G.T.N. ARTS COLLEGE (Autonomous)
Dindigul

(Affiliated to Madurai Kamaraj University)
(Accredited by NAAC with 'B' Grade)

DEPARTMENT OF ZOOLOGY

UNIVERSITY SYLLABUS

Choice Based Credit System (CBCS)
(From 2008 – 09 onwards)

MADURAI KAMARAJ UNIVERSITY
Choice Based Credit System (CBCS)

SL.NO	SEMESTER	COURSE CODE	SUBJECT TITLE	CREDITS	HOURS
1.	I	SZY8C11	Invertebrata	4	4
2.	I	SZY8S11	Biostatistics	2	2
3.	I	SZY8S12	Computer Application And Information Technology	2	2
4.	I	SZY8N11	Human Biology	2	2
5.	I	SZY8A11	Invertebrata	4	4
6.	II	SZY8C21	Chordata	4	4
7.	II	SZY8S21	Immunology	2	2
8.	II	SZY8S22	Fishery Biology	2	2
9.	II	SZY8N21	Ornamental Fish Culture	2	2
10.	II	SZY8A21	Chordata	4	4
11.	II	SZY8C2P	Invertebrata And Chordata	2	2
12.	II	SZY8A2P	Invertebrata And Chordata	2	2
13.	III	SZY8C31	Developmental Biology	4	4
14.	III	SZY8A31	Microbio, Cell Bio, Genetics, Mole Bio And Bio Tech	4	4
15.	IV	SZY8C41	Cell Biology	4	4
16.	IV	SZY8A41	Deve Bio, Bio Che, Physiology, Immunology And Evolution	4	4
17.	IV	SZY8C4P	Cell And Developmental Biology Practical	2	2
18.	IV	SZY8A4P	Microbio, Cell Bio, Genetics, MoleBio, Bio Tech, Deve Bio, Bio Che And Physiology	1	2
19.	V	SZY8C51	Ecology	4	4
20.	V	SZY8C52	Microbiology	4	4
21.	V	SZY8C53	Genetics And Molecular Biology	4	4
22.	V	SZY8S51	Poultry Science	2	2

23.	**VI**	**SZY8C61**	**Biotechnology**	**4**	**4**
24.	**VI**	**SZY8C62**	**Bio-Chemistry Physiology**	**4**	**4**
25.	**VI**	**SZY8C63**	**Evolution**	**4**	**4**
26.	**VI**	**SZY8S61**	**Economic Entomology**	**2**	**2**
27.	**VI**	**SZY8C6P**	**Practical III**	**5**	**2**
28.	**VI**	**SZY8C6Q**	**Practical IV**	**5**	**3**
29.	**VI**	**SZY8C6R**	**Practical V**	**5**	**3**

B.Sc., Zoology Major **Part - III** **Semester -I**

Core paper – I **Invertebrata (SZY8C11)** **(4 Credits)**

Contact hours per week – 4 hours
Contact hours per Semester – 60 hours

Objectives:

To enhance the knowledge of the students in
1) Understanding the animal organization and classification
2) Identifying the systematic position and differentiating all Invertebrate
3) Understanding the diversity of Invertebrates
4)Study the biology and adaptations of endoparasite of man

Unit – I TAXONOMY – 12 hours

1. Definition.
2. Principles of classification - Symmetry and Coelom.
3. Units of classification
4.Binomial nomenclature
5.Outline classification of Animal kingdom upto class level with example - Flow chart only.
6. General characters of the following phyla, i) Protozoa, ii) Porifera, iii) Coelenterata, iv) Platyhelminthes, v) Nematoda, vi) Annelida, vii) Arthropoda, viii) Mollusca, ix) Echinodermata.

Unit - II PROTOZOA and PORIFERA – 12 hours

Protozoa:

1.**Paramecium – (Type study)**
General organization, Cyclosis, Contractile vacuole and sexual reproduction conjugation only.
2. Structure, pathology, prevention and control measures of i) Plasmodium vivax.
3.General topic :Nutrition in protozoa.

2. Porifera:

1.**Leucosolenia – (Type study)**
Struture, Spicules, Canal system Reproduction and Development only.
2. General topic: Canal system in sponges.

Unit – III COELENTERATA AND HELMINTHES - 12 hours

Coelenterata:

1.**Obelia – (Type study)**
Structure of Obelia colony, Medusa, and Nematocyst, Reproduction and Development (Metagenesis).
2. Polymorphism in Coelenterata.
General topic:Coral reefs.

Helminthes:

1.**Fasciola hepatica (Liver Fluke) – Type study**

External characters, Digestive system, Excretion, Reproduction and Development (Life cycle).

2. Structure, Pathology and control measures of Ascaris and Wucheria.

UNIT – IV: ANNELIDA AND ARTHROPODA - 12 hours

Annelida:

1.Earth worm - Type study

External morphology, Setae, Nephridia, Nervous system, and Reproductive system only.

2. Metamerism in Annelids.

Arthropoda:

1.Penaeus (Marine Prawn) – Type Study

External morphology, Appendages, Respiratory System, Reproductive System and Development.

2. Affinities of Peripatus.

UNIT V: MOLLUSCA AND ECHINODERMATA - 12 hours

Mollusca:

1.Sepia – Type Study

External Morphology, Digestive System, Ink gland, circulatory system ,Reproductive system .

2.Tortion inmollusca.

Echinodermata:

1.Star fish - Type Study

External morphology, Pedicellaria, Water vascular system only.

2. Larval forms in Echinodermata.

References and Text Books:

1. Invertebrate Zoology -- T.C. Majupuria, (2001) Pradeep Publications, Jalandar.

2. A Manual of Zoology -- M. Ekambaranatha Iyer and T.N.Ananthakrishna. S (2003 reprint) Viswanathan publishers – Chennai.

3. Invertebrate Zoology -- E.L.Jordon and P.S.Verma. (2005 Reprint) S.Chand and Company, 7361, Ram nagar, New Delhi – 110 055;ISBN 81-219 -0367 –X.

4. Invertebrate Zoology -- R.L.Kotpal, (2005 Reprint) Third Edition published by Rakesh Rastogi for Rastogi publications, Meerat.

5. Invertebrate Zoology -- P.S.Dhami and J.K.Dhami. (2003) R.Chand and Company, New Delhi.

6. A Text Book of Invertebrata -- N. Arumugam et al., (2008) Saras Publications, Kottar, Nagercoil.

B.Sc., Zoology Major **Part - IV** **Semester - I**

Skill Based Elective Paper - I **Biostatistics (SZY8S11) (2 Credits)**

Contact hours per week - 2 hours

Contact hours per semester - 30 hours

Objectives:

To enhance the knowledge of the students in

i. Collection of data and tabulation of data.
ii. To present the data in various diagrams.
i. Compute measures of central tendency and dispersion.

Unit - I: - 6 hours

1. Collection of Data – Primary and Secondary data.
2. Classification and Tabulation of data.
3. Diagrammatic and graphic representations.

Unit: II - 6 hours

1. Measures of Central tendency – Mean, median, and mode – Individual discrete and continuous series.
2. Standard deviation.

Unit – III - 6hours

1. Measures of Dispersion – Range.
2.Quartile deviation.
3.Rank correlation.

Unit – IV - 6 hours

1. Regression – Types.
2. Regression – Equation.
3. Binomial dispersion.

Unit – V - 6 hours

1. Probability – Addition theorem – Simple problems.
2. Chi – Square test.
3. Students t - test.

Text Books:

Biostatistics and Computer application, Arumugam N, (2005) Saras publications, Kottar, Nagarcoil.

References:

1. Statistical methods, Gupta S.P, (2006) Sulthan chand & sons Educational publishers, New Delhi.

2**. Fundamental of Biostatistics**, Khan A.S, & Khanum A, (2004) Ukaas publishers, Hyderabad.

3. **Methods of Biostatistics,** Baskararao T, (2001) PARAS Publications, Hyderabad.

Text Books:

Biostatistics and Computer application, Arumugam N, (2005) Saras publications, Kottar, Nagarcoil.

References:

1. Statistical methods, Gupta S.P, (2006) Sulthan chand & sons Educational publishers, New Delhi.

2**. Fundamental of Biostatistics**, Khan A.S, & Khanum A, (2004) Ukaas publishers, Hyderabad.

3. **Methods of Biostatistics,** Baskararao T, (2001) PARAS Publications, Hyderabad.

B.Sc, Zoology Major. Part - IV Semester - I (2 Credits)

Skill Based Elective paper: II Computer Applications and Information Technology

(SZY8S12)

Contact classes per week - 2 hours.
Contact classes per Semester - 30 hours.

Objectives:

To enable the students to

1. develop the skill in computer operation
2. Know the characteristics of computer
3. Learn the types of Internet connections

Unit – I: **- 6 hours**

1. Introduction to Computer - Block diagram.
2. Characteristics of computer.
3. Generation and classifications of Computer

Unit – II: **- 6 hours.**

Computer and Communication: Type- needs - Communication media- Network topologies

Unit – III: **- 6 hours.**

MS Word: File Operations: New, Open, Save & Print. **Editing:** Cut, Copy, Paste, Find & Replace**. Insert:** Page numbers & Pictures

Unit – IV: **-6 hours.**

MS Word: Format: Font, Bullet & Numbering, Paragraph & Background**. Tools:** Spelling & Grammar. **Data:** Sort

Unit – V: **-6hours**

Internet: Internet concept- Types of internet connections- Internet services- Browsing techniques- Website- Email – Applications of Internet.

References:

1. Computer application in Business – I.Vasanthi Ramanathan – Meenakshi Pathippagam, 4/593, Vandiyur main road, Sadasivam nagar, Madurai – 20. Ph: 0452-2523824.
2. Fundamentals of Computer, V.Rajaraman
3. Mittal C. (2003) Fundamentals of Information Technology, Pragathi Prakasam, Meerut
4. MS: OFFICE for Win 95- Microsoft office Press.
5. Developing Application with MS: OFFICE- Christine Solomon- Microsoft office Press.

B.Sc., Chemistry (Allied Zoology) Part - III Semester - I

Paper - I **Invertebrata**: (**SZY8A11)** **(4 Credits)**

Contact hours per week - 4 hours.

Contact hours per semester - 60 hours.

Objectives:

To cater basic knowledge in animal diversity, classification, nomenclature, characteristics of different phyla and structure and functions organ systems in invertebrates.

Unit - I: **Taxonomy and Protozoa**: **- 12 hours.**

1. Types of classification and nomenclature
2. General characters of Phylum Protozoa
3. Amoeba - Type study-Externals, Nutrition, Locomotion, excretion and reproduction
4. Plasmodium: Life history, transmission, prevention and control.

