SARVODAYA KELAVANI SAMAJ MANAGED,

SHREE MANIBHAI VIRANI & SMT. NAVALBEN VIRANI SCIENCE COLLEGE

AN AUTONOMOUS COLLEGE- AFFILIATED TO SAURASHTRAUNIVERSITY, RAJKOT

Re-accredited at the 'A' Level (CGPA 3.28) by NAAC
'STAR' College Scheme & Status by MST-DBT
A College with Potential for Excellence - CPE (Phase-II) by UGC
UGC-DDU KAUSHAL Kendra
Accredited at the G-AAA Highest Grade 'A-1′ Level by KCG, Govt. of Gujarat
UGC-DDU KAUSHAL Kendra
GPCB-Government of Gujarat approved Environment Audit Centre

Enclosure-I

Sr. No.	Program	Semester	DSE-Allied	Enclosure
1.	B. Sc. Biochemistry	I	Botany	Enclosure-I A
2.	B. Sc. Microbiology	II	Botany	Enclosure-I B
3.	B. Sc. Biotechnology	III	Plant Science	Enclosure-I C
4.	B. Sc. Microbiology	I	Zoology	Enclosure-I D
5.	B. Sc. Biochemistry	II	Zoology-I	Enclosure-I E
6.	B. Sc. Microbiology	III	Sustainable Management	Enclosure-I F
7.	B. Sc. Biochemistry	III	Zoology-II	Enclosure-I G
8.	B. Sc. Microbiology	IV	Basics of Ecology	Enclosure-I H
9.	B. Sc. Biotechnology	IV	Animal Science	Enclosure-I I

2. Revised syllabi and Evaluation norms **framed** for Generic Elective courses for UG.

Enclosure – I A

BOTANY

SCHEME OF INSTRUCTION AND EXAMINATIONS

For Students Admitted from A.Y. 2019-2020 & Onwards

DSE - Allied Courses for other Programmes

Semester-I							
Course Code	**Course**	**Hrs. of Instruction/ week**	**Exam Duration (Hours)**	**Maximum Marks**			**Credits**
				CIA	**SEE**	**Total**	
Part-II							
19UBCDA01	BOTANY (For B.Sc. Biochemistry)	3	3	30	70	100	3
19UBCDA02	Botany Practical (For B.Sc. Biochemistry)	6	3	20	30	50	2

Semester-II							
Course Code	**Course**	**Hrs. of Instruction/ week**	**Exam Duration (Hours)**	**Maximum Marks**			**Credits**
				CIA	**SEE**	**Total**	
Part-II							
19UMBDA03	Botany (For B.Sc. Microbiology)	3	3	30	70	100	3
19UMBDA04	Botany Practical (For B.Sc. Microbiology)	6	3	20	30	50	2

Semester-III							
Course Code	**Course**	**Hrs. of Instruction/ week**	**Exam Duration (Hours)**	**Maximum Marks**			**Credits**
				CIA	**SEE**	**Total**	
Part-II							
19UBTDA05	Plant Science (For B.Sc. Biotechnology)	4	3	30	70	100	4
19UMBDA06	Plant Science Practical (For B.Sc. Biotechnology)	3	3	20	30	50	1

DSE – Allied BOTANY

SEMESTER I
(With Biochemistry)

19UBCDA01	BOTANY	3 Hrs/Week	3 Credit

OBJECTIVE

1. This course is survey of the botanical aspects of plant diversity, morphology, Reproduction, and Physiology.
2. Improve understanding of the structure functioning, life histories and diversity of plants.
3. Development of personal perception of plants and environment.

Unit I: Plant Kingdom **(09 Hrs)**

- Classification of kingdom (Five Kingdom System)
- Classification of Kingdom (Seven Kingdom System)
- General characters, Smith's Classification & economics importance of Algae
- General characters, Smith's Classification & economics importance of Fungi
- General account and outline classifications of Bryophytes
- General account and outline classifications of Pteridophytes
- General account and outline classifications of Gymnosperms

Unit II: Plant Morphology **(09 Hrs)**

- General study of Root
- General study of Stem
- General study of Leaf
- Types of Fruit
- Flower – Epigynous, Perigynous, Hypogynous
- General characteristics of herb, shrub, tree, climber and creeper

Unit III: Plant Diversity of Angiosperms **(09 Hrs)**

- Binomial Nomenclature of angiosperms
- Systems of classification
- Classification System of Bentham & Hooker.
- Taxonomic studies of Dicot plants from each following Families with its medicinal value.

