THANTHAI HANS ROEVER COLLEGE(AUTONOMOUS), ELAMBALUR, PERAMBALUR

Bachelor of ZoologyCourseStructure under CBCS

(For the candidates admitted from the academic year 2018-2019 onwards)

Semester	Part	Course	Course Code	Title of the Course	Ins. Hours/ Weeks	Credit	Exam Hours	CIA (Max)	ESE (Max)	Total (Max)
I	I	Language Course–I (LC) – Tamil*/Other Languages ** #	18UT1	Tamil-I (Ilakiyam-Kavithai, Sirukathai, Urainadai, Ilakkiya Varalaru)	6	3	3	25	75	100
	II	English Language Course-I (ELC)	18UE1	English-I (Prose for Effective Communication and Grammar)	6	3	3	25	75	100
	III	Core Course – I (CC)	18UZO1CC1	Invertebrata	6	5	3	25	75	100
	III	Allied Course – I (AC)	18UBO1AC1	Botany –I	4	4	3	25	75	100
	III	Core Practical - I (CP)	18UZO1CP1	Invertebrata and Chordata (P)	3	-	***	-	-	-
	IV	Allied practical-I (AP)	18UBO1AP1	Botany-I& II (P)	3	-	***	-	-	-
	V	Value Education	18UVE	Value Education	2	2	3	25	75	100
				Total	**30**	**17**	**-**	**-**	**-**	**500**
II	I	Language Course - II (LC) - Tamil/Other Languages	18UT2	Tamil-II (Idaikkala Ilakkiyam,Nadagam, Puthinam, Ilakkiya Varalaru)	6	3	3	25	75	100
	II	English Language Course -II	18UE2	English-II (Poetry for Effective Communication and Grammar)	6	3	3	25	75	100
	III	Core Course-II	18UZO2CC2	Chordata	6	5	3	25	75	100
	III	Allied Course-II	18UBO2AC2	Botany-II	4	4	3	25	75	100
	III	Core Practical-I	18UZO1CP1	Invertebrata and Chordata -I (P)	3	3	3	40	60	100
	III	Allied practical-I (AP)	18UBO1AP1	Botany- I & II (P)	3	3	3	40	60	100
	IV	Environmental Studies	18UES	Environmental Studies	2	2	3	25	75	100
				Total	**30**	**23**	**-**	**-**	**-**	**700**
III	I	Language Course - III (LC) -	18UT3	Tamil-III (Kappiya Ilakkiyam , Nadagam, Ilakiya Varalaru)	6	3	3	25	75	100

		Tamil/Other Languages								
	II	English Language Course - III	18UE3	English-III(Short Story and Effective Communication Skill)	6	3	3	25	75	100
	III	Core Course-III	18UZO3CC3	Cell and molecular biology	6	5	3	25	75	100
		Allied Course-III	18UCH3AC3	Chemistry-I	4	4	3	25	75	100
		Core course – III&IV Practical	18UZO3CP2	Cell and molecular biology and Genetics (P)	3	-	***	-	-	-
		Allied course-IIPractical	18UCH3AP2	Chemistry-I&II(P)	3	-	***	-	-	-
	IV	Non Major Elective -I	18UMB3NME1	Microbiology	2	2	3	25	75	100
				Total	**30**	**17**	**-**	**-**	**-**	**500**
IV	I	18UT4	18UT4	Tamil-IV (Palan Ilakkiyam, Ilakiya Varalaru, Podhu katturai)	6	3	3	25	75	100
	II	18UE4	18UE4	English-IV(One Act Play and Effective Communication Skill)	6	3	3	25	75	100
	III	Core Course-IV	18UZO4CC4	Genetics	5	5	3	25	75	100
		Allied Course-IV	18UCH4AC4	Chemistry-II	3	3	3	25	75	100
		Core Course-III&IV Practical	18UZO4CP2	Cell and molecular biology and Genetics (P)	3	3	3	40	60	100
		Allied Course -II Practical	18UCH4AP2	Chemistry-I&II(P)	3	3	3	40	60	100
	IV	Non Major Elective –II	18UBT4NME2	Biotechnology	2	2	3	25	75	100
	IV	Skill Based Elective-I	18UZO4SBE1	Ornamental fish farming	2	2	3	25	75	100
				Total	**30**	**24**	**-**	**-**	**-**	**800**
V	III	Core Course-V	18UZO5CC5	Animal physiology	5	5	3	25	75	100
	III	Core Course-VI	18UZO5CC6	Immunology	5	5	3	25	75	100
	III	Core Course-VII	18UZO5CC7	Ecology	5	5	3	25	75	100
	III	Core Course-III Practical	18UZO5CP3	Animal Physiology, Immunology & Ecology (P)	4	4	3	40	60	100
	III	Major Based Elective-I	18UZO5MBE1	Economic Entomology	5	5	3	25	75	100
	IV	Skill Based Elective-II	18UZO5SBE2	Applied Zoology	2	2	3	25	75	100
	IV	Skill Based Elective-III	18UZO5SBE3	Health education	2	2	3	25	75	100
	IV	Soft Skills Development	18USSD	Soft Skills Development	2	2	3	25	75	100
				Total	**30**	**30**	**-**	**-**	**-**	**800**

VI		Core Course-VIII	18UZO6CC8	Developmental Biology	6	6	3	25	75	100
	III	Core Course-IX	18UZO6CC9	Evolution	6	6	3	25	75	100
		Core Course- IV Practical	18UZO6CP4	Developmental Biology and Evolution (P)	5	5	3	40	60	100
		Major Based Elective-II	18UZO6MBE2	Biophysics & Biostatistics	6	5	3	25	75	100
		Major Based Elective-III	18UZO6MBE3	Human diseases	6	5	3	25	75	100
		Extension Activities		Extension Activities	-	1	-	-	-	-
		Gender Studies	18UGS	Gender Studies	1	1	3	25	75	100
				Total	**30**	**29**	**-**	**-**	**-**	**600**
Grand Total					**180**	**140**	-	-	-	**3900**

List of Allied Courses:

Allied Course I Botany- I
Allied Course IIBotany-II
Allied Course III Chemistry -I
Allied Course IV Chemistry -II

List of Non Major Elective (For 2018 – 2019)

Elective	Semester	Course Code	Title of the Course
NME-I	III	18UMB3NME1	Microbiology
NME-II	IV	18UBT4NME2	Biotechnology

List of Skill Based Elective (For 2018 – 2019)

Elective	Semester	Course Code	Title of the Course
SBE-I	IV	18UZO4SBE1	Ornamental fish farming
SBE-II	V	18UZO5SBE2	Applied Zoology
SBE-III	V	18UZO5SBE3	Health education