Unit - II: **Porifera and Coelenterata**: **- 12 hours.**

1. General characters of phylum porifera and Coelenterata.
2. Obelia - Type study-Structural organization of Obelia colony, Medusa and Life cycle of Obelia(Metagenesis)
3. Canal system and spicules of Sponges
4. Corals - Types, Ecological and Economic importance.

Unit - III: **Helminthes**: **- 12 hours.**

General characters of Platyhelminthes and Nematoda:

1. Fasciola - Type study- External characters, Digestive system, Excretion, Reproduction and Development (Life cycle).
2. Filarial Worm: Life history, transmission, prevention and control
3. Parasitic adaptations of helminthes worms.

Unit - IV: **Annelida and Arthropoda**:- **- 12 hours.**

1. General characters of Annelida and Arthropoda
2. Earth worm - Type study. External characters, Digestive system, Excretion, Nervous system, Reproduction and Development.
3. i) Pests of Paddy -- Tryporyza , and Leptocorisa
   ii) Pests of Coconut – Oryctes rhinoceros, and Nephantis.
4. Apiculture –Polymorphism, Newton's bee hive, Honey, Bee wax, and Bee venom.

Unit - V: Mollusca and Echinodermata **- 12 hours.**

1. General characters of Mollusca and Echinodermata
2. Star fish – Type Study External Morphology, Digestive System, Water vascular System, Coelomic canals vascular, and Reproduction and Development.
3. Pearl Culture: Structure of Pearl oyster-formation of pearl-types of culture
4. Oyster Culture**:** Structure of edible oyster-types of culture and its food value

Reference Books:

1. Invertebrate Zoology -- T.C. Majupuria,(2001) Pradeep Publications, Jalandar.
2. A Manual of Zoology -- M. Ekambaranatha Iyer and T.N.Ananthakrishna. S (2003 Reprint) Viswanathan publishers – Chennai.
3. Invertebrate Zoology -- E.L.Jordon and P.S.Verma. (2005 Reprint) S.Chand and Company, 7361, Ram nagar, New Delhi – 110 055; ISBN 81-219 -0367 –X.

4. Invertebrate Zoology -- R.L.Kotpal, (2005 Reprint) Third Edition published by Rakesh Rastogi for Rastogi publications, Meerut.
5. Invertebrate Zoology -- P.S.Dhami and J.K.Dhami.(2003) R.Chand and Company, New Delhi.
6. A Text Book of Invertebrata -- N. Arumugam et al., (2008) Saras Publications, Kottar, Nagercoil.

B.Sc., Zoology Major. **Part – IV** **Semester – I**

Non Major Elective – I **Human Biology** **(2 Credits)**

Contact hours per week: - 2 hours
Contact hours per semester: - 30 hours
(For non Biology students)

Objectives: It deals with

i. Anatomy and physiology of human reproduction
ii. Genetics of sex determination.
iii. Physiology of respiration, heart and kidney.
iv. Human health and common diseases
v. Human evolution

Unit – I Human Embryology:: **- 6 hours**

Structure of Human sperm and ovum - Menstrual cycle – Menopause – Pregnancy — Parturition – Twins - Test tube Baby.

Unit – II Human Physiology: **- 6 hours**

Respiration – Oxygen and Carbon di oxide transport; Blood: Blood Composition ; Structure and function of heart , Electrocardiogram (ECG), Blood pressure , Blood urea; Structure of kidney nephron - Formation of urine .

Unit – III Human Genetics: **- 6 hours**

Sex determination in Man - Chromosomal abnormalities (Down, Turner's, Klinefelter's syndromes) –Human Blood groups.

Unit – IV Human health and Hygiene: **- 6 hours**

Composition of food, Digestion and absorption of food, Balanced diet, Vitamin deficiencies, Calorie value of food, Malnutrition and Obesity,

Unit – V Human History: **- 6 hours**

Human origin – Diversification, Biological and cultural evolution – Human future.

Reference Books:

1. Chordate Embryology, P.S.Verma., & V.K.Agerwal., (2006) S.Chand & Co., Ramnagar, New Delhi,
2. Developmenyal Biology, Arumugam, N., (2008) Saras Publications, Kottar – 629002.
3. An Introduction to Embryology, Balinsky, B.I., (2002) W.B. Saunders Co., Philadelphia.

4. Hoar S. William – General, Comparative Physiology, (2005 Ed,) Prentice Hall of Indian Pvt. Ltd, New Delhi, ISBN- 0- 87692-337-6
5. Gupta.P.K, 1999, Genetics. Rastogi Pub., Meerut, ISBN 81 – 7133 – 413 – X
6. Sinnot, E.W.., Dunn, L.C., & Dobzhansky, 1958, Principles of Genetics, Mc Graw Hill Co., New York, ISBN 57 – 13342.
7. Biochemistry, Ambika Shanmugam (2006), 10, III Cross Street, West C.I.T. Nagar, Chennai – 600 035.
9. Organic Evolution, Rastogi, V.B., (2006) Kedar Nath and Ram Nath, Meerut.

B.Sc., Zoology Major **Part - III** **Semester -II**

Core Paper -II **Chordata (SZY8C21)** **(4 Credits)**

Contact hours per week - 4 hours
Contact hours per semester - 60 hours

Objectives:

To enhance the knowledge of the students in
1) Understanding the diversity of Chordates.
2) Identifying the systematic position and differentiating all Chordates
3)Understanding the Chordate organization and classification.

Unit - I: **- 12 hours**

Chordata characteristics, Outline classification upto class level with examples.

Type study: Prochordata –

General topics:

1) Retrogressive metamorphosis in Ascidian.
2) Affinities of Balanoglossus

Unit - II: **- 12 hours**

Classification of Fishes upto order level with examples.

Type study: Shark.

General topics:

1) Migration of Fishes.
2) Parental care in amphibia.

Unit - III: **- 12 hours**

Classification of Reptiles upto orders with examples.

Type study: Calotes.

General topics:

1) Poisonous and non-poisonous snakes – Identification and Biting mechanism.
2) Origin, dominance and decline of Mesozoic reptiles.

Unit - IV: **- 12 hours**

Classification of Aves upto orders with examples.

Type study: Pigeon – External morphology, Circulatory system, Pectoral and Pelvic girdles only.

General topics:

1) Flight adaptation in birds.
2) Archaeopteryx and its Evolutionary importance.

Unit – V: **- 12 hours**

Classification of Mammals upto orders with examples.

Type study: Rabbit – External morphology, Nervous system, and Reproductive system only.

General topics:

1) Dentition in mammals.
2) Adaptation of aquatics mammals.

Text Books:

1) Ekambaranatha Ayyar, M., & Ananthakrishna, T.N. – A manual of Zoology – (2005 Reprint) Volume II, Chordata; S.Visvanathan (Printers and Publishers) Pvt Ltd, Chennai.
2) Kotpal, R.L – Vertebrata, (2005 Reprint) Third Edition, Published by Rakesh Kumar Rastogi for Rastogi Publishers, Ganapathi Shivaji road, Meerut – 250 002.

References:

1) Alexander, R.MCN (1981) The Chordates – II International Edition - Cambridge University press, New Delhi.
2) Kent. C. George. – Comparative anatomy of Vertebrates. Mosby International Edition, Toppan printing, Japan, Library of Congress Catalogue, Card No: 65-15973. 3) Romer, R.S. & Parson.T.S., (1986) – The Vertebrate Body, VII Edition, W.B.Saunders, Philadelphia.
4) E.L.Jordon and P.S.Verma - .Chordate Zoology (2006 Reprint) Published by S.Chand and Co. 7361, Ram nagar, New Delhi- 110 055. ISBN: 81 – 219 -1839 -9.
5) P.S.Dhami and J.K.Dhami., Chordate Zoology (2006 Reprint) – R.Chand and company. New Delhi.

B.Sc., Zoology Major **Part - IV** **Semester – II**

Skill Based Elective Paper - III **Immunology (SZY8S21)** **(2 Credits)**
Contact hours per week - 2 hours
Contact hours per semester - 30 hours

Objectives:
To provide a basic knowledge in immunology.

i. Immune system, antigens, antibody structure and antigen-antibody interaction.
ii. Cell mediated and humoral immune response.
iii. Vaccines and Immunization schedule.

Unit - I: **- 6 hours**
1. Organs of the immune system: Thymus, Bone marrow, Bursa of fabricius, Spleen and lymph node.
2. Cells of immune system: Stem cells, B cells, and T cells.

Unit - II: **- 6 hours**
1. **Antigens:** haptens, epitopes, paratopes .
2. Antibodies: Structure, properties and functions – IgG.

Unit - III: **-6 hours**
1. Antigen- Antibody reactions: Invitro methods - precipitation, agglutination.
2. Antigen and antibody interaction: Humoral immune response – Cell mediated Immune response.

Unit - IV: **- 6 hours**

1. **Major Histocompatibility complex:** Structure and functions.
2. Autoimmune disorders -Cancer and AIDS.

Unit V: **- 6 hours**
1. Immune Techniques: VDRL slide test, ELISA.
2. Vaccines and Immunization: Types of Vaccines – Inactivated, Attenuated.
Passive and Active immunization

Reference and Text Book:
1.**Essential Immunology**, Roitt, I.M. (2000) Blackwell Scientific Publishers.
2**. Immunology** Kuby, J. (1999) W.H.Freeman and Company, New York
3. **Fundamental immunology,** William, E. Paul (1989) 2nd Edition Raven Press, New York.
4. **The Experimental Foundations of Modern Immunology** (4th Edition) John Wiley and Sons, New York. William, R. Clark (1991)
5**. Immunology**. Roiff J.M., Brosthoff J., and D.K.Male. 1997. Mobby International Ltd., USA.

Skill Based Elective Paper: IV F**isheries Biology (SZY8S22)** **(2 Credits)**

Contact hours per week - 2 hours.
Contact hours per semester - 30 hours.

Objectives:

To make the students to learn about

1. Fisheries and its importance
2. Fish culture and Processing techniques
3. Economic importance of common south Indian fishes

Unit – I: **- 6 hours.**

1. Importance of Fisheries.
2. Classification of Fisheries.
3. Fishing craft and gear in India.
4. Fisheries management.

Unit – II: **- 6 hours.**

1. Economic importance of common south Indian fishes.
2. Parasites and diseases of fishes.

Unit – III: **- 6 hours.**

Physiology and Ecology of fishes:

1. Food and feeding habit of fishes.
2. Migration in fishes.
3. Age and growth of fishes – Tagging.

Unit – IV: **- 6 hours.**

Fish culture: Kinds of Fish culture:

1) Induced spawning of Indian carps,
2) Paddy cum Fish culture,
3) Monoculture,
4) Composite fish culture,
5) Sewage fed fisheries,
6) Cage fish culture.