- *Malvaceae*
- *Solanaceae*
- *Apocynaceae*

- Taxonomic studies of Monocot plants from each following families with its medicinal value
  - *Poaceae*
  - *Amaryllidaceae*

Unit IV: Method of Plant Reproduction (06 hrs)

- Fission
- Fragmentation
- Vegetative reproduction
- Asexual reproduction
- Sexual reproduction

Unit V: Plant Physiology (10 Hrs)

- Opening and closing of stomata
- Plant-water relations
- Translocation in the phloem
- Photoperiodism
- Seed dormancy

Text Books

1. V.K. Jain (2000) Fundamental of Plant Physiology , S.Chand (G/L) & Company Ltd; 5th Revised edition .(For Unit 5)
2. V. Singh D. K. Jain P. C. Pande (2010) A Text Book of Botany : Angiosperms, Rastogi Publications-Meerut. (for Unit 1, 2, 3, 4)

Reference Books:

1. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi.
2. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.
3. Taiz, L., Zeiger, E., MØller, I.M. and Murphy, A (2015). Plant Physiology and Development. Sinauer Associates Inc. USA. 6th edition.

19UBCDA02	Botany Practical	3 Hrs/wk	2 Credit

1. Identification and observational Study of Herbs Diversity through field visit/Lab specimens
2. Identification and observational Study of Shrubs Diversity through field visit/Lab specimens
3. Identification and observational Study of Tree Diversity through field visit/Lab specimens
4. Identification and observational Study of Climbers Diversity through field visit/Lab specimens
5. Identification and observational Study of Creepers Diversity through field visit/Lab specimens
6. To Study Morphology of Root.
7. To Study Morphology of Stem.
8. To Study Morphology of Leaf.
9. To Study Morphology of Flower.
10. To Study Morphology of types of calyx.
11. To Study Morphology of types of corolla and perianth.
12. To Study Morphology of types of Androecium.
13. To Study Morphology of types of Gynoecium.
14. Demonstrate water potential of given tissue (potato tuber).
15. To study evaluation of oxygen during photosynthesis.
16. To Study various types of Fruits.
17. To understand floral formula and floral diagram.
18. Taxonomic studies of Malvaceae family with its economical and medicinal value.
19. Taxonomic studies of Solanaceae family with its economical and medicinal value.
20. Taxonomic studies of Apocynaceae family with its economical and medicinal value.
21. Taxonomic studies of Poaceae family with its economical and medicinal value.
22. Taxonomic studies of Amarilidaceae family with its economical and medicinal value.
23. Preparation of Herbarium.
24. To study different methods of plant reproduction through chart/slides.
25. Calculation of stomatal index and stomatal frequency from the two surfaces of leaves of mesophytes and xerophytes.
26. Filed visit for plant diversity.

Enclosure – I B

DSE – Allied BOTANY

SEMESTER II

(With Microbiology)

19UMBDA03	Botany	3 Hrs/Week	3 Credits

Objective

1. This course is survey of the botanical aspects of plant diversity, morphology, physiology Anatomy.
2. Improve understanding of the structure functioning of medical botany and plant pathology.
3. Development of personal perception of plants and environment.

Unit I: Plant Kingdom **(09 Hrs)**

- Classification of Five Kingdom System according to Whitaker
- General characters and classification of Algae
- General characters and classification of Fungi
- General account and outline of classifications of Bryophytes
- General account and outline of classifications of Pteridophytes
- General account and outline of classifications of Gymnosperms
- General account and outline of classifications of Angiosperms

Unit-II Plant Physiology and Plant Anatomy **(10 Hrs)**

- Plant-water relations
- Photobiology
- Types of simple tissue
- Types of complex tissue
- Microtomy

Unit- III Plants Products **(10 Hrs)**

- Alkaloids yielding plants – Sarpgandha, Tobacco
- Dye yielding plants – Heena, Kesudo
- Oil yielding plants – Ground nut, Nilgiri
- Resin yielding plants – Pinus, Gugal
- Gum yielding plants – Neem, Baval

Unit- IV Medicinal Plants **(09 Hrs)**

- Usage of plants for wellness of respiratory disease – Ardusi, Tulsi
- Usage of plants for wellness of gastrointestinal disease – Kariyatu, Kadu
- Usage of plants for wellness of dermatological disease –, Turmaric, Chandan
- Usage of plants for wellness of cancer disease – Kuvarpathu, Barmasi
- Scope and future of medicinal plants

Unit-V Plant Pathology **(10 Hrs)**

- Introduction and classification of plant diseases
- General symptoms of disease
- Tikka disease of ground nut
- Red rot of sugar cane
- Different methods of plant disease control
- Citrus canker