List of Major Based Elective (For 2018 – 2019)

Elective	Semester	Course Code	Title of the Course
Elective-I	V	18UZO5MBE1	Economic Entomology
Elective-II	VI	18UZO6MBE2	Biophysics & Biostatistics
Elective-III	VI	18UZO6MBE3	Human diseases

Paper Details:

Tamil Part I	- 4
English Part II	- 4
Core Paper	- 9
Core Practical	- 4
Allied Paper	- 4
Allied Practical	- 2
Non-Major Elective	- 2
Skill Based Elective	- 3
Major Based Elective	- 3
Environmental Studies	- 1
Value Education	- 1
Soft Skill Development	- 1
Gender Studies	- 1
Extension Activities	- 1 (Credit Only)

* For those who studied Tamil up to 10th +2 (Regular Stream)

+ Syllabus for other Languages should be on par with Tamil at degree level

those who studied Tamil up to 10th +2 but opt for other languages in degree level under Part I should study special Tamil in Part IV

** Extension Activities shall be outside instruction hours

Non Major Elective I & II – for those who studied Tamil under Part I

a) Basic Tamil I & II for other language students

b) Special Tamil I & II for those who studied Tamil up to 10th or +2 but opt for otherlanguages in degree programme

Note:

	Internal Marks	External Marks
1. Theory	25	75
2. Practical	40	60

3. Separate passing minimum is prescribed for Internal and External marks

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for Semester Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks]

The passing minimum for Semester Examinations shall be 40% out of 60 marks [i.e. 24 marks]

SEMESTER – I

CORE COURSE I - : INVERTEBRATA

Course Code: 18UZO1CC1 **Total Marks: 100**
Hours: 6 **External Marks: 75**
Credit: 5 **Internal Marks: 25**

OBJECTIVES:

- To understand the fundamental organization, adaptations and significance of invertebrate animals and to highlight the importance of invertebrate taxonomy.

UNIT – I

Taxonomy: Definition - Principles of classification- symmetry and coelom -units of classification -Binomial nomenclature -Outline classification of Animal kingdom up to class level with example- (Flowchart only).

UNIT – II

Protozoa and Porifera: Type Study: Plasmodium – structure, life cycle, pathology, and prevention and control measures - Type study: Ascon sponge – General organization and histology-General topic: Structure, pathology, prevention and control measures of Entamoebahistolytica.

UNIT – III

Coelenterata and Helminthes: Type Study: Obelia – Structure of Obelia colony, Medusa, Nematocyst and Life cycle (Metagenesis) -Type Study: Fasciola hepatica (Liver Fluke) – External characters and Life cycle - General topic: Polymorphism Coelenterata.

UNIT – IV

Annelida and Arthropoda: Type Study: Earthworm – External morphology, setae and Nephridia -Type Study: Penaeus (Marine Prawn) - External morphology, Appendages, Reproductive System and Development - General topic: Metamerism in Annelids.

UNIT - V

Mollusca and Echinodermata: Type Study: Pilaglobosa - External morphology, Digestive System and Respiratory System-General topic: Cephalopods as an advanced Mollusc, Larval forms in Echinodermata -Type Study: Star fish External morphology, Pedicellaria and water vascular system.

TEXT BOOK

1. Invertebrate Zoology by Arumugam N. *et al.*,Saras Publications, Kottar, Nagercoil –2012
2. Ekambaranatha Iyar and T.N.Ananthakrishnan. 1992. A Manual of Zoology, Vol.I. (Invertebrata).Parts I &II.Viswanathan& Co.

REFERENCES BOOK:

1. Jordon, E.L. and P.S. Verma. 1995 Invertebrate Zoology.12th Edn. Sultan Chand &co
2. Dhami P.S. and J.K. Dhami (2003) Invertebrate Zoology, R.Chand and company, New Delhi.
3. Kotpal R.L. (2005) Invertebrate Zoology, Third Edition published by RakeshRastogi for Rastogi Publications, Meerat.

SEMESTER – I
ALLIED COURSE I - BOTANY-I

Course Code: 18UBO1AC1 **Total Marks: 100**
Hours: 4 **External Marks: 75**
Credit: 4 **Internal Marks: 25**

OBJECTIVES:

- To study about the external morphology, description and classification of higher plants. To understand the internal morphology of higher plants and its morphogenesis.

UNIT- I
Morphology- Phyllotaxy-Inflorescence types (Raceme, Cyme, Mixed and Special)- Terminology of floral parts- floral diagram- floral formula.
UNIT- II
Taxonomy - Classification – Natural (Bentham and Hooker's system) sytem, its merits and demerits - Binomial Nomenclature.
UNIT- III
Detailed study on salient features, description, distribution and economic importance of the families: Annonaceae, Rutaceae, Fabaceae, Caesalpiniaceae, Rubiaceae, Apocyanaceae, Euphorbiaceae and Poaceae.
UNIT- IV
Anatomy**:** Meristems - classification and concepts-Primary structure of Root- Primary structure of Stem.
UNIT -V
Embryology: Structure and development of Anther- Microsporogenesis – Male gametophyte development - Structure, types and development of Ovule- Megasporogenesis – Female gametophyte development (Polygonum type). Endosperm (Nuclear, Cellular, Helobial and Ruminate) - Development of Embryo - Dicot (Capsella).

TEXT BOOKS

1. Pandey, B.P. Taxonomy of Angiosperms S. Chand and Co (p) Ltd. New Delhi, 2013.
2. Rendle, A.B. The classification of Flowering plants Vol. 1 and II, Vikas publishing house (P) Ltd. U.P., 1979.
3. Vashista, P.C. Taxonomy of Angiosperms, S. Chand and Co. New Delhi, Jullunder, 1997.

REFERENCES BOOKS:

1. Pandey, B.P. Plant Anatomy, S. Chand and Company Ltd, New Delhi, 2001.
2. Vashista,P.C. A Text Book of Plant Anatomy, S. Nagin& co., Jullunder and New Delhi, 1987.
3. Bhojwani, S.S. and Bhatnagar, S.P. The Embryology of Angiosperms (4th Edn.) Vikas Publishing House (P) Ltd., & UBS Publishers Distributors, New Delhi, 2000.
4. Maheswari, P. Recent Advances in the Embryology of Angiosperms, International Society of Plant Morphologists – Uniof Delhi,1973.