Unit – V: **- 6 hours.**

Fish processing and preservation:

1. Canning of fishes..
2. Products of fishes – Fish oil, CIFT.

Text and Reference Books:

1. Fishes N.Chandy – National book trust.
2. Fish and Fisheries of India – V.G.Jhingran – Hindustan Publishing Corp. Delhi.
3. A history of Fishes – J.R.Norman – Earnest Benn Ltd, London.
4. The life of Fishes – N.B.Marhall – Weidnefeld & Nicholson, London.
5. Marine and Fresh water fishes of Ceylon – S.R.Munro.
6. Fishes – Day.

Paper - II **Chordata (SZY8A21)** **(4 Credits)**

Contact hours per week - 4 hours.

Contact hours per semester - 60 hours.

Objectives:

To cater basic knowledge in animal diversity, classification, nomenclature, characteristics of different phyla and structure and functions organ systems in chordates.

Unit - I: Phylum Chordata and Prochrodates **- 12 hours.**

1. General characters of Phylum Chordata and classification
2. General characters of prochordates- Salient features of Hemichordata / Urochordata / Cephalochordata with one example each.
3. Amphioxus - Type Study - External features, Mode of feeding, Digestive system, excretory system, Nervous system, Sense organs, and Reproductive system.
4. Affinities of prochordates

Unit - II: Pisces and Amphibia **- 12 hours.**

1. General characters of Class Pisces and Amphibia.
2. Shark - Type study. External features, Digestive system, Respiratory system, Brain, Sense organs and Urino – genital system
3. Identification and Significance of any three local edible fishes.
4. Parental care in amphibia

Unit - III: Reptilia **- 12 hours.**

1. General characters of Class Reptilia. .
2. Identification of poisonous and non - poisonous snakes.
3. Biting mechanism of poisonous snake, Venoms of snake, first - aid and treatment for snake bite.
4. Extinction of dinosaurs-Classification of dinosaurs-causes of extinction

Unit: V: Aves **- 12 hours.**

1. General characters of Class Aves
2. Modification of beak and feet
3. Migration of birds.
4. Flight adaptations in birds.

Unit - V: Mammalia **- 12 hours.**

1. General characters of Class Mammalia.
2. Rabbit - Type study-Digestive system, Respiratory system, Brain and Sense organs and urinogenital system.
3. Dentition in mammals.
4. Adaptations of aquatic mammals

Reference and Text Books:

1) Alexander, R.MCN (1981) The Chordates – II International Edition - Cambridge University press, New Delhi.
2) Kent. C. George. – Comparative anatomy of Vertebrates. Mosby International Edition, Toppan printing, Japan, Library of Congress Catalogue, Card No: 65-15973.
3) Romer, R.S. & Parson.T.S., (1986) – The Vertebrate Body, VII Edition, W.B.Saunders, Philadelphia.
4) E.L.Jordon and P.S.Verma - .Chordate Zoology (2006 Reprint) Published by S.Chand and Co. 7361, Ram nagar, New Delhi- 110 055. ISBN: 81 – 219 -1839 -9.

B.Sc., Zoology Major. Part – IV Semester - II

Non Major Elective – II Ornamental Fish culture (2 Credits)

Contact hours per week: - 2 hours
Contact hours per semester: - 30 hours

(For non- biology students)

Objectives:

To enable the student to

1) Know the construction of fish tank,
2) Identify different types of ornamental fishes based on morphological characters,
3) Understand the preparation of live and artificial feed,
4) become familiar with different breeding methods and
5) gain knowledge about the common diseases of ornamental fishes.

Unit-1: -6 hours

Identification of popular Ornamental fishes:

Siamese fighting fish, Gold fish , Rosy barb, Jigee barb , Angel fish, Black molly, Guppy and Sword tail.

Unit -2: -6 hours

Construction of fish tank:

Size and Shape of fish tank, bottom settings, stocking of fish , Accessories of fish Tank - aerators, types of filters, nets, lights and hood.

Unit-3: -6 hours

Transport of fishes: Oxygen packing

Food and feeding: Culture of live food organisms- chironomous larva- tubifex.

Artificial feed - Pellet feed.

Unit -4: -6 hours

Breeding methods:

Siamese fighting fish, Gold fish, Black molly, Guppy and sword tail

Unit-5: -6 hours

Common diseases and treatment of ornamental fishes:

White spot diseases, Fungal diseases, Bacterial diseases, Dropsy diseases and ectoparasites.

TEXT BOOK:

1**. Manual of ornamental fishes and farming technologies**, Jameson J.D&R.santhanam, 1996,fisheries college & Research Institute, Tamilnadu, Veterinary & Animal sciences Tuticorin 1996

Reference:

1. **Manual of tropical fish diseases diagnosis**, Felix.S, sundaraj.v and S.Thilakar, Tamilnadu veterinary & Animal sciences University , Chennai. 1999.

2.Manual of Breeding & Larval rearing of cultivable fishes , Ramanthan .N and T.Francis, Tamilnadu Veteinary & Animal Sciences University, Chennai. 1996.

3.Manual of fresh water Aquaculture, Santhanam .R, Sukumaran.N and Natarajan.P, Oxford and IBH Publishing Co Pvt .Ltd., New Delhi 1990.

4.Manual of Aquatic Engineering , Sampathkumar J.S &Sundararaj.V. Tamilnadu Veteinary &Animal Sciences university Chennai 1996.

B.Sc., Zoology Major **Part - III** **Semester - II**

Core Paper-III Practical – I Invertebrata and Chordata (SZY8C2P) **(2 Credits)**

(To be done at the end of the Second semester)
Contact hours per week - 2 hours.
Contact hours per semester – 30 hours.

Objectives:
To develop the skill of the students in

i. Identifying animals and defining their systematic position
ii. Differentiating invertebrates with chordates.

DISSECTIONS:
Earthworm: Nervous System.
Cockroach: Digestive System and Nervous System.
Pila: Digestive system.
Frog: Arterial System and Venous System.
MOUNTINGS:
Earthworm: Body Setae
Cockroach: Trachea.
Honey bee: Mouth Parts
Pila: Radula
Shark: Placoid Scales
Frog: Brain
SPOTTERS:
Protozoa: Paramecium, Paramecium-conjugation, Euglena, Entamoeba, Plasmodium.
Porifera: Simple Sponge, Sponge-Gemmule, Sponge -Spicules
Coelenterata: Obelia colony, Obelia medusa, Aurelia, Physalia, Sea anemone.
Helminthes: Liver fluke, Redia larva, Cercaria larva, Ascaris (Male and Female)
Annelida: Earthworm, Nereis, Heteroneris, Chaetopterus, Leech
Arthropoda: Prawn, Zoea larva, Mysis larva, Peripatus, Centipede.
Mollusca: Pila, Fresh water mussel, Chiton, Sepia, Solen.
Echinodermata: Starfish, Sea-urchin, Sea-cucumber, Brittle Star, Bipinnaria larva.
Prochordata: Amphioxus, Amphioxus - T.S. through pharynx, Balanoglossus, Asidian.
Agnatha: Petromyzon.
Pisces: Narcine, Echeneis, Hippocampus, Eel, Catla. Tilapia.
Amphibian: Bufo, Rhacophorus, Ichthiophis. Salamander.
Reptilia: Poisonous Snakes: Cobra, Krait, and Viper.
Non -Poisonous Snakes: Dryophis and Ptyas.
Lizards- Chaemeleon and Draco.
Aves: Pectoral and Pelvic girdle of Pigeon, Archaeopteryx.
Mammals: Bat, Loris.

Practical - I Invertebrata and Chordata (SZY8A2P) (1 Credit)

(To be done at the end of the II Semester)

Contact hours per week - 2 hours.

Contact hours per semester - 30 hours.

Dissections:

Earth worm:

1. Nerve ring and nerve cord.
2. Body setae mounting.

Honey bee:

1.Mounting of mouth parts, and sting of Honey bee.

Frog:

1. Arterial system,
2. 2. Venous system and Mounting of Brain.

List of spotters:

Invertebrata:

1. **Protozoa**:

i) Amoeba, ii) Paramecium, iii) Euglena, and iv) plasmodium.

2. **Coelenterata:**

i) Hydra, ii) Obelia – Colony, ii) Obelia – Medusa, iv) Jelly fish, v) Sea anemone.

3. **Platy helminthes**:

i) Tape worm, ii) Liver fluke, iii) Redia, iv) Cercaria.

4. **Nematoda**:

i) Ascaris, ii) Wuchereria.

5. Annelida:

i) Nereis, ii) Earth worm, iii) Leech.

6. **Arthropoda**:

i) Honey bee – Queen, Drone, and workers. ii) Silk worm – Moth, Larva, and cocoon. iii) Paddy pest - Tryporyza, and Leptocorisa. iv) Coconut pest - Oryctes rhinoceros, and Nephantis.

7. **Mollusca**:

i) Pila, ii) Pearl oyster.

8. **Echinodermata**:

i) Star fish – oral and aboral view.

Chordata:

1. **Prochordata.**

i) Amphioxus, ii) Balanoglossus, and iii) Sea ascidians.

2. **Pisces**:

i) Any five edible fishes.

3. **Reptilia.**

i) Cobra, ii) Krait, iii) Viper, iv) Dryophis, v) Ptyas, vi) Eryx.

Osteology:

Rabbit: i) Skull, ii) Axis iii) Atlas, iv) Pectoral girdle, v) Pelvic girdle, vi) Fore limb, and vii) Hind limb.

B.Sc., Zoology Major. **Part – III** **Semester - III**

Core Paper - IV **Developmental biology (SZY8C31)** **(4 Credits)**

Contact hours per week - 4 hours

Contact hours per semester - 60 hours

Objectives

To enrich the knowledge of the students to

i. Learn about the formation of gametes.
ii. Study the menstrual cycle, infertility and test tube babies.
iii. Understand the organogenesis.
iv. Focus about Placentation and regeneration.
v. Know about the mechanism of fertilization and cleavage.

UNIT–I: **- 12 hours**

1. Definition - Phases of development.
2. Theories of development: Preformation, Epigenetic, Recapitulation and Germplasm theories.
3. Gametogenesis: Spermatogenesis- Types of Sperm, Oogenesis – Types of eggs and egg membranes. Structures of mammalian sperm and ovum.