19UMBDA04	Botany Practical	3 Hrs/Week	2 Credit

1. Observational study of Blue green algae – Nostoc through specimen and slides.
2. Observational study of Green algae – Spirogyra through specimen and slides.
3. Observational study of Brown algae – Sargassum through specimen and slides.
4. Observational study of Red algae – Batrachospermum through specimen and slides.
5. Observational study of Fungi- Mucor through specimens and slides.
6. Observational study of Fungi- Peziza through specimens and slides.
7. Observational study of Fungi- Agaricus through specimens and slides.
8. Observational study of Bryophyta – Marchantia through specimens and slides.
9. Observational study of Bryophyta – Funaria through specimens and slides.
10. Observational study of Pteridophyta – Adiantum through specimens and slides.
11. Observational study of Gymnosperm – Cycas through specimens and slides.
12. Study of Rotary Microtome.
13. Demonstrate water potential of given tissue (potato tuber).
14. To study evaluation of oxygen during photosynthesis.
15. To study of simple and complex tissue.
16. To study of plant products – Alkaloids.
17. To study of plant products – Dye.
18. To study of plant products – Oil.
19. To study of plant products – Resin.

20. To study of plant products – Gum.
21. To study of medicinal plants - wellness of respiratory disease.
22. To study of medicinal plants - wellness of Gastrointestinal disease
23. To study of medicinal plants - wellness of dermatological disease.
24. To study of medicinal plants - wellness of Cancer disease.
25. Study of Plant disease.
26. To understand floral formula and floral diagram.

Text Books:

- Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi (For Unit 1, 2, 3, 4).
- Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India. (For Unit 5)

References:

- Agnes Arber (1999). Herbal plants and Drugs. Mangal Deep Publications.
- Taiz, L., Zeiger, E., MØller, I.M. and Murphy, A (2015). Plant Physiology and Development.
- Sinauer Associates Inc. USA. 6th edition.

Enclosure – I C

DSE – Allied PLANT SCIENCE

SEMESTER III

(With Biotechnology)

19UBTDA05	Plant Science	4 Hrs/Week	4 Credit

Objectives of Outcome :

After completion of this course, student will be able to :

- Define and describe morphology of plant sex organs, flower and process of development and fertilization of male and female gametophyte in plants, and Identify the internal anatomy of root stem of plants.
- Understand the process of evolution and origin of life
- Carry out preparation of sections and staining of plant organs for microscopic studies and also comprehend the basis of photobiology and plant movements.

Unit I: Evolution **(10 Hrs)**

- Origin of species
- Catastrophism
- Origin and evolution of land plants
- Process of fossilization
- Adaptations, natural selection and patterns of evolution

UNIT II: Basics of plant anatomy **(10 Hrs)**

- Plant anatomy : Introduction and organization of meristems.
- Apical, Intercalary and lateral meristem.
- Simple plant tissue (parenchyma, collenchyma and sclerenchyma)
- Complex plant tissue (xylem, phloem, secretary structure and periderm)
- Microtomy.

UNIT III: Secondary growth in plants **(10 Hrs)**

- Primary structure of monocot root and stem
- Primary structure of dicot root and stem

- Secondary anomalous growth in stem with special reference to *Aristolochia* and *Salvodora*
- Secondary anomalous growth in root with special reference to carrot, radish and beet root
- Biological importance and function of secondary and anomalous structure in growth

UNIT IV: Basic of plant embryology **(10 Hrs)**

- Structure and development and male and female gametophytes
- Fertilization
- Development and types of embryo
- Polyembryony
- Apomixis

Unit V: Sensory photobiology of plant **(10 Hrs)**

- Structure, function and action of phytochromes, cryptochorome and phototropins
- Stomatal movement
- Photoperiodism
- Biological clocks
- Plant movement

19UBTDA06	Plant Science Practicals	3 Hrs/Week	1 Credit

Exe:-1. Study of anatomical details of monocot root and stem through permanent slides/temporary stain mounts/macerations/museum specimens with the help of suitable examples.

Exe:-2. Study of anatomical details of dicot root and stem through permanent slides/temporary stain mounts/macerations/museum specimens with the help of suitable examples.