SEMESTER – II
CORE COURSE II - CHORDATA

Course Code: 18UZO2CC2 **Total Marks: 100**
Hours: 6 **External Marks: 75**
Credit: 5 **Internal Marks: 25**

OBJECTIVES:

- To enlighten the students about the diverse forms of Vertebrate animals which belong to 5 major classes present around us. To help our students to distinguish various vertebrate animals and to know the evolutionary sequence of them.

UNIT-I

General characteristics, Outline classification up to class level with example. Prochordates - Type study-- Amphioxus – external morphology, digestive system, excretory system only. Ascidian -tadpole larva and retrogressive metamorphosis. Affinities -Balanoglossus.

UNIT-II

Pisces - Classification of fishes, Type study – Shark: external morphology, Digestive system, Circulatory system only -Migration of fishes, Economic importance of fishes, Amphibians – Frog – external morphology, respiratory system, reproductive system and development only. Parental care- Amphibian.

UNIT- III

Reptilia -Type study – Calotes, external morphology, Urinogenetal system and nervous system. Poisonous and non-poisonous Snakes - identification and biting mechanism, first aid.Decline of Mesozoic reptiles (Dinosaurs).

UNIT-IV

Aves- Type study – Pigeon; external morphology, respiratory system, pectoral and pelvic girdles only. –Flight adaptation, beak and feet modification in birds, -Migration of birds, -Flightless birds, -Fossil bird Archaeopteryx and its evolutionary importance.

UNIT-V

Mammalia - Classification of Mammals with examples, Type study- Rabbit, - external morphology, nervous system and reproductive system.Dentition in mammals, Aquatic mammals.

TEXT BOOKS

1. Chordate Zoology – E.L. Jordon and P.S. Verma (2006) S.Chand& co. New Delhi.
2. Chordate Zoology - P.S. Dhami and J.K. Dhami. (2006) R.Chand& co. New Delhi.
3. Chordate – A Manual of Zoology, M.EkambaranathaIyer and T.N.Ananthakrishnan (2003) Viswanathan Publications, Chennai.

REFERENCES:

1. Vertebrate Zoology – R.L.Kotpal, (2005) Rastogi Publications, Meerat .
2. Text book of Vertebrate – N.Arumugam et al., (2008) SarasPubulications. Nagerkovil.

SEMESTER – I & 1I
CORE PRACTICALI–INVERTEBRATA AND CHORDATA

Course Code: 18UZO2CP1 **Total Marks: 100**
Hours: 3 **External Marks: 60**
Credit: 3 **Internal Marks: 40**

Dissection Charts: Visual models

1. Earthworm: Nervous system.
2. Cockroach: Digestive system and Nervous system,
3. Pila: Digestive system
4. Frog: Arterial system
5. Calotes: Venous system

Mounting Charts:

1. Earth worm – Body setae
2. Cockroach – Trachea
3. Honey Bee – Mouth parts and Sting
4. Pila – Radula
5. Shark –Placoid scales
6. Frog – Brain

Spotters:

1. Protozoa- paramecium Entire, paramecium conjugation, euglena
2. Porifera – simple sponge, gemmule, spicules
3. Coelenterata – obelia colony, medusa of obelia, sea anemone,
4. Helminthes- liver fluke, redia larva, cercaria larva, ascaris male and female
5. Annelida – earthworm, nereis, heteronereis, leech
6. Arthropoda – prawn, zoea larva, mysis larva, peripatus, honey bee and silk worm
7. Mollusca - pila, sepia, octopus, pearl oyster
8. Echinodermata – star fish, sea-urchin, sea-cucumber, bipinnaria larva
9. Prochordata – Amphioxus, Balanoglossus, Ascidian
10. Agnatha – Pertomyzon

SEMESTER – II

ALLIED COURSE II – BOTANY-II

Course Code: 18UBO2AC2 **Total Marks: 100**
Hours: 4 **External Marks: 75**
Credit: 4 **Internal Marks: 25**

OBJECTIVES:

To Study about the external Thallophytes and Bryophytes. To understand the Plant physiology and Photosynthesis of higher plants.

UNIT- I

Thallophytes : Algae: General characters, study of structure and life histories of the following genera – Oscillatoria, Volvox, Oedogonium and Polysiphonia

UNIT -II

Fungi: Study of structure and reproduction of the following genera, Albugo and Pencillium. Economic importance of fungi.

UNIT- III

Bryophytes, Pteridophytes and Gymnosperms, General characters of pteridophytes. - Bryophytes. Structure and life cycle of Lycopodium. General characters' of Gymnosperms structure and life cycle of Cycas.

UNIT -IV

Plant physiology – Absorption of water – Ascent of sap – Transpiration - Specific role and symptoms of mineral elements. Growth Hormones Auxins, Gibberellins and cytokinins.

UNIT- V

Photosynthesis – mechanism of photosynthesis – C3 and C4 cycle - Factors affecting photosynthesis – Respiration - mechanism of respiration - Glycolysis- Kreb's cycle – Factors affecting Respiration.

TEXT BOOKS

1. Verma, V. Text book of Plant Physiology, Ane Books India, New Delhi. 2007.
2. Sharma. O.P. Textbook of Pteridophyta, MacMillan India Ltd., New Delhi, Madras, 1990.

REFERENCES:

1. Gangulee, H.C &Kar A.K. College Botany Vol I and II, Books and Allied (Pvt.)Ltd., Calcutta,1980.
2. Vashistha,B.R. Botany for Degree students,Vol I and II Chand & Co, New Delhi, 1995.
3. Sharma,O.P. Text book of Algae. Tata McGraw Hill Publishing Co., Ltd., New Delhi, 1990.
4. Srivastava,N.N.Bryophyta. PradeepPrakashnan, Meerut, India, 1996.
5. SundaraRajan. S Introduction to Pteridophyta, New Age International Publishers Ltd., Wiley Eastern Ltd., New Delhi. Madras 1994.
6. Vashista, P.C. Botany for Degree Students –Pteridophyta. S. Chand & Co., New Delhi, 1997.
7. Rasheed, A. An Introduction to Pteridophyta, Vikas Publishing Co., NewDelhi, 1999.

8. Chopra,G.W&Verma,Y. Gymnosperms, Pradeep Publications, Jalandhar,1988.
9. Vashista, P.C. Botany for Degree Students - Gymnosperms (2nd Edn.) S.Chand& Co., NewDelhi. 1996.
10. Sharma,O.P. Gymnosperms, PragatiPrakashan, Meerut, India, 1997.
11. Jain, V.K. Fundamentals of Plant Physiology, S.Chand& Co, New Delhi. 2000.
12. Pandey, S.N. 1991. Plant Physiology, Vikas Publishing House (P) Ltd., New Delhi, India.