UNIT–II: **- 12 hours**

1. Fertilization: Types, Process of fertilization: Chemotaxis, Fertilizin- antifertilizin reaction, Acrosomal reaction, cortical reaction, Amphimixis - Physiological and Biochemical changes- Significance.
2. Parthenogenesis: Types – Significances.
3. Cleavage: Definition, planes and patterns of cleavage, significance of cleavage, types of blastula, factors controlling cleavage and laws in cleavage – blastulation and gastrulation in Frog, Fate map in Frog.

UNIT–III: **- 12 hours**

1. Organogenesis: Development of Brain, Eye and Heart in Frog.
2. Extra-embryonic membranes in chick.
3. Placentation in Mammals: Definition, types, classification on the basis of morphology and histology; functions of placenta.

UNIT–IV **- 12 hours**

1. Organizer: Concept and process of induction.
2. Gradients: Child hypothesis, Double gradient theory, Biochemical gradients in sea-urchin eggs and their morphogenic importance. Factors affecting gradients.

3 Amphibian metamorphosis: Definition, Ecological, Morphological (Progressive and Regressive changes) and Physiological changes. Hormonal control.

4. Regeneration: Definition, Types, Regeneration of Salamander limbs. Factors affecting regeneration.

UNIT–V: - 12 hours

1. Human reproduction: Puberty, Menstrual cycle, Menopause, pregnancy , Parturation and lactation.
2. Birth Control: Contraception-Natural-Barrier or mechanical contraceptives, and methods of contraception.
3. Infertility: Methods to overcome; i) Intra uterine insemination (IUI), ii) Intra uterine Fertilization (IUF), and iii) Test tube baby method – merits and demerits.

Text Books :

1. Chordate Embryology, Verma S. and Agarwal V.K., (2000), S.Chand & Co., New Delhi.
2. Text Book of Embryology, Arumugam, N. A. (2008 Edition) Saras Publication, Kottar, Nagercoil.

Reference Books:

1. An Introduction to Embryology. Balinsky, B.I. 1981. W.B.Saunders Company, Philadelphia.
2. Developmental Biology, Berrill, N.J., 1986, McGraw Hill, New Delhi.
3. Foundations of Embryology, Patten, B.M., 1958, McGraw Hill, New York.
4. Developmental Biology – Patterns and Principles, Saunders, J.W., 1982 Macmillan, New York.
5. Developmental Biology, Browder L.W. Erickson C.A. & Williams, (1992) 3rd edition, R.J. Saunders College Publications, London.

B.Sc., Chemistry (Allied Zoology) Part - III Semester - III
Paper - III Microbiology, Cell biology, Genetics,
Molecular biology, and Biotechnology(SZY8A31) (4 Credits)

Contact hours per week - 4 hours.

Contact hours per semester - 60 hours.

Objectives:

To enable the students to

1. Structure of prokaryotic cell and morphology of bacteria
2. Structure and functions of the cell components
3. Mendel's laws
4. Hereditary diseases
5. Structure and functions of genetic materials
6. To learn about the applications of rDNA technology, stem cell culture, transgenesis, and DNA fingerprinting

Unit - I: Microbiology - 12 hours.

1. Structure of a prokaryotic cell (E.Coli).
2. Structure of T4 Phage.
3. Morphology of Bacteria i) coccus type: - Micrococcus, Diplococcus, Streptococcus, and Staphylococcus. ii) Bacillus type: - Micro bacillus, Diplobacillus, Streptobacillus, and Staphylobacillus. iii) Spirochetes, and iv) Comma shaped.
4. Bacterial and Viral disease - Gonorrhea and AIDS (Pathogenesis, Symptoms, Prevention, and Control).

Unit - II: **Cell biology**: **- 12 hours.**

Structure and functions of the following cell components:

1. Cell membrane
2. Mitochondria
3. Endoplasmic reticulum and Ribosomes
4. Golgi body

Unit - III: **Genetics**. **- 12 hours.**

1. Mendel's Laws – Mono and Dihybrid crosses.
2. Linkage and Crossing over
3. Multiple Allele and polygene inheritance
4. Sex linked inheritance in Man

Unit - IV: **Molecular biology**. **- 12 hours.**

1. Structure and functions of DNA.
2. Structure and functions of RNAs
   (t RNA, m RNA, and r RNA).
3. DNA replication.
4. Protein synthesis.

Unit - V: **Biotechnology**. **- 12 hours.**

1. Recombinant DNA -Construction and applications.
2. Stem Cell Culture- Methods and applications
3. Transgenic animals-Methods and applications
4. DNA finger printing-Methods and applications

B.Sc., Zoology Major Part - III Semester-III

Allied paper – I Plant Diversity (SBY8A11) (4 Credits)

Contact hours per week – 4 hours

Contact hours per Semester – 60 hours

OBJECTIVES

To enable the students to

i. understand the characters and life cycle of algae, fungi, bryophytes, pteridophytes and gymnosperms.
ii. know the economic importance of algae & fungi
iii. learn the various forms of non-vascular & vascular plants

Unit I – Algae **– 12 hours**

1. Introduction
2. General Characters
3. Structure and Life Cycle of the following:
   a) Oscillatoria b) Oedogonium c) Sargassum
4. Economic Importance of Algae

Unit II – Fungi **– 12 hours**

1. Introduction
2. General Characters
3. Structure and Life Cycle of the following:
   a) Aspergillus b) Puccinia
4. Economic Importance of Fungi

Unit III – Bryophytes **– 12 hours**

1. Introduction
2. General Characters
3. Structure and Life Cycle of Funaria

Unit IV – Pteridophytes **– 12 hours**

1. Introduction
2. General Characters
3. Structure and life cycle of Selaginella

Unit V – Gymnosperms **– 12 hours**

1. Introduction
2. General Characters
3. Structure and life cycle of Pinus

References

1. Cryptogamic Botany Vol. I & II – Smith, G.M.
2. Structure and Reproduction of Algae. Fritsch.
3. Pteridophyta – Rashid
4. Gymnosperms – Chopra
5. A Text Book of Gymnosperms – Venkatesvaralu
6. A Text Book of Algae – Vashista
7. Outlines of Botany – Narayanasamy & Rao

Contact hours per week - 4 hours
Contact hours per semester - 60 hours

Objectives

To provide basic knowledge about Cell Biology in
1 .Compound and electron microscopes.
2. Differentiating prokaryotic and eukaryotic cell.
3.Ultra structure of cell organelles
4.Various patterns of cell division

- 12 hours

Unit - I

1. Microscopy: Compound microscope and Electron Microscopes - Structure, Magnification, Resolution power and applications.
2. Cytological techniques: i) Fixation, types of fixation and fixatives. ii) Staining, Types of staining and Cyto-chemical staining methods. iii) Centrifugation, Ultra centrifuge, Sedimentation co-efficient.
3. Protoplasm: Structure, Protoplasm as a colloidal system, Different theories, Colloidal properties, Chemical nature and Biological properties.

Unit - II: **- 12 hours**

Ultra structure and functions of i)Plasma membrane, ii) Mitochondria, iii) Golgi apparatus, iv) Endoplasmic reticulum, and Ribosomes.

Unit - III: **- 12 hours**

Ultra structure and functions of i) Lysosomes, ii) Centrioles, iii) Nucleus iv) Nucleolus v) Chromosome and vi) Giant chromosomes.

Unit - IV: **- 12 hours**

i) Cell division: Cell cycle, Amitosis, Mitosis, and Meiosis. ii) Comparison between Mitosis and Meiosis. iii) Mitotic apparatus. iv) Synaptinemal complex and v) Genetic significance of Meiosis.

Unit – V: **- 12 hours**

1. Cancer: Definition, Characteristics, Properties, origin, sites of infection, Metastasis, Ill effects, Types, Causes, Diagnosis, Treatment and Oncogenes. 2. Molecular basis of aging and genes responsible for aging. 3. Stem cells: Occurrence, Concept, types, and application of Karyotypic techniques.

Reference and Text Books:

1.Cell biology - De Robertis, E.D.Nowinski, and Saez.(2001 reprint) WB Saunders Co, Philadelphia.

2. Cell biology -Ambrose E.J., and Dorothy M.E., (2002) ELBS Camlet press, Great Britain.
3. Cell and Molecular biology - De Robertis and De Robertis. (2004Reprint) WB Saunders Co, Philadelphia.
4. Molecular Biology – by David Freifelter (Second Edition – XV Reprint) 2005, Published by N.K.Mehra for Narosa publishing house, New Delhi – 110 002.
5. Molecular biology of Gene –by James D.Watson, Tunia A. Baker, Stephen P.Bell, Alexander Gann, Michel Lavine and Richard Losick, Low priced edition (2005) Published by Dorling Kindersly (India) Pvt. Ltd., 482, FIE, Patparganj, Delhi – 110 092.

B.Sc., Chemistry (Allied Zoology) Part - III Semester – IV

Paper - IV Developmental biology, Biochemistry, Physiology, Immunology, and Evolution (SZY8A41) (4 Credits)

Contact hours per week - 4 hours.
Contact hours per semester - 60 hours

Objectives

To enable the students to
1 .learn about the structure of sperm and ovum in frog
2. know the process of fertilization & cleavage
3. classification, structure and metabolism of carbohydrates, proteins and lipids
4 learn the mechanism of physiological systems
5. study the lymphoid organs

Unit - I: **Developmental biology:** **- 12 hours**

1. Structure of sperm and ovum in Frog.
2. Fertilization, Blastulation and Gastrulation in Frog.
3. Placentation in Mammals-Formation, Classification and functions
4. Test tube baby methods

Unit - II: **Biochemistry**. **- 12 hours**

1. Classification and structure of Carbohydrates.(Mono, Di, Polysaccharides with one example each).
2. Classification and structure of proteins with examples (primary, secondary, tertiary, and quaternary structure).
3. Classification and Structure of Lipids with examples.
4. Metabolism: Glycogenesis, Glycolysis, Deamination and Transamination-Beta oxidation

Unit - III: **Physiology** (Human) **- 12 hours**

1. Digestion of Carbohydrates, Protein, and Lipids.
2. Mechanism of respiration and Transport of gases
3. Structure of Nephron and Formation of urine
4. Structure of Neuron and conduction of impulse

Unit - IV: **Immunology**. **- 12 hours**

1. Types of Immunity (Innate and Acquired immunity).
2. Lymphoid organs (Primary and secondary)
3. Immunoglobulin – Types and structure.
4. Antigen – antibody reaction

