bundh Breeding - Transport of Fish Seeds - Open System - Closed System.

**UNIT - V: ORNAMENTAL FISH CULTURE**

 Aquarium Culture - Aims of Aquarium Culture - Types of Aquariums - Requirements for Aquarium making - Setting of Aquarium - Aquarium maintenance - Aquarium Fishes - Gold Fish - Angel Fish - Fighter Fish - Koi - Molly - Sword Tail - Zebra Fish - Guppy - Fish Marketing - Definition - Marketing Channels - Types of Fish Marketing - Risk of Fish Marketing.

**Expected Course Outcomes**

After completion of this course, students will be able to gain knowledge in

 1. Animal distribution.

 2. The evolutionary significance of animal kingdom.

 3. The economic importance of animals.

 4. Breeding pattern of fishes.

 5. Ornamental fish culture.

**Textbooks**

 1. Sharma, P.D. (2018). *Fundamentals of ecology*, Rastogi publication.

 2. Arumugam N, (2001). *Organic Evolution*, Saras Publication.

 3. Ravindranath K.R. (2005). *Economic Zoology*, Dominant Publishers, New Delhi.

 4. Srinivasalu Reddy, M & Sambasivarao K.R.S, (2004). *A Text Book of Aquaculture*, Discovery Publishing House, New Delhi.

5. Pradip V Jabde (2016). *Text Book of Applied Zoology*, Discovery Publishing House, New Delhi.

**Reference Books**

1. Pillay T.V.R. (1990). Aquaculture. Principles & Practices, Black Well Publication, Oxford.

2. Jhingaran V.G. (1981). *Fish & Fisheries of India,* Hindustan Publishing Corporation.

**Supplementary reading:**

 1. [https://www.researchgate.net](https://www.researchgate.net/)

 2. [https://www.aquaculturealliance.orgs](https://www.aquaculturealliance.orgs/)

3. [https://www.iaszoology.com](https://www.iaszoology.com/)

#### Outcome Mapping

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO/PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
| **CO1** | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 2 | 3 | 3 | 3 |
| **CO3** | 2 | 3 | 3 | 2 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 |

\*3 - Strong; 2 - Medium; 1- Low

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester** | **Elective – I****COURSE CODE: 23UEVMEP1****COURSE TITLE: ENVIRONMENTAL ZOOLOGY PRACTICAL–I**  | **H/W** | **C** |
| **I** | **2** | **1** |

Course Objectives

1. To identify Freshwater and Marine fishes
2. To get knowledge on identification of fish diseases
3. To know the water salinity
4. To learn the LC50 and LD50
5. To know the method of fish seed and fish transport

 Practicals

1. Identification of Cultivable Marine fishes.
2. Identification of Cultivable fresh water fishes.
3. Identification and treatment of common fish diseases.
4. Estimation of oxygen consumption in fish by Winkler’s method.
5. Estimation of salinity.
6. Estimation of LC50 and LD50 with heavy metals using fish.
7. Effect of temperature and salinity on respiration of fish.
8. Demonstration of setting up of High-Tech aquarium tank.
9. Methods and transport of seeds and breeders.
10. Visit to aquaculture farm and submission of report.

Expected Course Outcome

After the completion of this practical course , the students are able to

1. Identify Cultivable Freshwater and Marine water fishes
2. Identify and treat fish diseases
3. Know the water salinity and its impact
4. Estimate LC50 and LD50
5. Transport of fishes

Text Books

1. Sharma, P.D. (2018). *Fundamentals of ecology*, Rastogi publication.

 2. Arumugam N, (2001). *Organic Evolution*, Saras Publication.

 3. Ravindranath K.R. (2005). *Economic Zoology*, Dominant Publishers, New Delhi.

 4. Srinivasalu Reddy, M & Sambasivarao K.R.S, (2004). *A Text Book of Aquaculture*, Discovery Publishing House, New Delhi.

5. Pradip V Jabde (2016). *Text Book of Applied Zoology*, Discovery Publishing House, New Delhi.

#### Outcome Mapping

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO/PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
| **CO1** | 3 | 3 | 2 | 3 | 3 |
| **CO2** | 3 | 2 | 3 | 3 | 2 |
| **CO3** | 2 | 3 | 3 | 2 | 3 |
| **CO4** | 3 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 |

\*3 - Strong; 2 - Medium; 1- Low

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester** | **Elective – I****COURSE CODE: 23UEVME25****COURSE TITLE: ENVIRONMENTAL ZOOLOGY -II** | **H/W** | **C** |
| **II** | **3** | **2** |

**Course Objectives**

1. To know about the classification of animals in the universe

2. To understand the physiology of animals

3. To learn about genetics of animals

4. To understand the causes of diseases in human

5. To learn the methods of analysis of parasitic diseases.

UNIT-I

Classification of Animals - Practical, artificial, Natural system of classification - Binomi nomenclature - Modern classification of living organisms - Branches of science related to zoology- Discoverers.

UNIT-II

Physiology-definition - brief history - fields of Physiology - Branches of Physiology- embryology - Program of development - Historical thoughts - Concepts - Branches of embryology-Scope of Embryology -Branches of Genetics.