SEMESTER – I&II

ALLIED PRACTICALI–BOTANY I&II

Course Code: 18UBO2AP1 **Total Marks: 100**
Hours: 3 **External Marks: 60**
Credit: 3 **Internal Marks: 40**

OBJECTIVES:

- To learn the description of external and internal morphology of plants.To identify the plant families and their description.To study the development of plant body.

Morphology:

1. Phyllotaxy types
2. Types of inflorescence – Raceme, Cyme, Mixed and special
3. L.S. of Dicot flower-Hypogynous/ Epigenous
4. Mounting of floral parts
5. Construction of floral diagram and floral formula.

Taxonomy:

1. Detailed of study of the plants belonging to the families mentioned in theory.

Anatomy:

1. Structure of Dicot stem
2. Structure of Monocot stem
3. Structure of Dicot root
4. Structure of Monocot root

Embryology:

1. T.S. of anther – Datura
2. Structure of ovule
3. Isolation of Dicot embryo - Tridax

REFERENCES:

1. Rao, K.N. and Krishnamurthy, K.V. 1979. Ancillary Botany Viswanathan&co. Chennai
2. Jeyaram, P. Allied Botany 1983. Veekay Publishing house.Chennai.
3. Muneswaran.A. Allied Botany Srinivas Book Center.Thanjavur.
4. Fullar, H.J and Tippo.O. 1949. College Botany. Henry, Holt & co.
5. Nathawat, G.S., Sharma. P.D and Shani R.K. 1977. A text Book of Botany. Ramesh Book Depot.Jaipur.

SEMESTER – III
CORE COURSE III-CELL AND MOLECULAR BIOLOGY

Course Code: 18UZO3CC3 **Total Marks: 100**
Hours: 6 **External Marks: 75**
Credit: 5 **Internal Marks: 25**

OBJECTIVES:

- To understand the cell and cellular details with their significance.
- To train the students about the various types of animal cell structures with their characteristic features and detailed functions. It facilitates to understand the structure and function at molecular level in prokaryote and eukaryote.

UNIT I
Microscopy – Principles and applications of Light, Phase Contrast, Fluorescent and Electron Microscopes – SEM, TEM. **Micro-technique** – tissue fixation, sectioning and staining. Ultrastructure organization of virus, bacteria and animal cell.
UNIT II
Plasma Membrane: Ultra structure, UNIT membrane and fluid mosaic models, Membrane proteins - peripheral and integral proteins- functions of plasma membrane. **Cytoplasm**: structure and composition, physical and biological properties. **Endoplasmic Reticulum**: ultrastructure and functions.
UNIT III
Golgi complex – Morphology, structure, role in secretion and other functions.**Lysosome and Centrosome** – Morphology, chemistry and functions.**Mitochondria** – ultrastructure and functions, **Ribosomes** – ultrastructure and functions.
UNIT IV
Nucleus: ultrastructure of interphase nucleus. **Nucleolus and Chromosome**– structure and functions; Giant chromosomes- Polytene and Lampbrushchromosomes.**Cell divisions**: Mitosis and Meiosis. Cell cycles and its significance.
UNIT V
Molecular structure of DNA. DNA– Replication in prokaryotes and eukaryotes, DNA-repair mechanisms. **RNA** – Types and functions. Genetic code- **Protein synthesis** – Transcription, Translation and post-translational modifications. Cancer Biology, Apoptosis-mechanism of programmed cell death, Stem cells.

TEXT BOOKS

1. Verma, P.S. and V.K. Agarwal. 2003. Cytology (Cell Biology and Molecular Biology). S.Chand Company Ltd, New Delhi.
2. Powar, C.B. 1997. Cell Biology.Himalaya Publishing House, Bombay.3. Kumar, H.D. 2003. Molecular Biology. Vikas Publishing House Pvt. Ltd., New Delhi.

REFERENCES:

1. De Robertis, E.D.P. and De Robertis E.M.F. 1995.Cell and Molecular Biology. 8th Edition, B.I. Waverly Pvt., Ltd., New Delhi.
2. Freidfelder, D. 2003. Molecular Biology.Narosa Publishing House, New Delhi.
3. Turner, P.C., McLennan, A.G., Bates, A.D and White, M.R.H. 2001. Molecular Biology. Second Edition. Viva Books Pvt. Ltd., New Delhi.
4. Verma, P.S. and V.K. Agarwal. 1998. Cell Biology. S.Chand Company Ltd., New Delhi.
5. Arumugam, N.2001. Cell Biology.Saras Publications, Nagercoil. 6. David, F. 2003.

SEMESTER – III
ALLIED COURSE III- CHEMISTRY-I

Course Code: 18UCH3AC3 **Total Marks: 100**
Hours: 4 **External Marks: 75**
Credit: 4 **Internal Marks: 25**

OBJECTIVES:

To know the properties of elements and fertilize.To understand the reactions of alkane. To analyze theoretical aspects of volumetric analysis

UNIT – I
Periodic properties- ionization potential, electron affinity and electro negativity - variation in the periodic table , Molecular Orbital Theory**:** Some important basic concepts of molecular orbital theory **–** LCAO- Bonding , anti-bonding orbitals and bond order – applications of MO theory to H2, He2, O2 and F2 molecules.
UNIT – II
Volumetric analysis**:** Standard solution, titration, equivalence point, end point, indicators, primary and secondary standards, expressing concentrations of standard solutions – Normality, Molarity, Molality and mole fraction. Volumetric titrations – Acid base titrations – theory – strong acid Vs strong base, strong acid Vs weak base. Redox titrations – theory – Mohr salt Vs KMnO4, complexometric titrations – theory – EDTA titrations.
UNIT – III
General methods of preparation of alkanes, properties- mechanism of free radical halogention of alkanes, conformation analysis of ethane, n- butane and cyclohexane.Methods of preparation of alkenes.
UNIT-IV
Synthetic polymers – Teflon, Alkyl and Epoxy resins, Polyesters – definitions and uses Types of polymerization – Thermosetting and thermoplastics.Heterocycliccompounds:Furan, thiophene, pyrrole and pyridine – Preparation and properties. Stereoisomerism:Optical isomerism – lactic and tartaric acid – Racemic mixture and resolution – Geometrical isomerism –maleic and fumaric acid.
UNIT – V
Rate of reaction , order, molecularity, first order rate law and simple problems, half-life period of first order equation, pseudo first order reaction, zero and second order reactions. Arrhenius and collision theories- assumption, derivation, demerits- experimental determination of order of reactions.