Unit - V: **Evolution** **- 12 hours**

1. Lamarckism and De veries theory of Mutation
2. Darwin's theory and Modern synthetic theory
3. Speciation – Allopathic and Sympatric
4. Human Evolution-Fossils and Genomic studies only

References and Text Books:

1. Balinsky, B.I. 1981. An Introduction to Embryology. (2001) W.B.Saunders Company, Philadelphia.
2. Berrill, N.J., 1986, Developmental Biology, McGraw Hill, New Delhi.
3. Harper's Biochemistry, Robert. K. Murray., Daryl. K. Granner., Peter. A.Mayes., & Victor. W. Rodwell. (2004) Prentice Hall International, ISBN 0 – 8385 -3612 -3.
4. Elements of Biochemistry, (2006) H. S. Srivastava. Rastogi Publications, Meerut.
5. Biochemistry, Ambika Shanmugam., (2007) 10, III Cross Street, West C.I.T. Nagar, Chennai – 600 035.
6. Gordon, S.Maleon, et al., Animal Function – Principles and Adaptations. (2000) The Macmillan Company.
7. Hoar, S. William – General and Comparative Physiology,(2002) Prentice Hall of Indian Pvt Ltd, New Delhi.
8. Roitt, I.M. (2000) Essential Immunology, Blackwell Scientific Publishers
9. Kuby, J. (1999) Immunology W.H.Freeman and Company, New York
10. Evolution, Savage. (1998) Amerind Publishing Co., Pvt. Ltd., New Delhi.
11. An introduction to Evolution, Moody, P.A., (1997) Kalyani Publishers, Ludhiana.

B.Sc., Zoology Major. **Part - III** **Semester - IV**

PRACTICAL- II **(2 credit)**

DEVELOPMENTAL BIOLOGY & CELL BIOLOGY **(SZY8C4P)**

(To be done at the end of the Fourth Semester)

Contact hours per week - 2 hours.
Contact hours per semester - 30 hours
Contact hours per year - 60 hours

DEVELOPMENTAL BIOLOGY

Study the following prepared slides and Museum specimens.

1. Sections of testis and ovary showing the maturation stages of gametes (Mammalian)
2. Observation of egg and sperm (mammalian Sperm and ovum).
3. Early developmental stages of Frog: Cleavage, blastula, gastrula and neurula.
4. Different stages of chick embryo- 24 Hours, 48 Hours , 72 Hours and 96 Hours.
5. Placenta of Sheep / Man.

CELL BIOLOGY

1. Microcopy: Handling of dissection and compound microscopes.
2. Mounting buccal epithelium and observing living cells using vital staining
3. Mitosis in Onion root tip squash
4. Meiosis in grasshopper testis squash
5. Charts on- Mitochondria, Golgi apparatus, Endoplasmic reticulum, Ribosomes.

B.Sc., Chemistry (Allied Zoology) Part - III Semester - IV

Practical - II Microbiology, Cell biology, Genetics, Molecular biology, Biotechnology, Developmental biology, Biochemistry, Physiology, Immunology, and Evolution.(SZY8A4P) (1 Credit)

(To be done at the end of the IV Semester))

Contact hours per week - 2 hours.

Contact hours per semester - 30 hours.

List of Practicals:

1. Simple staining of non- pathogenic bacteria and observe the morphological structure.
2. Preparation of Onion root tip and observe the Mitotic stages.
3. Mendelian Monohybrid ratio with beads.
4. Self observation and recording of some common Mendelian traits.
5. Quantitative test for ammonia, urea, and uric acid.
6. Quantitative test for Carbohydrates, protein, and lipid.
7. Antigen – antibody reaction (in blood grouping)

List of Spotters:

1. Different morphological appearance of Bacteria.
2. Mitochondria, Golgi body, Endoplasmic reticulum, Lysosome and Ribosome.
3. Mitotic stages identification.
4. Meiotic stages identification.
5. Mendelian traits in Human population.
6. DNA – Model / paper cutting.
7. t RNA – Model / paper cutting.
8. Following stages of Frog embryo: i) Egg, ii) Sperm, iii) Blastula, iv) Gastrula.
9. Frog embryo – Section through optic cup.
10. Sheep placenta.
11. Paper cutting of zebra neck growth to explain Lamarckism.

B.Sc., Zoology Major **Part - III** **Semester-IV**
Allied paper – II Plant Ecology & Applied Botany (SBY8A21) (4 Credits)
Contact hours per week – 4 hours
Contact hours per Semester – 60 hours

OBJECTIVES

To enable the students to
i. understand the ecological groups of plant communities
ii. develop interest in knowing the bio-technological developments
iii. agree that no living creature is an isolated organism in the nature

Unit – I Ecology **– 12 hours**

1. Historical Account, Concepts & Terminologies.

2. Plant Adaptations
    a. Hydrophytes b. Xerophytes c. Halophytes
3. Vegetation of Tamilnadu.
4. Methods of studying vegetation – Quadrat and Transect.

Applied Botany

Unit II – Mushroom cultivation – 12 hours

Introduction – Nutritive value and Importance of mushrooms, cultivation of Button Mushroom – spawn preparation – preservation of Mushrooms.

Unit III - Plant Tissue Culture – 12 hours

Introduction – Application of plant tissue culture – Basic Tissue Culture Techniques.

Unit IV – Bio-fertilizers – 12 hours

Introduction – Symbiotic Nitrogen Fixers – Asymbiotic Nitrogen Fixers – Blue Green Algae – VAM Fungi – PO4 Solubilizers – Advantages of Biofertilizers.

Unit V – Farming – 12 hours

Organic Farming – Methods of Compost Preparation – Biodiesel – Production from Jatropha curcas.

References

1. Elements of Biotechnology – P.K.Gupta, - Rastogi & Co.
2. Economic Botany – Pandey, B.P. , - S.Chand & Co.
3. Textbook of Biotechnology – R.C. Dubey
4. Economic Botany – Hill
5. Mushroom cultivation and uses- B.C.Suman & V.P. Sharma – Agrobios(India)2005.
6. Plant Tissue Culture – Purohit – Agrobios(India)2005.
7. A Hand Book of Organic Farming – A.K.Sharma, Agrobios(India)2005.

B.Sc., Zoology Major **Part - III** **Semester-IV**

Allied Botany Practical Paper –I **(4 Credits)**

Plant Diversity, Plant Ecology and Applied Botany (SBY8A2P)

1. Micro Preparation of Plants mentioned in Plant Diversity part of the Syllabus.
2. Section Cuttings and Submission of Slides of – Selaginella and Pinus.
3. Spotters – Identification of Specimens or Slides from Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms included in the Syllabus.
4. Section Cutting and Mounting Plant Materials of Ecological Importance (such as .Leaves of Nerium, Bryophyllum, Nymphaea and other available materials)
5. Maintenance of Observation Note Book and Submission of the same during Practical Examination.

B.Sc., Botany Allied Practical Question Pattern

Paper I – Plant Diversity, Plant Ecology & Applied Botany **Paper Code – SBY8A2P**

Time: 3Hrs. **Max. Marks: 100**

1. Take T.S. of **Specimen "A".** Identify, Draw Labeled Sketch giving Reasons. Submit slide for Valuation. **10 Marks.**
2. Make Suitable **Micro Preparation** of **"B" and "C".** Identify, Draw Labeled Sketch giving Reasons. Submit slide for Valuation. **2x10=20 Marks.**
3. Identify, Draw Sketches and Write Notes of **Spotters D, E, F, G, H, I, J and K**. **8X5=40Marks.**
4. Comment on the **Ecological Adaptations** of the plant **"L" and "M". 2x5=10Marks.**
5. **Observation Note Book**. **20Marks.**

(Note: Scale Down to 60 Marks)

Key for Botany Ancillary Practical - I

1. A – Angiosperm material – Stem, Leaf of Hydrophytes or Xerophytes prescribed in the syllabus (Slide =5, Diagram = 2 and Description = 3)
2. (B&C) Vegetative material from Plant Diversity (Pteridophytes and Gymnosperm) for each material (Slide = 5, Diagram = 2 and Description = 3)
3. E, F, G, H and I (Permanent slides or museum specimens of Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms). J & K – Applied Botany (for each one Identification = 1, Diagram = 2 and Description = 2)
4. L & M – Xerophytes or Hydrophytes or a Mangrove plant or plant part (Identification = 1, Diagram = 2 and Description = 2)
5. Observation Note Book – 20 Marks

B.Sc., Zoology Major **Part -III** **Semester-V**

Core Paper - VII **Ecology (SZY8C51)** **(4 Credits)**

Contact hours per week - 4 hours

Contact hours per semester -60 hours

Objectives

To enable the students to

1) Understand the importance of environmental factors
2) Realize the characteristics of populations and community
3) Know the concepts and dynamics of ecosystem
4) Study the types of habits and animals inhabiting and
5) Learn the values of biodiversity and their conservation.

Unit-I Physico –Chemical factors (12 hours)

Light: Spectra, light on Land, Light in water, Biological effects of Light – (effect on metabolism, reproduction, development and pigmentation only).

Temperature: Range, Diurnal variation, thermal stratification and Biological effects. (Effects on temperature on metabolism, Reproduction, development and morphology only)

Medium & Substratum:

Air as a medium for the living organisms. Soil profile, soil fauna and adaptation of soil animals.

Role of salt content, Temperature & O_2 in fresh water, estuarine and marine water.

Unit-II: Habitat (12 hours)

Terrestrial habitat: Characteristics, ecological classification of Land, their fauna, and their adaptation.

Fresh water: Thermal stratification, types of ponds and pond fauna.

Marine habitat: Characteristics, stratification, planktonic, muddy shore and deep sea adaptations.

Estuarine habitat: Estuarine fauna and their adaptations.

Unit-III Population Ecology: (12 hours)

Types, density and estimation, natality, mortality, age distribution, growth pattern, fluctuation and equilibrium. Dispersal and distribution. Regulation of population.

Animal Relationship: Intra specific Inter specific relationship-neutralism, mutualism, commensalism, parasitism, predation and competition.

Unit-IV: Community Ecology (12 hours)

Definition, characteristics, diversity - dominance, stratification, periodicity, ecotone and edge effect. Ecological niche, equivalence and ecological succession.

Ecosystem: Definition-components-food chain and its types. Food web-ecological pyramids – Biogeochemical cycles - carbon, phosphorous and nitrogen cycles.