UNIT-III

Gene theories: Definition - History - Vapour theory - fluid theory - epigenic theory - particulate theory- Performation theory-Pangenic theory-germ plasm theory.

UNIT IV

Medical Microbiology: Bacterial diseases: Cholera, typhoid, tuberculosis- Viral diseases: Small pox, measles, rabies, encephalitis, AIDS

UNIT V

Methods of diagnosing Parasitic diseases:

Examination of stools: Direct examination- sedimentation technique, floatation technique, Examination of blood-thick smear and thin smear method

Bacterial examination: Gram Positive and Gram Negative staining method

**Expected Course Outcomes**

After completion of this course, students will be able to gain knowledge in

1. The classification of animals in the universe

2. The physiology of animals

3. The genetics of animals

4. The causes of diseases in human

5. The methods of analysis of parasitic diseases.

**Textbooks**

1. Jordon, E.L. and P.S Verma, (2014). *Invertebrate Zoology*. S. Chand and Co. Ltd., New Delhi.
2. Adam Sedgwick, (1960). *A student’s text book of Zoology, Vol. I & III*, General Book Depot, Allahabad.
3. Sharma, P.D. (2018). *Fundamentals of ecology*, Rastogi publication.
4. Ravindranath K.R. (2005). *Economic Zoology*, Dominant Publishers, New Delhi.

 5. Srinivasalu Reddy, M & Sambasivarao K.R.S, (2004). *A Text Book of Aquaculture*, Discovery Publishing House, New Delhi.

6. Pradip V Jabde (2016). *Text Book of Applied Zoology*, Discovery Publishing House, New Delhi.

#### Outcome Mapping

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO/PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
| **CO1** | 3 | 3 | 2 | 3 | 3 |
| **CO2** | 3 | 2 | 3 | 3 | 2 |
| **CO3** | 2 | 3 | 3 | 2 | 3 |
| **CO4** | 3 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 |

\*3 - Strong; 2 - Medium; 1- Low

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester** | **Elective – I****COURSE CODE: 23UEVMEP2****COURSE TITLE: ENVIRONMENTAL ZOOLOGY PRACTICAL – II** | **H/W** | **C** |
| **II** | **2** | **1** |

**Course Objectives**

1. To learn the principles of microscope.

2. To know the method of identification of blood groups.

3. To learn the method of blood smearing

4. To identify the viral diseases

5. To know the bacterial diseases

**Practicals**

1. Compound microscope.
2. PTC test.
3. Identification of ABO Blood Group
4. Preparation of thick and thin smear of blood.
5. Examination of Blood – thick and thin smear method.
6. Bacterial Examination – gram positive and gram negative method.
7. Water borne disease – Bacterial disease – Typhoid.
8. Viral disease – Hepatitis and Rabies.
9. Gram staining of Bacteria.
10. Examination of stool.

**Expected Course Outcomes**

After the completion of this course, students will be able to

1. Know the principles of microscope.

2. Identify human blood groups.

3. Make the blood smearing

4. Identify the viral diseases

5. Understand the bacterial diseases

**Textbooks**

1. Jordon, E.L. and P.S Verma, (2014). *Invertebrate Zoology*. S. Chand and Co. Ltd., New Delhi.
2. Adam Sedgwick, (1960). *A student’s text book of Zoology, Vol. I & III*, General Book Depot, Allahabad.
3. Sharma, P.D. (2018). *Fundamentals of ecology*, Rastogi publication.
4. Ravindranath K.R. (2005). *Economic Zoology*, Dominant Publishers, New Delhi.

 5. Srinivasalu Reddy, M & Sambasivarao K.R.S, (2004). *A Text Book of Aquaculture*, Discovery Publishing House, New Delhi.

6. Pradip V Jabde (2016). *Text Book of Applied Zoology*, Discovery Publishing House, New Delhi.

#### Outcome Mapping

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO/PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
| **CO1** | 3 | 3 | 2 | 3 | 3 |
| **CO2** | 3 | 2 | 3 | 3 | 2 |
| **CO3** | 2 | 3 | 3 | 2 | 3 |
| **CO4** | 3 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 |

\*3 - Strong; 2 - Medium; 1- Low

**Non-Major Elective Courses (NME)** to other Departments)

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester** | NME-I: **COURSE CODE: 23UEVMN16****COURSE TITLE:**GLOBAL ENVIRONMENTAL ISSUES AND MANAGEMENT | **H/W** | **C** |
| **I** | **2** | **2** |

# Course Objectives

1. To learn about the major global environmental issues.
2. To know about global atmospheric changes like global warming.
3. To study the over exploitation of natural resources.
4. To know about global disaster like forest fire &oil spills.
5. To know about sustainable environmental management goal.

# UNIT – I: HUMAN POPULATION AND MANAGEMENT

Basic demographic concepts: Growth, fertility, mortality and migration -Population distribution and Urbanization - Poverty, food security and environmental degradation.