TEXT BOOKS:

1. Bahl and ArunBahl – "Advanced Organic Chemistry" – 19th Edition., (2005) – Sulthan and Chand company, New Delhi.
2. M.K. Jain – "Organic Chemistry" – 12th Ed., (2003) Sulthan and Chand Company, New Delhi.
3. R.D. Madan, J.S. Tiwari and G.L. Mudhara – A Textbook of First Year B.Sc. Chemistry: S.Chand and Co, 2002.
4. B.R. Puri and L.R. Sharma – Principles of Inorganic Chemistry: ShobanLalNagin Chand and Co., New Delhi (2000).

REFERENCES

1. B.R. Puri, L.R. Sharma and S. Pathania – Principles of Physical Chemistry: ShobanLalNagin Chand and Co., New Delhi, 2001.
2. R. Gopalan, P.S. Subramanian, K. Rangarajan – "Elements of Analytical Chemistry", Sultan Chand & Sons, 1995.

SEMESTER – III

NON MAJOR ELECTIVE-I- MICROBIOLOGY

Course Code: 18UMB3NME1 **Total Marks: 100**
Hours: 2 **External Marks: 75**
Credit: 2 **Internal Marks: 25**

OBJECTIVES:

- To understand the basic principles and applications of Microbiology and immunology.

UNIT – I
History and scope of Micro biology – Contributions of Louis Pasteur, Robert Koch, Lister, Edward Jenner, AlexandFlemming – General characteristics of Bacteria, Brief Classification of Microbes – 5 kingdom concept.
UNIT – II
Bacteria growth and culture of bacteria – Types of culture Media cultural characteristics of Bacteria – Methods – staining, maintenance of culture.
UNIT – III
Reproduction in Bacteria – Conjugation – Transformation - Transduction – control of Bacteria – Sterilization by Heat radiation and Air-filter, Disinfectants and Antibiotics (Three each)
UNIT – IV
Study of common bacterial diseases in man, Causative organism, mode of transmission, Pathogenicity Symptoms and their preventive measures – Cholera, Typhoid, Tuberclosis, Leprosy, Syphilis.
UNIT – V
Food borne infections and intoxications - Clostridium, Salmonella, and Staphylococcus – mycotoxins in food with reference to Aspergillus species

TEXT BOOK:

1. Mani.A.Selvaraj.A.M, Narayanan.L.M&Arumugam.N (1999) „Microbiology" – General and Applied, Saras Publications., Nagercoil.
2. A Text Book of Microbiology – Dubey – S.Chand& Co.

REFERENCES :

1. Anantha Narayanan &JayaramPanicker – Medical Microbiology.
2.PelezasJr.M.J., Chan, E.C.S and Kreig.N.R (1993) Microbiology – Concepts &Applications, Mc.Graw Hill New York ISBN.
3. Kuby.J (1999) Immunology, W.G.Freeman& Co., New York 5. Roitt.I.M (1988) Essentials of Immunology ElBSEdn. London.

SEMESTER – 1V

CORE COURSE 1V-GENETICS

Course Code: 18UZO4CC4 **Total Marks: 100**
Hours: 5 **External Marks: 75**
Credit: 5 **Internal Marks: 25**

OBJECTIVES:

- Giving a basic overview of genes, mutations, sex determination and patterns of inheritance.
- An understanding of the chromosomal inheritance and expression of human genetic characters and disorders.

UNIT I

Introduction to Genetics- Basis of Mendelian Inheritance and Mendelianlaws.Simple Problems Relating to Inheritance.Structure of gene – Interaction of Gene – Commentary factors, Supplementary factors, Inhibitory and lethal Factors – Atavism.

UNIT- II

Blood Groups and their Inheritance in Human – Linkage and Crossing Over:-Drosophila – Morgans' Experiments – Complete and Incomplete Linkage, Linkage Groups, Crossing Over types, Mechanisms – Cytological Evidence for Crossing Over, Mapping of Chromosomes – Interference and Coincidence.

UNIT-III

Sex Linkage in Drosophila and Man, Sex influenced and Sex Limited Genes – Non-Disjunction and Gynandromorphs – Cytoplasmic Inheritance – Meternal Effect on Limnaea (Shell Coiling), Male Sterlity (Rode's Experiment). CO_2 sensitivity in Drosophila, Kappa particles in Paramecium, Milk factor Mice.

UNIT-IV

Nature and Function of Genetic Material – Fine Structure of the Gene – Cistron, Recon, Muton – Gene Regulation – Operon Concept – Lac Operon – Positive and Negative Regulation. Mutation – Molecular Basis of Mutation, Types of Mutation, Mutagens, Mutable and MutatorGenes.Chromosomal Aberrations – Numerical and Structural Examples from Human.

UNIT-V

Applied Genetics- Animal Breeding – Heterosis, Inbreeding, Out Breeding, Out Crossing, Hybrid Vigour. Population Genetics, Hardy Weinberg Law – Gene Frequency, Factors Affecting Gene Frequency, Eugenics, Euphenics and Ethenics, Bioethics.

TEXT BOOKS

1. Verma, P.S. and V.K. Agarwal, 1995. Genetics, 8th edition, S. Chand & Co., New Delhi – 110 055, 580 pp.
2. Gunther, S. Stent, 1986. Molecular Genetics. Macmillan Publishing Co Inc. 773 pp.
3. Goodenough, V., 1978. Genetics, 2nd ed., New York Holt, Rinchart and Winston, 894 pp.

4. Hart, D.L. and D. Freifelder, 188. Basic Genetics, John &Barlet Publishers, 505 pp.
5. Garder, 1972. Principles of Genetics, Wiley Eastern Pvt. Ltd. 590 pp.

REFERENCE:

1. Watson, J.D. and W.A. Benjamin, 1976. Molecular Biology of the Gene, 3rd., Benjamin Co. Inc., New York, 739 pp.
2. Winchester, 1967. Genetics, Oxford IBH Publications, 504 pp.
3. Stickberger, 1968. Genetics, Macmillan Publications, New York, 914 pp.

SEMESTER – 1V

CORE PRACTICAL-II

CELL AND MOLECULAR BIOLOGY AND GENETICS

Course Code: 18UZO4CP2 **Total Marks: 100**
Hours: 3 **External Marks: 60**
Credit: 3 **Internal Marks: 40**

Cell and Molecular Biology

1) Blood grouping in man.
2) Squash preparation of onion root tip – observe the stages of mitosis.
3) Chironomous larva – Giant Chromosomes. (Drosophila / Chironomous)
4) Blood Smear Preparation
5) Spotters:Compound microscope,
6.pH meter, Centrifuge, Colorimeter/ Spectrophotometer,

Genetics

1. Drosophila – male and female identification, Mutant forms (from pictures),Genetic importance.
2. Observation of simple Mendelian traits in man.
3. Human Karyotypes: normal, Down's, Klinefelters and Turner, is syndrome.
4. Recording of Mendelian traits in humans.