Unit-V: Pollution and Pollution and Social issues (12 hours)

Pollution: - Causes, effects and control measures of air pollution, Water pollution, nuclear and thermal pollution. Climate change, Green house effect and global warming, acid rain, ozone layer depletion, Bhopal episode, stone leprosy in Taj mahal and minimata disease.

Solid waste management, rain water harvesting disaster management. Wild life conservation-Biological clocks and rhythms and application of remote sensing.

Text Books:

Environmental Biology - P.D.Sharma (2006) Published by Rastogi publications, GanapathiShivaji road, Meerut – 250002.

Concepts of Ecology - N.Arumugam (2007) Published by Saras publications, Kottar, Nagercoil.

Reference Books:

1. Fundamentals of Ecology, Odum.E.P. (1985 Edition) Published by W.B.Saunders Publishers, Philadelphia.

2. Fundamentals of Ecology (1996 Reprint) by M.C.Dash, Published by Tata Mc Craw Hill Publishing Co., Ltd, New Delhi 110 002. ISBN: O – 07 – 460103 – 2.

Core Paper - VIII **Microbiology (SZY8C52)** **(4 Credits)**

Contact hours per week - 4 hours
Contact hours per semester - 60 hours

Objectives:

To enhance the knowledge of the students in

i. Preliminary techniques in microbiology.
ii. Food microbiology.
iii. Medical Microbiology.
iv. Agriculture Microbiology.

Unit - I: Basics of Microbiology **-12 hours**

1. Preparation of Nutrient agar, Broth, Slant and Stab.
2. Sterilization: i) Dry heat, ii) Moist heat, iii) Filtration, and iv) Radiation.
3. Pure culture techniques: i) Types of culture medium.
ii) Bacterial culture in Spread plate, Pour plate, and Streak plate and Serial dilution methods.
4. Bacterial growth: i) Growth curve, ii) Phases of growth, and iii) Factors affecting growth.
5. Gram staining Technique.

Unit - II: **Prokaryotes** **- 12 hours**

1.Structure of a prokaryotic cell (E.Coli),
2.Prokaryotic Cell components: (Structure and functions)
i) Capsule, ii) Cell wall - Gram positive and Gram negative difference,
iii) Outer and inner membrane, iv) Mesosome, v) Ribosome, vi)Nucleoid, and vii) Plasmids.
3.Structure of Bacteriophage - T4 Phage.

Unit - III: Food Microbiology **- 12 hours**

1.Food as a medium for the growth of Microorganisms.
2. Microorganisms and food spoilage.
3. Food borne infections.
4. Food borne intoxication.
5. Principles and Methods of food preservation.
i) Asepsis, ii) Removal of micro-organisms. iii) Maintenance of anaerobic conditions.
vi) Preservation at high and low temperatures. v) Preservation by drying, vi) Chemical preservation and vii) Irradiation.

Unit – IV: Medical Microbiology - 12 hours

1. Infections – Types, Methods of transmission of infections, Sources of infections, and Nosocomial infections.

2. Bacterial Infections - Transmission, Diagnosis, Clinical symptoms, and Treatment for Tuberculosis, and Gonorrhea.

3. Viral infections - AIDS, Polio myelitis.

4. Fungal infections - Candidasis, Dermatophytids

5. Antibiotics - Penicillin, Cephalosporin, and Tetracycline.

Unit – V: Agriculture Microbiology - 12 hours

1. Symbiotic nitrogen fixation: Rhizobium – Host specificity, root nodulation, and Mechanism.

2. Non - symbiotic nitrogen fixation: Azotobacter, Azospirillum, and Blue green algae – Preparation of inoculums, field application and crop response.

3. Bio – manure:Azolla – Mass cultivation, field application, and crop response.

4. Mycorrhizae – Ecto and Endo mycorrhizae, Role of Mycorrhizae in Agriculture.

Text Books:

1. A Text book of Microbiology. 1995, Chakaraborty. P New Central Book Agency Pvt Ltd., Calcutta.
2. Microbiology – Principles and explorations. - Black.J. (1999).Printice Hall International Inc, New Jersey.
3. Biology of Microorganisms - Madigan.M, Martinko.J, and Parker.J, (2005) Printice Hall International Inc, New Jersey.
4. Microbiology - Prescott.L. Harley. and Klein. (2004) Wmc Brown McGraw Hill Publications.
5. Ananthanarayanan, R., and C.K. JayaramPaniker, 1994: Text book of Microbiology, V Edition, Orient Longman.
6. Chakaraborty. P., 1995, A text book of Microbiology. New Central Book Agency PvtLtd.Calcutta.
7. Adams. M.R., and Moss, M.D., 1995, Food Microbiology, New Age International Ltd.

B.Sc., Zoology Major. Part – III Semester – V

Core Paper - XI Genetics & Molecular biology (SZY8C53) (4 Credits)

Contact classes per week - 4 hours.

Contact classes per Semester - 60 hours.

Objectives:

To enhance the knowledge of the students in

1. Principles of genetics.
2. Chromosomal and Gene mutations.
3. Hereditary diseases
4. Structure and functions of genetic materials
5. Molecular mechanisms of gene regulation in prokaryotes

UNIT - I: **- 12 hours.**

1. Mendelian Principle: Mendel and his experiments and the laws of inheritance:
Monohybrid cross and Dyhybrid cross in pea , Law of Segregation, Law of Independent Assortment, back cross and test cross.
2. Gene interactions: Complementary genes: Flower colour in sweet peas, Epistasis: Plumage colour in poultry. Supplementary genes: Coat colour in mice.
3. Multiple alleles: ABO Blood groups and Rh factor in Human beings.
4. Multiple factors: Skin colour in Human beings.

UNIT–II: **- 12 hours.**

1. Sex determination: Chromosomal theory of sex determination- XX-XY, XX-XO, ZW-ZZ, ZO-ZZ types, Genic balance theory of Bridges, Environment and Sex determination, Hormonal control of sex determination (free martin).
2. Linkage and Crossing Over: Coupling and repulsion hypothesis, Linkage in Drosophila- Linkage groups, Crossing over in Drosophila - Mechanism of crossing over - Types of crossing over, Sex Linkage: Sex-linkage in Man (Hemophilia and Colour blindness).
3. Chromosomal aberrations: Structural: Deletions, Duplications, Translocations and Inversions, Numerical: Euploidy (Monoploidy, Polyploidy), Aneuploidy (Monosomes, Nullisomes and Trisomes).
4. Extra Chromosomal Inheritance: Kappa particles in Paramecium, Plastid inheritance in Mirabilis.

UNIT–III: **- 12 hours.**

1 Human Chromosomes: Normal human karyotype, inherited disorders: Allosomal (Klinefelter's syndrome and Turner’s syndrome), Autosomal (Down syndrome).
2. Mendelian Traits: Strait hair, Curly hair, Widow’s peak, Dimpled Cheeks, Mid digital hair, Hitchhiker’s thumb, Clasping of hands, and Hypertrichosis.
3. Pedigree studies: Symbols used in pedigree analysis- Pedigree analysis of important genetic disease like Hemophilia.
4. Eugenics: Positive and Negative- Euthenics and Genetic Counseling.
5. Genetics and Society: Human genome project.

UNIT–1V: **- 12 hours.**

1. Nucleic Acids: DNA Structure, Types and Replication - RNA Types and Structure.

2. Chemical basis of Heredity: Experimental Proof of DNA and RNA as genetic material.
3. Gene Mutation: Types of gene mutations – substitution, insertion and deletion
4. Genetics of Bacteria: Recombination in bacteria: Transformation, Conjugation, Transduction and Sexduction.

UNIT–V: - 12 hours.

1. Genetic Code: Features of genetic code.
2. Gene Action: Protein synthesis – Transcription and Translation in Prokaryotes.
3. Regulation of Gene expression: Regulation of Gene expression in Prokaryotes – Operon concept (Lac Operon).
4. Insertional elements and transposons: Transposable elements in Maize and Drosophila

Text Books

1. Genetics, Verma, P.S. and Agarwal, V.K. 2005, S.Chand & Co, New Delhi.
2. Genetics by P.K. Gupta, 3rd Edition, (2006 Reprint) Rastogi Publications, Meerut.

Reference Books.

1. Principles of Genetics (VIII Edition) by Eldon John Gardener, Michael J.Simmons, D.Peter Snustad (2006) Published by John Wiley & Sons Inc., Canada. (2005 Reprint) 3rd Edition, John Wiley & Sons Publications, New York.
2. Theory and Problems of Genetics – W.D. Stansfield (Schum's Outline Series) McGraw hill Publication, latest Edition 2002.
3. Molecular biology of Gene –by James D.Watson, Tunia A. Baker, Stephen P.Bell, Alexander Gann, Michel Lavine and Richard Losick, Low priced edition (2005) Published by Dorling Kindersly (India) Pvt. Ltd., 482, FIE, Patparganj, Delhi – 110 092.
4. Essentials of Human Genetics by S.M. Bhatnagar et al, 4th Edition, (1999), Orient Longman.
5. Principles of Genetics by Robert H. Tamarin, Seventh Edition. Tata Mc-Graw Hill, India, 2002 Edition.
6. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt. Ltd., New Delhi.
7. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.
8. Principles of Gene – Manipulation of Genomics –by S.A.Primrose and R.M.Twyman, (VII Edition) 2006, T.J.International, Padstow, Cornwall, U.K.
9. Genetics – by Monroe W. Stick Berger – III Edition (1999) – Published by Prentice Hall of India Pvt. Ltd., New Delhi – 110 001.

B.Sc., Zoology Major **Part - III** **Semester-V**
Allied paper – III **(4Credits)**

Plant Taxonomy, Embryology of Angiosperms and Medicinal Botany (SBY8A31)

Contact hours per week – 4 hours
Contact hours per Semester – 60 hours

OBJECTIVES

To enable the students to

i. understand the Taxonomical Concepts
ii. develop interest in Conservation of Medicinal plants
iii. understand the concept of embryology

Unit I – Classification & Families **– 12 hours**

Bentham & Hooker Systems of Classification
Study of the following Families and their Economic Importance.

1. Nymphaeceae 2. Caesalpiniaceae 3. Rutaceae

Unit II – Families **– 12 hours**

1. Asclepiadaceae 2. Lamiaceae 3.Euphorbiaceae 4. Poaceae

Unit III – Medicinal Botany **– 12 hours**

The Systematic Position – Description of the Individual Plant, Morphology of Useful Parts – Curative Properties of the following plants

1. Aegle marmelos – Rutaceae
2. Azadirachta indica – Meliaceae
3. Ocimum sanctum – Lamiaceae

Unit IV – Medicinal Botany **– 12 hours**

1. Coriandrum sativum – Apiaceae
2. Phyllanthus amaras – Euphorbiaceae
3. Gloriosa superba – Liliaceae

Unit V – Embryology of Angiosperms **– 12 hours**

1. Structure and Development of Anther & Male Gametophyte
2. Structure and Types of Ovules
3. Embryosac – Polygonum Type – Structure and Development.