Exe:-3. Mounting of embryo - monocot and dicot

Exe:-4. Study of different types of ovules through slide preparation/permanent slide/photographs

Exe:-5. Study of T.S. of anther and mounting of pollen grains

Exe:-6. Study of anomalous structure of stem through slide preparation (*Aristolochia* and *Salvodora*)

Exe:-7. Study of anomalous structure of root through slide preparation (carrot, radish and beet root)

Suggested Reading:

Text books

- Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms, Vikas Publishing House. Delhi. 5th edition (For Unit 4)
- Sharma, P.D. (2010). Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition. (For Unit 2,3and 5)
- Rastogi, V. B. (1994). Organic evolution. Kedernath Ramnath, India, 190.(For Unit 1)

Reference books

- Dickison, W.C. (2000). Integrative Plant Anatomy. Harcourt Academic Press, USA.
- Odum, E.P. (2005). Fundamentals of ecology. Cengage Learning India Pvt. Ltd., New Delhi. 5th edition.
- Hopkins, W.G. and Huner, A. (2008). Introduction to Plant Physiology. John Wiley and Sons. U. S.A. 4th edition.
- Raghavan, V. (2000). Developmental Biology of Flowering plants, Springer, Netherlands

Enclosure – I D

ZOOLOGY

SCHEME OF INSTRUCTION AND EXAMINATIONS

For Students Admitted from A.Y. 2019-2020 & Onwards

DSE - Allied Courses for other Programmes

Semester-I							
Course Code	**Course**	**Hrs. of Instruction/ week**	**Exam Duration (Hours)**	**Maximum Marks**			**Credits**
				CIA	**SEE**	**Total**	
Part-II							
19UMBDA01	Zoology (For B.Sc. Microbiology)	3	3	30	70	100	3
19UMBDA02	Zoology Practical (For B.Sc. Microbiology)	6	3	20	30	50	2

Semester-II							
Course Code	**Course**	**Hrs. of Instruction/ week**	**Exam Duration (Hours)**	**Maximum Marks**			**Credits**
				CIA	**SEE**	**Total**	
Part-II							
19UBCDA03	Zoology (For B.Sc Biochemistry.)	3	3	30	70	100	3
19UBCDA04	Zoology Practical (For B.Sc. Biochemistry)	6	3	20	30	50	2

Semester-III							
Course Code	**Course**	**Hrs. of Instruction/ week**	**Exam Duration (Hours)**	**Maximum Marks**			**Credits**
				CIA	**SEE**	**Total**	
Part-II							
19UBTDA05	Sustainable Management (For B.Sc. Microbiology)	3	3	30	70	100	3
19UMBDA06	Sustainable Management Practical (For B.Sc. Microbiology)	6	3	20	30	50	2
19UMBDA	Zoology-II (For B.Sc. Biochemistry)	3	3	30	70	100	3
19UMBDA	Zoology-II Practical (For B.Sc. Biochemistry)	6	3	20	30	50	2

Semester-IV							
Course Code	**Course**	**Hrs. of Instruction/ week**	**Exam Duration (Hours)**	**Maximum Marks**			**Credits**
				CIA	**SEE**	**Total**	
Part-II							
19UBCDA	Basics of Ecology (For B.Sc Microbiology)	3	3	30	70	100	3
19UBCDA	Basics of Ecology Practical (For B.Sc. Microbiology)	6	3	20	30	50	2
19UBTDA401	Animal Science (For B.Sc Microbiology)	4	3	30	70	100	4
19UBTDA402	Animal Science Practical (For B.Sc. Microbiology)	1	3	20	30	50	1

DSE – Allied ZOOLOGY

SEMESTER – I

(With Microbiology)

19UMBDA01	Zoology	3Hrs/Week	3 Credit

Unit -I: Systematic of Chordate animals [10 Lectures]

- An introduction to Invertebrate animals.
- Outline classification of Chordate animals.
- Salient features up to Class mammals with its examples.
- Type study : Scoliodon
    1. Morphology
    2. Digestive system
    3. Arterial system
    4. Reproductive system
    5. Brain.

Unit-II: Histology of Mammals. [08 lectures]

- Integumentary glands.
- Histology of Stomach
- Histology of Pancreas.
- Histology of Thyroid gland.

Unit-III: Digestive system & Respiratory system in human. [08 Lectures]

- Structural organization of Digestive track.
- Mechanical digestion.
- Chemical digestion.
- Structural organization of Respiratory system.
- Histology of Lung.

Unit-IV: Circulatory system & Excretory System in human. [08 Lectures]

- Structure and function of Blood vessels.
- Morphological and internal structure of Human Heart.
- Cardiac cycle.
- Morphology and histology of Kidney.
- Structure of Nephron.

Unite-V: Co-ordinatory system. [08 Lectures]

- Structure and types of Nerve cell.
- Morphological structure of Human Brain
- Endocrine secretion and its function.
    1. Pituitary gland
    2. Parathyroid gland
    3. Adrenal
    4. Ovary and Testis.