SEMESTER – 1V

ALLIED COURSE 1V- CHEMISTRY-11

Course Code: 18UCH4AC4 **Total Marks: 100**
Hours: 3 **External Marks: 75**
Credit: 3 **Internal Marks: 25**

OBJECTIVES

- To understand the basic concepts of C-ordination compounds and Carbohydrates.
- To learn about the aromaticity and electrochemistry.
- To know about chromatography

UNIT - I: Coordination Chemistry
Nomenclature and isomerism of coordination compounds. EAN rule, VB and Crystal field theories of octahedral, tetrahedral and square planar complexes. Chelation and its industrial applications. Magnetic studies -magnetic susceptibility, ferromagnetism and anti ferromagnetism.
UNIT II- Carbohydrates
Classification – Glucose and fructose – Preparation and properties – Sucrose – Manufacture and properties – Starch and cellulose – Properties and uses.Amino Acids and Proteins: Amino acids – Classification, preparation and properties. Peptides (Elementary treatment) – Proteins – Classification based on physical properties and biological functions. Nucleic acid:DNA and RNA – functions (Structure not necessary)
UNIT III- Aromaticity
Aromaticity– Conditions – Huckel's rule - aromaticity of benzene, Substitution reactions-Nitration, halogenation, sulfonation and alkynation of benzene,Halogen containing compounds: Preparation and uses of Dichloromethane, Chloroform, Carbon tetrachloride, DDT and BHC, Name reactions:Benzoin, Perkin, Cannizaro, Claisen, Haloform, Carbylamine reactions – Biuret reaction.
UNIT – IV: Electrochemistry
Specific and equivalent conductance – their determination – Effect of dilution on conductivities – An elementary idea about ionic theory – Ostwald's Dilution Law, Kohlrausch Law, Conductometric titrations. pH and Buffer:Importance of pH and buffers in the living systems. pH determination by colorimetric and electrometric methods. Corrosion:Types of corrosion, Prevention.
UNIT – V: Chromatography
Principles of column, paper and thin layer chromatography- Photochemistry**:** Photochemical reaction – Lambert's law – Beer's law – Absorbtion, Extinction Coefficient – The law of Photochemical equivalence, Quantum efficiency, Some Photochemical reactions and their quantum yield-Phase Rule:Phase, Component, Degree of freedom, Phase Rule – Definition. One component system – Water system.

TEXT BOOK

1. Bahl and ArunBahl – "Advanced Organic Chemistry" – 19th Edition., (2005) – Sulthan and Chand company, New Delhi.

REFERENCE

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition), New Delhi, ShobanLalNagin Chand & Co.,(1993)
2. Bahl and ArunBahl – "Advanced Organic Chemistry" – 19th Edition., (2005) – Sulthan and Chand company, New Delhi.
3. B.R. Puri, L.R. Sharma and S. Pathania – Principles of Physical Chemistry: ShobanLalNagin Chand and Co., New Delhi, 2001.

SEMESTER – 1V

ALLIED PRACTICAL 11- CHEMISTRY-1&11

Course Code: 18UCH4AP2 **Total Marks: 100**
Hours: 3 **External Marks: 60**
Credit: 3 **Internal Marks: 40**

OBJECTIVES

- To understand the basic principles and different types of volumetric analysis.
- To identify the organic compounds.
- To know the difference between qualitative and quantitative analysis
-

I. VOLUMETRIC ANALYLSIS

a) **Acidimetry and Alkalimetry**

i) Estimation of hydrochloric acid

ii) Estimation of sodium hydroxide

b) **Permanganometry**

iii) Estimation of oxalic acid using KMnO4

iv) Estimation of ferrous sulphate using KMnO4

II. ORGANIC ANALYSIS

A study of

(i) Reactions of the following organic compounds along with

(ii) Tests for aromatic/ aliphatic, saturated/ unsaturated, solubility in common solvents, and presence of nitrogen :

(iii) Carbohydrate

(iv) Diamide

(v) ketone

(vi) Acid

(vii) The students may be trained to perform the specific reactions like- aliphatic or aromatic, saturated or unsaturated, solubility test, nitrogen test involving (zn / na2co3) fusion, and functional group present and record their observation.

TEXT BOOK

1. V. Venkateswaran, R. Veerasamy , A.R. Kulandaivelu, “Basic Principles of Practical Chemistry” Sultan Chand & Sons , New Delhi, 1997.

SEMESTER – 1V

NON MAJOR ELECTIVE II-BIOTECHNOLOGY

Course Code: 18UBT4NME2 **Total Marks: 100**
Hours: 2 **External Marks: 75**
Credit: 2 **Internal Marks: 25**

OBJECTIVES:

- To enlighten our students on various aspects of biotechnology and its beneficial products.
- To encourage the students to take biotechnology as their career as it provide ample scope for bright feature.

UNITI

History & scope of Biotechnology & Overview of Gene transfer methods: Introduction on **h**istory and scope of Biotechnology**;** Animal cell culture- Media – serum and free media, biology of cultured cells- cell growth kinetics, primary culture-subculture –Development of cell lines- types of culture methods ; stem cell culture, scale-up- monolayer and suspension and applications of animal tissue cultures.

UNITII

Embryo transfer & transgenic animal technology: Artificial insemination in cattle, Super ovulation, Embryo transfer, sexing, splitting, cryopreservation, Microinjection, Stem cell Technology; targeted gene transfer-Knock out technology.

UNIT III

Animal cloning & gene therapy: Nuclear transfer - applications, reproductive and therapeutic cloning – Genetic defects – germ line and somatic gene therapy – strategies involved in gene therapy –Examples and potential of gene therapy. –Ex vivoandinvivogene therapy.

UNITIV

Genetic engineering of plants and transgenic plants Structure, Biology and vector construction of Ti Plasmid and Ri plasmid, – use of marker and reporter genes; Development of pathogen and herbicide resistant plant – stress tolerant plants.

UNIT V

Genetically Modified organisms, Bioethics, Biosafety regulations and IPR: Transgenic mice, goat, cattleand Applications of transgenic animals. Vaccine production - Humanized antibodies in transgenic mice & recombinant immunotoxins**;** golden rice, Bt cotton-microbial insecticide (Bt strains); Intellectual property rights, Patents - case studies, plant breeders rights – ethical and social issues of IPR – ethical limits of animal use – ethics of genetic engineering – bioethical implications of cloning – Biosafety regulations and organizations – containment categories and safe disposal methods.