References

1. A Text Book of Systematic Botany – R.K.Gupta, - Atmaram & Sons, Delhi.
2. Outlines of Botany – R.N.Narayanaswami & K.N. Rao.
3. Economic Botany – B.P.Pandey – Chand & Co.
4. Text Book of Pharmacognosy – T.E. Wallis, CBS Publishers & Distributors, Delhi.
5. Pharmacognosy – K.R. Arumugam & N. Murugesh – Sathya Publishers.
6. Herbs Cultivation and Medicinal Uses – H. Panda, NIR Publication, Delhi.
7. Indigenous Drugs of India – R.N. Chopra – Academic Publishers,1994.
8. Flora of the Presidency of Madras – Gamble et.al. 3 Volumes.
9. Economic Botany – Albert, F.Hill, Tata Mc. Graw-Hill Publishing Co. Ltd., NewDelhi.

B.Sc., Zoology Major. **Part - IV** **Semester – V**

Skill Based Subject Paper: V **Poultry Science** **(2 Credits)**

Contact hours per week - 2 hours.
Contact hours per semester - 30 hours.

Objectives:

1. It is a job oriented course, deals with
2. Poultry Breeds and its importance
3. Infra structure of poultry farming.
4. Poultry management.

Unit – I: **- 6 hours.**

1. Choosing commercial layers and Broilers.
2. Poultry housing.
3. The deep litter system.
4. Cage rearing.

Unit – II: **- 6 hours.**

1. Practical aspects of Chick rearing.
2. Management of layers.
3. Management of broilers.

Unit – III: **- 6 hours.**

1. Lighting.
2. Summer management.
3. Winter management.
4. Debeaking.

Unit – IV: **- 6 hours.**

1. Non – nutritive feed additives.
2. Feed stuff for Poultry.
3. Feed formulation.

Unit – V: **- 6 hours.**

1. Viral, Bacterial and Fungal diseases (any one in each)
2. Parasitic diseases (any two).
3. Vaccination Programme.

Text book:

Modern aspects of commercial Poultry Keeping: M.R.Gnanamani, Ninth Edition, Jan – 2003. Giri Publication, Alwar nagar, Nagamalai, Madurai – 19, Tamilnadu.

References:

1. **Poultry Keeping in India**, Naidu.P.M.N, Indian council of Agriculturalresearch, New Delhi.

2. **Nutrition of the Chicken**. Scott. M.L., Nesmehi.M.C, and R.J.Young., New York.

3. **Poultry production**, Singh.R.A, New Delhi.

B.Sc., Zoology Major **Part – III** **Semester –VI**

Core Paper - X **Biotechnology (SZY8C61)** **(4 Credits)**

Contact hours per week - 4 hours

Contact hours per semester - 60 hours

Objectives:

To provide basic knowledge about biotechnology for the students

1.In understanding about biotechnology and genetic engineering.
2.To study about various tools in genetic engineering
3.To provide basic knowledge about cloning
4.To learn about the applications of animal, plant, industrial and environmental biotechnology

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Unit – I: Recombinant DNA Technology: - 12 Hours.

1. Tools for Gene cloning:

i) DNA manipulative enzymes: Restriction enzymes and DNA ligases.

ii) Gene cloning vectors: Plasmids, Bacteriophage (Lambda) and Cosmids.

2. Major steps involved in cloning of human insulin gene.

3. Molecular biology techniques:

i) Microinjection

ii) Electroporation,

iii) Polymerase chain reaction (PCR).

iv) Blotting techniques: Southern and Northern blots.

Unit – II: **Application of r-DNA technique in Human health - 12 Hours.**

1. Recombinant DNA proteins and their uses:

i) Interferon, ii) Interleukin, iii) Factor VIII, and iv) Urokinase

v) Tissue plasminogen activator.

2. Recombinant vaccines: Hepatitis-B and Rabies and FMD Vaccine.

3. Commercial production of Penicillin.

4. DNA finger printing and its use in Forensic science.

Unit - III: **Animal Biotechnology**: **- 12 hours.**

1. Hybridoma technology: Production and Applications of monoclonal antibodies.

2. Cloning of animals: Methods and uses.

3. Transgenic Animals: Transgenic fish and sheep.

4. Production of Elite cows.

5. Human genome project- basic knowledge only.

Unit – IV: **Plant Biotechnology:** **- 12 hours**.

1. Plant tissue culture: Applications of plant tissue culture.
2. Protoplast culture: Protoplast fusion methods and uses.
3. Transgenic plants: Technique of transformation – Agrobacterium mediated and physical methods (electroporation). Applications of transgenic plants.
4. Bio-pesticides: Bt toxins- Transgenic "Killer cotton".

Unit – V: **Environmental and Industrial Biotechnology** **-12 hours.**

1. Super Bug to control oil pollution.
2. Single cell proteins (SCP): Technique of mass culture of Algae – Spirulina.
3. Enzyme immobilization: Methods and advantages.
4. Bio-electronics:

i) Biosensors: Principle and Applications of Glucose Biosensor only.

ii) Biochips: Principle and uses.

5. Bioinformatics- basic knowledge only.

Text book:

Text book of Biotechnology. Dubey, R.C.1995. S.chand & co., New Delhi.

Reference books:

1. **DNA Technology** – Alacama, L.D., 1996, The Awesome skill, WCB, Dubuque, I. A. ISBN. 0 – 697- 21248 – 3.

2. **Modern Biotechnology**, Primrose, S.B., 1987, Blackwell Scientific Pub., London. ISBN 0 – 632 – 01764 – 3.

3. **Principles of Gene manipulation**, Primrose, S.B., R.Y.Twyman., and R.W.Old., 2001, Blackwell Scientific Pub., London, ISBN O – 632 – 059540.

4. **Gene Cloning and DNA Analysis an introduction**, T.A.Brown., (2005) IV Edition, Blackwell Scientific Pub., London, ISBN 0 – 632 – 05901. 5. **Principles and applications of Recombinant DNA**, Bernard, R. Glick., & Jack. J. Pasternak., (2003) III Edition, AMS Press Washington. ISBN 15581 – 224 – 4.

B.Sc, Zoology Major **Part-III** **Semester - VI**

Core Paper-XI **Biochemistry and Physiology (SZY8C62)** **(4 credits)**

Contact hours per week - 4 hours
Contact hours per semester - 60 hours

Objectives:

To enhance the knowledge of the students in

1. Understanding the nature, structure and classification of biological molecules.
2. .To have a clear knowledge about the mechanism of enzyme action.
3. Understanding the various metabolic reactions.Make students to know about the mechanism of various activities in animals and man.
4. Nutrition, malnutrition and digeson.
5. Respiration, excretion and blood circulation.

Unit – I **- 12 hours**

1. Biochemical techniques: pH metry, Paper Chromatography and Spectrophotometry.
2. Carbohydrate: Outline classification- Structure of Monosaccharide (Glucose) Disaccharide (Sucrose) and Polysaccharide (Starch)
3. Protein: Structure and Classification
4. Lipid: Structure and Classification

Unit - II **- 12 hours**

1. Enzymes: Classification, Mechanism of enzyme action and factors affecting enzyme action
2. Vitamins: Structure and function of Fat and Water soluble vitamins

Unit – III **- 12 hours**

1. Digestion: Physicochemical process of digestion and absorption of Carbohydrates, Proteins and Lipids
2. Circulation: Mechanism of Heart beat, Pace Makers, EGC, Blood Pressure and Blood Coagulation.
3. Respiration: Respiratory pigments-Transport of Oxygen and Carbon di oxide-Respiratory Quotient-Mechanism of pulmonary respiration.
4. Excretion: Structure of nephron and formation of Urine.

Unit – IV **- 12 hours**

1. Muscle Physiology: Ultra structure of muscle-Theories of muscle contraction
2. Nerve physiology: Ultra structure of neuron-physiology of nerve coordination
3. Reflex Action: Definition – Reflex arc
4. Receptor Physiology: Physiology of vision and hearing in man

Unit – V **- 12 hours**

1. Osmoregulation in Crustaceans and teleost fish.
2. Thermoregulation: Poiklotherms and Homeotherms.
3. Hormonal function: Pituitary, Thyroid, Parathyroid, Adrenal, Islets of Langerhans and Testes & Ovary.
4. Chronobiology: Characteristics of Circadian rhythm-examples.

References:

1.Principles of Biochemistry, **Lenninger, (2001)** Nelson & Co., CBS Publishers &Distributors, Delhi – 110 032. CBS ISBN, 81 – 239 – 0295 -6.

2. Text Book of Physiology and Biochemistry. **Bell**, **Davidson and Scarborough**. (2005) ELBS &E & S – Livingstone. ISBN 443 00691 – 1

3. Biochemistry, **Ambika Shanmugam**., (2007) 10, III Cross Street, West C.I.T. Nagar, Chennai – 600 035.

4. Animal Function – Principles and Adaptations. **Gordon, S.Maleon**, et al., (2005) The Macmillan Company.

5. General, Comparative Physiology, **Hoar, S. William** – (2004) Prentice Hall of Indian Pvt Ltd, New Delhi.

B.Sc., Zoology Major. **Part – III** **Semester – VI**

Core Paper – XII **Evolution (SZY8C63)** **(4 Credits)**

Contact classes per week - 4 hours.

Contact classes per Semester - 60 hours.

Objectives:

To enable the students to

1. get an idea about origin of life and organic evolution
2. understand the theories on evolution
3. know the mechanism of evolution
4. learn the different levels of evolution and
5. realize the importance of fossils in the study of evolution

Unit – I: **- 12 hour.**

1. Origin of life: Abiogenesis, Biogenesis, Cosmic theory, Biochemical origin of life - Coacervatives, and Microspheres, Urey - Miller experiment.

2. Evidences:

i) Morphological evidences - Homologous, Analogous, Vestigial structures, Atavism and connecting link - Peripatus and lung fishes.

ii) Embryological evidences .

iii) Biochemical evidences and

iv) Paleontological evidences.

Unit – II: **- 12 hours.**

1. Lamarckism and Neo – Lamarckism.
2. Darwinism and Neo – Darwinism.
3. Supplementary theories of Darwin - Sexual selection theory, Artificial selection theory, and Theory of Pangenesis.
4. HMS Beagle, Galapagos island, and Darwin's Finches.
5. Mutation theory of De Vries.
6. Modern mutation theory and
7. Modern synthetic theory.