19UMBDA02	Zoology Practical	6 Hrs/Week	2 Credit

[1]. Identification and classification of Invertebrate animals Part I.
[2]. Identification and classification of Invertebrate animals Part II.
[3]. Identification and classification of Chordate animals part I.
[4]. Identification and classification of Chordate animals part II.
[5]. Study of Scoliodon system - Digestive system.
[6]. Study of Scoliodon system - Arterial system.
[7]. Study of Scoliodon system - Reproductive system.
[8]. Study of Scoliodon system - Brain.
[9]. Study of temporary mounting in Scoliodon.
[10]. Histological structure of mammalian organs.
[11]. Structural organization of Human Digestive system.
[12]. Digestion of starch by salivary Amylase.
[13]. To determine the presence of Lipid by qualitative test.
[14]. Comparative study of Mammalian Stomach.
[15]. Structural organization of Human respiratory system and T.S. of Lung.
[16]. Morphological and internal structure of Heart.
[17]. Comparative study of Heart in higher chordates.
[18]. Comparative study of Aortic-arch in higher chordates.
[19]. Morphological and internal structure of Kidney.
[20]. Comparative study of Kidney in higher chordates.
[21]. Structure of Nerve cell and Brain in human.
[22]. Internal anatomy of some endocrine glands.
[23]. Study of Mitosis.
[24]. Study of Meiosis.

Textbook:

- Jain A. K., Textbook of Physiology, Avichal Publishing Company, 6th edition.(for Unit 2 to 5)
- Vander A, Sherman J. and Luciano D. (2014). Vander's Human Physiology: The Mechanism of Body Function. XIII Edition, Mcgraw Hills.(for Unit 2 to 5)
- Jordan E.L. and Verma P.S., Textbook of Chordates, S. Chand Publication, New Delhi.(for Unit 1)

Reference books:

- Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons.
- Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII Edition.Lippincott W. & Wilkins.

Enclosure – I E

DSE – Allied ZOOLOGY

SEMESTER – II

(With Biochemistry)

19UBCDA03	Zoology - I	3 Hrs/Week	3 Credits

OBJECTIVE

- The students pursuing this course would have to develop in depth understanding various aspects of the Zoology.
- The working principles, design guidelines and experimental skills associated with different fields of Zoology.

Unit –I Animal Taxonomy **(10 Lectures)**

- Systematic of Non-chordate Animals.
- Systematic of Chordate Animals.

Unit-II Forms & Functions in Animals **(08 lectures)**

Type Study: Earth worm.

- External Characters
- Digestive system
- Reproductive system
- Nervous system
- Structure of Septal Nephridia

Unit-III: Developmental Biology **(08 Lectures)**

- Structure of Frog Sperm.
- Structure of Frog Ovum.
- Fertilization in Frog.
- Cleavage in Frog.
- Blastula in Frog.
- Gastrula. in Frog.

Unit-IV: Evolution and Animal Behaviour **(08 Lectures)**

- [A] Evolution
  - Isolation
  - Speciation
  - Genetic Drift.
- [B] Animal Behaviour
  - Social Behaviour in Animals
    (1) Termite (2) Honey-bee
  - Parental Care in Animals
    (1) Pices (2) Amphibia.

Unit-V Applied Zoology **(08 Lectures)**

A study of general structure and characters of following pathogenic animals.

- Entamoeba.
- Trypenosoma.
- Filarial worm.
- Guinea worm.

19UBCDA04	Zoology-I Practical	6 Hrs/Week	2 Credits

1. Identification and Classification of Protozoa and Porifera.
2. Identification and Classification of Coelenterate to Annelida.
3. Identification and Classification of Arthropoda.
4. Identification and Classification of Mollusc & Echinodermata.
5. Identification and Classification of Protochordate and Pisces.
6. Identification and Classification of Amphibia & reptiles.
7. Identification and Classification of Aves and Mammal.
8. Study of most diversified some animals.
9. Systems of Earthworm.
10. Developmental Biology of Frog.
11. To compare embryonic development of Frog and Chick.
12. Study of Animal Behaviour.
13. To study the Learning behavior in animals.
14. Study of Pathogenic Animals.
15. Digestion of starch by salivary Amylase.
16. To determine the presence of Lipid by qualitative test.
17. Ascending paper chromatography
18. Circular paper chromatography.
19. To study Mitosis division.
20. To study Meiosis division.
21. Isolation and identification of Chick embryo.
22. To study the isolation among Lung fishes.
23. Study of Zoogeography as reference to speciation.
24. Study of Living fossils and connective link.

Text Books:

1. Jordan E. L & Varma P.S.(2010) Non-chordate Zoology, S.Chand & Co. Ltd. New Delhi, 4th edition.(for unit 1, 2 &5).
2. Gilbert S.F. (2010) Developmental Biology (Sinauer) 10th edition.(for unit 3).
3. Mathur R (2010) Animal Behaviour, Rastogi Publications, Merrut (for unit 4).
4. Rastogi, V. B. (1994) Organic evolution. Kedernath Ramnath, India.(for unit 4).