TEXT BOOKS

1. Old, R.W & Primrose, S.B., Principles of Gene manipulation – An introduction to Genetic Engineering , 5th edition– Blackwell Scientific Publishers, 1994.
2. Dubey R.C, A Textbook of Biotechnology, S.Chand&Comp.Ltd, New Delhi, 2004

REFERENCES:

1. PuhlerA.,Genetic Engineering of Animals, VCH publications, New York, U.S.A., 1993.
2. Slater A., Scott N. and Fowler M., Plant Biotechnology – The genetic manipulation of plants, Oxford University Press, Oxford, 2003.
3. De K.K., An Introduction to plant tissue culture, 1st edition, New Central Book Agency, Calcutta, 1992.
4. Freshney R.I., Culture of Animal cells – A Manual of Basic Techniques, 5th editionJohn Wileyand Sons (Asia) Pvt. Ltd, 2006.
5. Glick B.R. and Pasternak J.J., Molecular Biotechnology 3rd edition ASM press, Washington D.C., 2003.
6. Ignacimuthu, S. Plant biotechnology Oxford & IBA publishing Co. Pvt. Ltd, 1997.
7. Jogdand S.N., Gene Biotechnology, Himalaya Publishing House, Mumbai, 2000.
8. Masanaru M., Plant Tissue culture: An alternative for production of useful metabolites, Daya Publishing house, New Delhi, 1997.
9. Narayanaswamy S., Plant Cell & Tissue Culture, Tata McGraw – Hill Publishing Company, New Delhi, 1999.
10. Ramadass P and Meerarani S., Textbook of Animal Biotechnology, 2nd editionMadras Veterinary College, Chennai, 2002.
11. Razdan M.K., An Introduction to Plant Tissue Culture, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 1994.
12. Trivedi. P.C., Plant Biotechnology – Recent Advances, Panima Publishing Corporation, NewDelhi, 2000.

SEMESTER – 1V

SKILL BASED ELECTIVE 1- ORNAMENTAL FISH FARMING

Course Code: 18UZO4SBE1 **Total Marks: 100**
Hours: 2 **External Marks: 75**
Credit: 2 **Internal Marks: 25**

OBJECTIVES:

- To enlighten the non-major elective students about ornamental fish farming a profitable culture practice.
- To help Arts students about this self-employment programme.

UNIT I

Importance and scope of ornamental fish culture - Economics. Commercial value and potential trends in ornamental fish farming in the world and in India. Budget required for setting up an Aquarium Fish Farm as a Cottage Industry.

UNIT II

Important freshwater and marine ornamental fishes - Indigenous and exotic species- Guppy, Sword tail, Gold fish, Angel fish, Blue morph, Anemone fish, Butterfly fish, Zebra fish, Koi, Tetra, Molly, Glass fish, Cichlids, Hippocampus and Scat fishes**.**

UNIT III

Mass production of fancy fishes: Preparations for breeding – breeding behaviour of chosen fishes- molly and fighter fish. Induced breeding.Food and feeding – Preparation and composition of formulated fish feeds. Live feeds: rotifers, tubifex. Live fish transport- Fish handling, packing and forwarding techniques.

UNIT IV

Aquarium design, Construction and preparation: size, shape, substrate, ornamental aquatic plants. Construction and functions of Bio filters, aerators –accessories for fish tanks – hood and light, nets, suction tube.

UNIT V

General Aquarium maintenance – Maintenance of water quality: controlling ammonia build up, pH, feeding regimes. Disease management: Common bacterial, viral, fungal, protozoan and crustacean infections, their treatment and control.

TEXT BOOKS

1. Santhanam, R., N. Sugumaran and P. Natarajan. 1987. A manual of Fresh water aquaculture. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Shanmugam, K. 1992. Fishery Biology and Aquaculture. Leo Pathipagam, Madras.

REFERENCES:

1. Jameson, J.D. and R.Santhanam (1996). Manual of ornamental fisheries and farming technology. Fisheries College and Research Institute, Thoothukudi.
2. Mitchell Beazley, 1998. The complete guide to tropical aquarium fish care.Read and Consumes Book Ltd., London.
3. Jingran V.G., 1991 : Fish and Fisheries in India – Hindustan Publ. Co. New Delhi – India.

4. Mill Dick, 1993 : Aquarium Fish, DK Publ. Co. Inc. New York – USA.
5. Day, F, 1978 : Fishes of India Vol. I & II, William Danisan& Sons, India.Gupta, S.K and Gupta, P.C. 2006. General and Applied Ichthyology.S.Chand and company Ltd. New Delhi.
6. Mitchell Beazley, 1998. The complete guide to tropical aquarium fish care. Read and Consumes Book Ltd., London

SEMESTER – V

CORE COURSE V-ANIMAL PHYSIOLOGY

Course Code: 18UZO5CC5 **Total Marks: 100**
Hours: 5 **External Marks: 75**
Credit: 5 **Internal Marks: 25**

OBJECTIVES:

- To understand the basic definition and functions in the fields of Physiology

UNIT I

Definition, Fields of Physiology and Scope. Physiology of Digestion – Protein, Carbohydrates, Lipids, Digestive enzymes.

UNIT II

Muscle – Types of muscle cells, Ultra structure of muscle cells, Muscle contraction and types of muscle contraction.

UNIT III

Respiration, Respiratory pigments and their functions.Hormones- composition of blood and their functions.Factors of coagulation – Intrinsic and extrinsic factors – Cardiac cycle – Cardiac Rhythm.

UNIT IV

Nerve – Nervous coordination: Transmission of impulses in nerve cells. MichalisMenton constant – Ramachandran Plot – Clinical and Industrial Applications of enzymes.

UNIT V

Urine formation – Ultra filtration, reabsorption, secretion – Hormonal regulation.Hormonal action – Pituitary, Thyroid, Adrenal, Pancreas, Sex hormones and their functional significance.

TEXT BOOK

1. Parameswaran, Anantha Krishnan and AnanthaSubramaniam, 1975. Outlines of Animal Physiology, S. Viswanathan, Printers and Publishers, Pvt. Ltd., 329 pp.

REFERENCES

1. Berg J.M. Tymoczke., J. L. and Styer L. Palmer D.T. Handbook of enzymes.
2. Biological chemistry by H.R. Mabler and E. Corder (1986).
3. Enzyme by Dixon and Webb.
4. Molecular Biotechnology by Click and Paster hark, ASM press.
5. General and comparative Animal Physiology by William Hoar.