Unit – III: **- 12 hours.**

1. Microevolution: Evolutionary forces, Mechanism with examples, Adaptive colouration, Mimicry - Batesian and Mullerian mimicries and their significances in evolution, Co-evolution.
2. Macroevolution: Elementary forces and Mechanism with example.
3. Convergent and Divergent evolution.
4. Parallel evolution. and
5. Adaptive radiation.

Unit – IV: **- 12 hours.**

1. Sources of Variation.
2. Hardy – Weinberg Law and Evolution.
3. Isolation - Isolating mechanism, and role of isolation in Speciation.
4. Species concepts, Mechanism of Allopatric and Sympatric speciation.

Unit – V: **- 12hours.**

1. Fossils: Types, Methods of Fossilization, Methods of dating fossils. Geological time table.
2. Horse evolution – Trends, Fossil records, Orthogenesis.
3. Human evolution – Fossil records, Cultural evolution, and future evolution of Man.

Text and Reference Books:

1. Organic Evolution, Rastogi, V.B., (2003) Kedar Nath and Ram Nath, Meerat.
2. Process of Organic Evolution, Stabbins.
3. Animal Species and Evolution, Mayr, E.
4. Evolution, Savage. Amerind Publishing Co., Pvt. Ltd., New Delhi.
5. An introduction to Evolution, Moody, P.A., Kalyani Publishers, Ludhiana.
6. Major features of Evolution, Simpson, G.G.,
7. Evolution, Dobzhansky, Ayala, Stebbin, and Valentine.
8. The Vertebrate story, Romer., A.S.
9. Evolution, Genetics and Man, Dobzhansky, Oxford and IBH Publishing Co., New Delhi.

B.Sc., Zoology Major **Part - IV** **Semester – VI**

Skill based Elective paper: VI Economic Entomology (2 Credits)
Contact hours per week - 2 hours.
Contact hours per semester - 30 hours.

Objectives:
To enable the students to

1. Know the insect development and metamorphosis
   become aware of the control methods against insect pests
2. Know the principles and methods of biological and integrated methods of pest control
3. Understand the significance of agricultural and medical entomology

Unit – I: **- 6 hours.**
Insect development and metamorphosis: Types, Larval and Pupal types

Unit – II: **Beneficial insects**: **- 6 hours.**

i) Apiculture – Biology, production and uses.
ii) ii) Sericulture - Biology, production and uses.

Unit – III: **Helpful insects**: **- 6 hours.**

Scavenger, Pollinators, Predators, and Parasites effecting biological control.

Unit – IV: **- 6 hours**

Principles and Methods of Pest control – Physical, Chemical, Mechanical, Biological, and recent integrated control methods (Integrated pest management).

Unit – V: **- 6 hours.**

Medical Entomology:
House holds insect pests and their control measures.
Disease causing vectors: House fly, Mosquito, Lice. Tsetse fly, - Life cycle, diseases transmitted and their control measures.

References:

1. Hand book of Economic Entomology for South India – T.V.Ramakrishna Ayyar.
2. Agricultural insect pests of the tropics and their control.1975, Dennis Hill.
3. Destructive and Useful insects. IV Edition (1998) – Metcalf. Flint & Metcalf.
4. Agricultural Entomology: ICAR, New Delhi.
5. Text book of Economic Entomology. Vasantha Raj David.
6. Text book of Entomology – M.S. Moni.

B.Sc., Zoology Major. **Part - III** **Semester - VI**

Paper: 13 **PRACTICAL –III** **(5 Credits)**

BIOCHEMISTRY & ECOLOGY (SZY8C6P)

(To be done at the end of the Sixth Semester)

Contact hours per week - 2 hours.
Contact hours per semester - 30 hours

BIOCHEMISTRY:

1. Qualitative analysis of protein, carbohydrates and lipids.
2. Instrumentation: Principle and uses of
   i) pH meter
   ii) Electrophoresis – Paper Electrophoresis.
   iii) Chromatography – Paper Chromatography.
   iv) Spectrophotometer / Colorimeter
   v) Centrifuges.

ECOLOGY:

1. Estimation of Dissolved oxygen in water samples.
2. Plankton Mounting - Fresh water and marine planktons.
3. Study of abiotic factors in aquatic environment – Dissolved oxygen, pH and turbidity.
4. Examples illustrating animal association.
5. Food chain and food web in a pond Ecosystem.
6. Adaptations:

i) Parasitic adaptations – Ascaris, Taenia soloium & Saculina.
   ii) Flight adaptations – Birds and Bat
   iii) Aquatic adaptations – Aquatic mammals (Model or paper cuttings)
iv) Burrowing adaptations – Rat / Pangolin

B.Sc., Zoology Major. Part - III Semester - VI Paper – 14

PRACTICAL- IV SZY8C6Q (5 Credits)

GENETICS AND MOLECULAR BIOLOGY& MICROBIOLOGY

(To be done at the end of the Sixth Semester)

Contact hours per week - 3 hours.

Contact hours per semester - 45 hours

GENETICS AND MOLECULAR BIOLOGY:

1. Study of Mendelian traits in Man.
2. Human blood grouping
3. Study of Abnormal Karyotypes – Down syndrome (Autosomal). Turner syndrome and Klinefelter syndrome (sex chromosomal) (Pictures).
4. Pedigree analysis: Symbols used in sex chromosomal (x linked) disorders.
5. DNA and RNA models
6. Charts on – Conjugation, Transformation and Transduction

MICROBIOLOGY:

1. Gram staining.
2. Isolation of bacteria from soil and water.
3. Pure culture technique:
    i. Streak method
    ii. Pour plate method
    iii. Spread plate method.
    iv. Serial dilution method.
4. Clinical analysis of the following Bacterial Diseases: Tuberculosis and Gonorrhea.
5. Symbiotic nitrogen fixation in Rhizobium.
6. Non - Symbiotic nitrogen fixation in Azotobacter.
7. Biomanure: Azolla.

B.Sc., Zoology Major **Part - III** **Semester-VI Allied**

Botany Paper – IV **Plant Physiology and Horticulture** **(4 Credits)**

OBJECTIVES

To enable the students to

i. understand the life process happening inside plants

ii. appreciate that only plants capture light energy and convert it into chemical energy.

iv. practice the methods of vegetative propagation

Unit I - Plant Physiology – 12 hours

Absorption of Water – Transpiration – Ascent of Sap (Dixon's Cohesion Theory) – Photosynthesis – Structure and Function of Chloroplast – Light and Dark Reactions.

Unit II – Respiration – 12 hours

Structure and Function of Mitochondria – Glycolysis and Kreb's Cycle.

Plant Growth Hormones – Auxins, Gibberellins, Cytokinins, Abscisic Acid and Ethylene .

Unit III – Horticulture – 12 hours

Introduction – Basic Requirements – Kinds of Manures – Methods of Vegetative Propagations – Cuttage, Layerage and Graftage.

Unit IV – Planning and Layout – 12 hours

Planning and Layout of Kitchen Garden – Planning and Layout of Orchards – Indoor Gardening – Hanging Pots.

Unit V – Art and Storage – 12 hours

Bonsai, Rockery and Methods of Storage of Fruits.

References

1. Introduction to Horticulture – N.Kumar – Rajalakshmi Publications, Nagercoil.
2. Hand Book of Horticulture – K.L.Chandha – ICAR , New Delhi.
3. Text Book of Horticulture – K.M.Rao – Mac Millan India Ltd., New Delhi.
4. Plant Physiology – Rao – Chand&Co.
5. Complete Home Gardening – S.C Dey, Agrobios(India)
6. Plant Hormones Action and Applications – Rajan – Agrobios(India)

B.Sc., Zoology Major **Part - III** **Semester-VI**

Allied Botany Practical paper –II **(4 Credits)**

Taxonomy, Embryology of Angiosperms, Medicinal Botany, Plant Physiology and Horticulture (SBY8A4P)

1. To make dissections using dissection microscope of the floral parts of Angiospermic plants and to make drawing to bring out the salient features (floral diagram also expected) to learn to mount the floral parts on a given slide.
2. To assign the given plants to its natural order giving reasons.
3. To describe plants in Technical Terms.
4. Identification of Medicinal Plants and record their morphological features.
5. Identification of sections of anther and ovule.
6. Propagation methods of Horticulture plants – Cuttage, Layerage and Graftage.
7. Demonstration of techniques of Horticulture.
8. To describe simple setups in plants physiology (Evolution of Oxygen during Photosynthesis, Light Screen Experiment, Mohl's Half Leaf Experiment).
9. To maintain an observation notebook and to submit it for external valuation.

B.Sc., Botany Allied Practical Question Pattern

Paper II - Taxonomy, Embryology of Angiosperms, Medicinal Botany, Plant Physiology and Horticulture

Paper Code – SBY8A4P **Time: 3 Hrs.**
Max. Marks: 100

1. Refer **specimen A** to its Family, giving reasons **10 Marks**
2. Describe **B in Technical Terms**. Draw labeled sketches including L.S of Flower. Submit L.S. of the flower for valuation. **15 Marks**
3. Identify and write notes on Botanical Name, Common Name **Medicinal Values** of **C,D,E & F** (No sketches required) **20 Marks**
4. Identify the **spotter** and write notes on **G.** **5 Marks**
5. Demonstrate the **Horticultural Technique** (any one method) assigned to you **(H)** and write the procedure for the same. **10 Marks.**
6. Identify the **spotter** and write notes on **I, J and K.** **15 Marks**
7. Comment on the **Physiology Set-up L.** **5 Marks.**
8. **Observation Notebook.** **20 Marks**

(Note: Scale Down to 60 Marks)

Key and Scheme of Valuation

1. A – Angiosperm material of any family prescribed in the syllabus. As a whole 10 Marks.
2. B – Any Angiosperm specimen (included in the syllabus) Description – 5, L.S. – 2, other diagrams – 5, Floral Diagram – 2 and Floral Formula – 1)
3. C,D,E & F – Medicinal plants prescribed in the syllabus (Botanical Name and Common Name – 1 + 1, Notes =3)
4. G – Embryology Slides. Section of Anther and Ovule (Description -3, Diagram – 2)
5. Horticulture – (Demonstration -5, Procedure – 5)
6. I and J – Horticulture, K – Physiology (Identification – 1, Diagram – 2, Notes – 2)
7. Any physiological set-up (Identification – 1, Diagram – 2, Notes – 2)