References:

1. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science .
2. Walter, H.E. and Sayles, L.P; *Biology of Vertebrates*, Khosla Publishing House

Enclosure – I F

DSE – Allied ZOOLOGY
SEMESTER – III

19UMBDA05	Sustainable Management	3Hrs/wk	3 Credits

Course objectives:

This course is designed to provide awareness and importance about

1. Environment, its condition and its impact globally and locally
2. Need for sustainable management
3. Agricultural biodiversity in sustainable growth
4. Role of society, corporate and government in sustainable management

Unit 1: Introduction to Sustainable Management (8hrs)

- What is Sustainable Management?
- Sustainable development and Green Climate Fund
- Introduction to Corporate Social Responsibility and ISO 14001

Unit 2: Basic concepts of Biodiversity (8hrs)

- Biodiversity – Definition, Types and Importance of Biodiversity.
- Global Distribution of Biodiversity and Biodiversity Hotspots
- Biodiversity in India – Wetlands, Marine Environment, Endemism.

Unit 3 : Agro biodiversity and Food Security (8hrs)

- Scope and importance of agricultural biodiversity and food Security
- The decline of biodiversity
- Agro ecosystems v/s natural ecosystems, Issues in sustainable agriculture
  Food Security and sustainability in India

Unit 4: Threats to Biodiversity and impact of Biodiversity loss on sustainability (8hrs)

- Extent of Biodiversity Loss
- Biodiversity Threats
- The Indian Scenario
- Protected Areas.

Unit 5: Sustainable use of Biodiversity (8hrs)

- Sustainable use of Biodiversity.
- National Instruments Relating to Biodiversity Management.
- Conservation Measures of Biodiversity.

Reference Book:

- IGNOU Study Materials
- Verma, P.S., Agrawal, V.K. (2005). Ecology, Cell Biology, Molecular Biology, Genetics. New Delhi: S. Chand and Company Limited.

19UMBDA06	Sustainable Management Practical	6hrs/wk	2 Credits

1. Isolation of micro organism forms various soil samples.
2. Isolation of micro organism forms various water samples.
3. Herbarium preparation for agro diversity.
4. Study of Legumes agro diversity.
5. Study of Cereals agro diversity.
6. Agro diversity study among Bagayati diversity.
7. Study of Insect diversity part I.
8. Study of Insect diversity part II.
9. Pathogenic insects and its effect on the crop.
10. Animal diversity of Invertebrate animals.
11. Animal diversity of lower Chordate.
12. Animal diversity of Higher Chordate.
13. Preparation of permanent slide by Single staining method.
14. Preparation of permanent slide by Double staining method.
15. Study of Agro ecology to compare natural ecosystem.
16. Biochemical test of Adulteration in powder form agro-product.
17. Biochemical test of Adulteration in addible liquids.
18. Group discussion.
19. Case study.
20. Field visit.

Enclosure – I G

DSE Allied Zoology

Semester III

(With Biochemistry)

	Zoology - II	3 Hrs/Week	3 Credits

Objective:

Unit 1: Introduction to Environmental Biology (8hrs)

- History, basic concepts and Applications.
- Chemical and biological evolution for the Origin of life.
- Ecosystem – structure, function and types.
- Abiotic factors – Water, Light and Temperature.

Unit 2: Habitat Ecology (8hrs)

- Soil formation, constituents, types, profile, soil organism in Terrestrial habitat.
- Types, Stratification and Zonation in Aquatic habitat
- Atmosphere – Structure and Stratification, Air and Gases, Aerosol.
- Causes and Effects of Habitat loss.

Unit 3: Community and interaction (8hrs)

- Composition, Structure, Quantitative characters, Qualitative characters of Community
- Interaction – Mutualism, Commensalism, Antagonism, competition
- Introduction, General process, Causes and types of Successions.
- Population Ecology- Population characteristics; Size and Density, Dispersion, Age structure, Natality and Mortality and population dynamics

Unit 4: Environmental pollutions and Biogeochemical Cycles (8hrs)

- Types of Pollutants, Air, water and Soil pollution and strategies to control.
- Environmental policies of India to control the pollution
- Carbon cycle, Nitrogen Cycle
- Phosphorous cycle, Water cycle

Unit 5: Human Welfare and Wild Life Management (8hrs)

- Classification and Conservation of natural Resources
- Types of Agriculture, Introduction to Aquaculture and Waste management
- Concept of threatened species, reasons and modes of wild life conservation; in situ and Ex-situ
- National parkas and Sanctuaries of India, Projects tiger, Asian elephant project, Conservation of Rhinos

Text books:

- A. Arumugam, Concepts of Ecology, seventh edition, 2010, Saras publication.