# UNIT – II: GLOBAL ATMOSPHERIC CHANGES

Regional and global Air Quality and CO2 emission - Air pollutants and climate change - Sources of greenhouse gases - Ozone depleting substances - Global warming - El Niño and La Niña

# UNIT – III: OVER EXPLOITATION OF NATURAL RESOURCES

Overexploitation of natural resources: Ecological footprint - Earth Overshoot Day - Water resources: Status of groundwater quality in India - Soil Resources: Global threats for soil quality - Loss of organic carbon. Biodiversity Resources: Deforestation, Biodiversity Loss.

# UNIT – IV: GOBAL DISASTER

Geological Disasters: Earthquake, Effects of earthquake; Volcanoes: Types of volcanic eruptions - Active volcanic belts in the world; Hydrological hazards: Flash flood - Flood management strategies - Oil spills - Forest fire.

# UNIT – V: SUSTAINABLE ENVIRONMENTAL ANAGEMENT

Sustainable utilization of renewable energy resources - Solar, Wind, Hydroelectric and Biomass energy resources. Sustainable agricultural practices: Biofertilizers and Biopesticides - National Action Plan on Climate Change - UNDP Sustainable Development Goals 2030 Agenda

# Expected Course Outcome

After completing this course, students will be able to gain knowledge in

1. Clearly identifying important global, national, and local issues relating to population, food, and the environment.
2. Recognizig the values of global atmospheric changes.
3. The consequences of over exploitation of natural resources.
4. The basic knowledge of global disaster.
5. Sustainable environmental management strategies.

# Text Books

1. Frances Harris (2012) Global Environmental Issues, 2nd edition, John Wiley & Sons Ltd., UK.
2. Stavros G. Poulopoulos and Vassilis J. Inglezakis (2016) Environment and Development: Basic Principles, Human Activities, and Environmental Implications. Elsevier, Netherlands.
3. John V. Walther (2014) Earth’s Natural Resources, Jones & Bartlett Learning, USA.

**Supplementary Readings:**

1. <https://www.stateofglobalair.org/sites/default/files/soga-2018-report.pdf>

2. <https://unfccc.int/>

#### Outcome Mapping

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO/PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
| **CO1** | 3 | 3 | 2 | 3 | 3 |
| **CO2** | 3 | 2 | 3 | 3 | 2 |
| **CO3** | 2 | 3 | 3 | 2 | 3 |
| **CO4** | 3 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 |

\*3 - Strong; 2 - Medium; 1- Low

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester** | NME-2 **COURSE CODE: 23UEVMN26****COURSE TITLE:** OCCUPATIONAL SAFETY, HEALTH AND MANAGEMENT | **H/W** | **C** |
| **II** | **2** | **2** |

# Course Objectives

1. To impart knowledge about Occupational hazards and deficiency diseases.

2. To learn about the health problems due to air and water pollution.

3. To study the occupational diseases and their preventive measures.

4. To learn the industrial safety standards

5. To understand the environmental management system.

# UNIT - I: OCCUPATIONAL HAZARD

Types of Occupational Hazards – Health – Definition – Need for Good Health – Factors Affecting Health – Malnutrition – Deficiency Diseases-Balanced diet-Food adulterants-Personal Hygiene.

# UNIT - II: HEALTH PROBLEMS DUE TO AIR AND WATER POLLUTION

Communicable Disease - Mode of transmission (Epidemic and Endemic diseases)-Water borne - Air borne - Food borne Diseases.

# UNIT – III: OCCUPATIONAL HEALTH HAZARDS

Physical-Chemical and Biological hazards-Occupational diseases –Silicosis-Asbestosis- Byssinosis-Hearing loss-Prevention and Control of Occupational diseases.

# UNIT – IV: INDUSTRIAL SAFETY STANDARDS

Causes of Accidents-Definition-Accident Reporting System-First aid-Frequency rate- Prevention and Control-Health education-Safety awareness.

# UNIT – V: ENVIRONMENTAL MANAGEMENT SYSTEM

ISO14000 and ISO14001-OSHA-The Public Liability Insurance Rules, 1991.

Compensation Act.

# Expected Course Outcome

After the completion of course students will able to gain knowledge in

1. The types of occupational hazards

2. The health impacts of air and water pollution.

3. Different types of health hazards.

1. The importance of industrial safety.
2. The ISO certification procedure.

# Text books

1. Scoot, R, M, 1997 concepts of industrial hygine, lewis publisher, New York.
2. Diberardins L.J., 1998. Hand Book of Occupational safety and health, john Willey,

New York.

1. Park J.E, and Park Preventive and social medicine.

# Supplementary readings

* 1. <https://dgfasli.gov.in/sites/default/files/service_file/Nat-OSH-India-Draft%281%29.pdf>
	2. [www.ehs.ucsb.edu](http://www.ehs.ucsb.edu/)
	3. <http://safety.ucanr.edu/Safety_Notes/>

#### Outcome Mapping

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO/PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
| **CO1** | 3 | 3 | 2 | 3 | 3 |
| **CO2** | 3 | 2 | 3 | 3 | 2 |
| **CO3** | 2 | 3 | 3 | 2 | 3 |
| **CO4** | 3 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 |

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