Reference books:

- Verma, P.S., Ecology, fifth edition, S. Chand and Company Limited.

	Zoology II Practical	**6hrs/wk**	**2 Credits**

1. Study of Aquatic ecosystem
    a. Pond ecosystem
    b. Oceanic Zonetion
2. To Compare the chemical characteristics of soil - I
    a. pH
    b. Moisture content
3. To Compare the chemical characteristics of soil - II
    a. Carbonate content
    b. Nitrate content.
4. Estimation of Chlorinity in water.
5. Estimation of Carbon dioxide in tap water.
6. Measurement of water quality, based on Hardness.
7. Measurement of water quality, based on BOD and COD.
8. Study of Biotic-interaction.
9. Study of Ecological adaptation part I.
10. Study of Ecological adaptation part II.
11. To determine ‘species Area curve’ and community size by quadrate method.
12. To determine Frequency of the community by quadrate method.
13. To determine Density of the community by quadrate method.
14. To determine Abundance of the community by quadrate method.
15. To calculate Mean for community dynamics.
16. To calculate Median for community dynamics.
17. To calculate Mode for community dynamics.
18. To determine population strength by quadrate method.
19. To determine Water holding capacity of the soil from deferent soil samples.
20. To count planktonic population among polluted water.

21. Study of Marine Zonetion and stratification.
22. Habitat study of Desert Area.
23. Habitat study of Forest Area.
24. Habitat study of Fresh water Area.

Enclosure – I H

DSE Allied Zoology

Semester IV

(With Microbiogy)

	Basics Of Ecology	**3 Hrs/Week**	**3 Credits**

Objective:

Unit 1: Introduction

- History, basic concepts and scopes
- Origin of life – Theories.
- Ecosystem – structure, function and types.
- Abiotic factors – Water, Light, Temprature.

Unit 2: Habitat Ecology

- Terrestrial Habitat – Soil formation, constituents, types, profile, soil organism.
- Aquatic Habitat – Types, Stratification and Zonation,
- Atmosphere – Structure and Stratification, Air and Gases, Aerosol.
- Habitat loss - Causes and Effects.

Unit 3: Community and interaction

- Community - Composition, Structure, Quantitative characters, Qualitative characters.
- Interaction – Mutualism, Commensalism, Antagonism, competition
- Succession – Introduction, General process, Cause, types, Hydrosere, Lithosere.
- Population Dynemics – Size and Density, Dispersion, Age structure, Natality and Mortality.

Unit 4: Biogeochemical Cycles

- Carbon cycle
- Nitrogene Cycle
- Phosphorous cycle
- Water cycle

Unit 5: Microbial Ecology

- History and development, Major contribution
- Soil as habitat natural habitat, Soil microflora

- Airo microflora and Microb dispersal
- Microbiomics reference to Human.
- Micro Interaction – with Microb, Plant and Animal.
- Microbial deteroration – Matals, Textile and Paper.

Text books:

- A. Arumugam, Concepts of Ecology, seventh edition, 2010, Saras publication.

Reference books:

- Verma, P.S., Ecology, fifth edition, S. Chand and Company Limited.

	Basics Of Ecology Practical	**3 Hrs/Week**	**3 Credits**

1. Study of Aquatic ecosystem
    a. Pond ecosystem
    b. Oceanic Zonetion
2. To Compare the chemical characteristics of soil - I
    a. pH
    b. Moisture content
3. To Compare the chemical characteristics of soil - II
    a. Carbonate content
    b. Nitrate content.
4. Estimation of Clorinity in water.
5. Estimation of carbondioxide in tap water.
6. Measurement of water quality, based on Hardness.
7. Measurement of water quality, based on BOD and COD.
8. Study of Biotic-interaction.
9. Study of Ecological adaptation part I.
10. Study of Ecological adaptation part II.
11. To determine ‘species Area curve’ and community size by quadrate method.
12. To determine Frequency of the community by quadrate method.
13. To determine Density of the community by quadrate method.
14. To determine Abundance of the community by quadrate method.

15. To determine population strength by quadrate method.
16. To calculate Median for community dynamics.
17. To calculate Mode for community dynamics.
18. To calculate Mean for community dynamics.
19. To determine Water holding capacity of the soil from deferent soil samples.
20. To count planktonic population among polluted water.
21. Study of Marine Habitat and stratification.
22. Habitat study of Desert Area.
23. Habitat study of Forest Area.
24. Habitat study of Fresh water Area.

Enclosure – I I

DSE – Allied ZOOLOGY

SEMESTER – IV
(With Biotechnology)

19UBTDA401	**DSE Allied 4:Animal Science**	**4 hrs/wk**	**4 Credit**

Objectives:

After completion of this course, student will be able to :

1. Know about the basic principle and overview of animal classification.
2. Understand the internal structure of organ and working principle of body.
3. Define and describe process of fertilization and development of embryo in human.
4. Understand the process of evolution and origin of life,

Unit1: Animal Classification (10 hrs)

- Principle of Animal classification
- General overview of Animal classification.
- Non Chordates: General classification & Salient features of important nonchordate i.e. Protozoa, Porifera, Cnidaria, Platyhelminthes, Aschelminthes, Nematoda; Annelida, Arthropoda, Mollusca, Echinodermata
- Chordates: Salient Features of Pisces, Amphibia, Reptilia, Aves and Mammalia.

Unit 2: Animal Tissues (8 hrs)

- Epithelial tissue, connective tissue, muscular tissue, nervous tissue and types of Integumentary glands
- Bones: structure and types, ossification, bone growth.
- Nervous tissue: general organization, Myelinated and non myelineated nerve.
- Muscle: histology of different types of muscle, ultra structure of skeletal muscle and cardiac muscle.
- Molecular and chemical basis of muscle contraction

Unit 3: Human Physiology (12 hrs)

- Endocrine system: basic concept of hormone, Structure and function of various endocrine gland (Pituitary, Parathyroid, Adrenal, Ovary, Testis).
- Digestive system: structure and functions of organs and glands involved in the digestive system, mechanism of digestion.

- Respiratory and Circulatory System: Heart and its functioning, Circulatory pathway of blood and lymph, Bohr and Haldane effect, Chloride shift, cardiac cycle, cardiac output, Structure of lungs, mechanism of gaseous exchange.
- Excretory system: Structure of mammalian nephron and kidney, physiology of urine formation, osmoregulations.
- Nervous system: Type of nervous system, Structure and function of Brain, Propagation of nerve impulse through nerve fibers.

Unit 4: Basic of Developmental Biology (10 hrs)

- Structure and functions of Testis and ovary in Human.
- Gametogenesis: Spermatogenesis and structure of sperm, Oogenesis and structure of ovum, types of ova
- Fertilization: Events of fertilization, mechanism of sperm transfer, polyspermy.
- Cleavage, blastulation and gastrulation and organogenesis of Amphioxus.
- Extra embryonic membranes, Placentation.

Unit 5: Evolution (8 hrs)

- Evidences of organic evolution
- Geological time scale
- Species concept: isolating mechanisms and modes of speciation
- Adaptation: definition, kinds of adaptations, adaptive radiation, convergence and divergence
- Evolution of man

Text books

1. Gyton C. and Hall J.E.(2011)Textbook of Medical Physiology,11th edition,Elsevier,USA.
2. Gilbert S.F. (2010) Developmental Biology (Sinauer) 10th edition.

Reference books

1. Tortora, G.J. and Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition. John wiley & sons, Inc.
2. Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional Correlations. XII Edition. Lippincott W. & Wilkins
3. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
4. Mathur R (2010) Animal Behaviour, Rastogi Publications, Merrut
5. Rastogi, V. B. (1994) Organic evolution. Kedernath Ramnath, India, 190.

19UBTDA402	DSE Allied Practical 4:Animal Science Practical	3 hrs/wk	1 Credit

Objectives:

Students will be able to:

1. Understand the Transverse section of various parts through permanent slides
2. Evaluate the biotic and abiotic components of the simple ecosystem

List of Experiments

1. Study of whole mount of eggs, early cleavage stage, T.S. of blastula and gastrula of frog.
2. Study and isolation of chick embryo: 18 hours, 24 hours, 36 hours, 48 hours and 72 hours.
3. Study of T.S. of ovary, testis and placentation through permanent slide
4. Preparation of temporary mounts: Squamous epithelium, Ciliated epithelium, Striated muscle fibres and nerve cells.
5. Examination of permanent sections of mammalian skin, Cartilage, Bone, Pancreas, Testis, Ovary
6. Study of all the biotic and abiotic components of any simple ecosystem- natural pond or terrestrial ecosystem or human modified ecosystem.
7. Study of the life table and fecundity table, plotting of the three types of survivorship curves from the hypothetical data.

Reference Books

1. Tortora, G.J. and Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition. John wiley& sons, Inc.
2. Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional Correlations. XII Edition. Lippincott W. & Wilkins