SEMESTER – V

CORE COURSE V1- IMMUNOLOGY

Course Code: 18UZO5CC6 **Total Marks: 100**
Hours: 5 **External Marks: 75**
Credit: 5 **Internal Marks: 25**

OBJECTIVES:

- To learn the structural features of the components of the immune system as well as their functions, but the primary emphasis will be on the mechanisms involved in immune system development and responsiveness.

UNIT I

Scope – History - Innate immunity - Acquired immunity- Structure and functions of Primary and Secondary lymphoid organs - Cells of Immune System: Types of Lymphocytes – Macrophages – Antigen Presenting Cells –Mast cells – Polymorpho nuclear cells

UNIT II

Antigens: Types and Properties of Antigens – Haptens – Adjuvants - Immunioglobulins – Types - Structure and Functions- Biological properties of Antibodies - Vaccines and its types

UNIT III

Immune response – Antigen – Antibody reaction – Primary and Secondary immune response – Humoralimmunity - Cell mediated Immune response – Role of B cells in Antibody production – Cytokines – Lymphokines

UNIT IV

Major Histocompatibility Complex in man - Human Leukocyte Antigen (HLA) – Complements: Salient features – Functions – Hypersensitivity – Types – Anaphylaxis –Auto Immune diseases – Immunodeficiency diseases

UNIT V

Immunological Techniques: Agglutination – Precipitation – Simple double and single radial immune diffusion - Counter current and Rocket - Immunoelectrophoresis - ELISA – Western Blotting – WIDAL – VDRL test – Hybridoma technology.

TEXT BOOKS

1.NandhiniShetty (1994) Immunology, Introductory Text Book, New Age Int. (P) Ltd. Publications, New Delhi.
2.Dulsy Fatima et al., (2000) Immunology, Saras Publications, Nagercoil, Tamil Nadu.

REFERENCES

1. Roitt, (3rd Edition) Immunology, Crover Medical Publishing Company, London
2. Barret, J. T. (1983) Text Book of Immunology (5th Edition), The C.V. Mosby Company.
3. Richard, H.M. (1992), Immunology (2nd Edition), Williams and Wilkins, Baltimore Maryland.
4. Hidemann, W.H. (1980) Essentials of Immunology, Elsevier Science Publishing Co. Inc.
5. Weinn. D.M. and Steward, L. (1993), Immunology, Singapore Publishers Private Ltd.,

SEMESTER – V

CORE COURSEV11-ECOLOGY

Course Code: 18UZO5CC7 **Total Marks: 100**
Hours: 5 **External Marks: 75**
Credit: 5 **Internal Marks: 25**

OBJECTIVES:

- To understand the relationship between every organism and its environment.
- To study the impact of ecological factors on the distribution and life of organisms.
- To have a clear understanding about the concept and theories of evolution.

UNIT – I

Ecology, environment and ecosystem: Abiotic factors- Light, Water, Temperature and Soil and their impact on organisms. Ecosystem: Pond and River- Food Chain - Food Web -Tropic level –Energy Flow- Ecological Pyramids: Biomass, Number and Energy.

UNIT-II

Species interaction, population &community ecology: Biotic factors - Animal relationships – Symbiosis: Commensalisms and Mutualism– Antagonism: Antibiosis, Predation, Parasitism and Competition –Intraspecific and Interspecific competition.

UNIT-III

Population Ecology – Definition –Characteristics.Community, Ecology: Types – Components – Ecotone – Edge effect –Ecological niche – Ecological succession – Concept of climax.

UNIT- IV

Natural resources, biodiversity & conservation: Natural Resources - Renewable and Non-renewable - Resources Management. Wild life Conservation and Management. Biodiversity – Types – Mega diversity and hotspots with reference to India –Conservation of Biodiversity.

UNIT-V

Environmental Pollution: Air, Water and Land. Sewage and Solid Waste disposal and Management – Global Warming and Climate change – Green House Effect – Ozone Layer and its significance. Acid Rain.

TEXT BOOKS

1. Odum, E.P. 1996. Fundamentals of Ecology (III Edn.), NatrajPub.Dehradun..
2.Rastogi,V.B. and M.S. Jayaraj. Animal Ecology and Distribution of Animals,Kedarnath Ramnath. 1989

REFERENCES

1. Clarke, G.L. Elements of Ecology. John Wiley & Sons, N: y.3rd Edition, 1954.2. . Rastogi,V.B. and M.S. Jayaraj. Animal Ecology and Distribution of Animals,Kedarnath Ramnath. 1989
2.Kendeigh,S.C. Animal Ecology. Prentice Hall.2nd Edition, 1961.
3.Sharma,P.D. Ecology and Environment. Rastogi Publications. Meerut. 1990.
4. Southwick,C.H. Ecology and the quality of Environment. D.VasNostrand Co. 1976.
5. Verma, P.S. and V.K. Agarwal, Principles of Ecology. S.Chand& Co. NewDelhi. 1996.
6. Dowdeswell,P.M. The Mechanism of Evolution, Heinemann London 2nd Edition, 1956, Mayr.El. Animal species and evolution.Harvard University Press. (1963).

SEMESTER – V

CORE PRACTICAL 111
ANIMAL PHYSIOLOGY, IMMUNOLOGY AND ECOLOGY

Course Code: 18UZO5CP3 **Total Marks: 100**
Hours: 4 **External Marks: 60**
Credit: 4 **Internal Marks: 40**

OBJECTIVES:

- To study the biochemical constituents of macromolecules in animal systems;
- To impart knowledge on immune systems, the benefits of productive insects,
- To develop skill in estimating environmental parameters.

Animal Physiology

1. Human Salivary Amylase activity in relation to Temperature and pH
2. Effects of Temperature on the ciliary activity of Freshwater Mussel and calculation of Q10
3. Identification of Nitrogenous Waste Products.
4. Total count of RBC and WBC & Differential count of WBC.
5. Quantitative tests for Carbohydrates, Proteins, and Lipids.
6. Simple tests for Sugar, Albumin, and Urea in Human Urine.
7. Estimation of Haemoglobin.
8. Estimation of the rate of O2 consumption in fish with reference to body weight.

Spotters

Centrifuge, pH meter, Colorimeter, ECG, Sphygmomanometer, pregnancy test kit, Haemoglobinometer, Haemocytometer, Amino acids Model.

Immunology

Primary and Secondary Lymphoid organs in fish, Immunoglobulins: IgA, IgG, IgM and IgE. Spotters: Immunoelectrophoresis – ELISA, Blotting techniques: Southern-Northern and Western.

Ecology

1. Estimation of dissolved oxygen
2. Estimation of salinity
3. Estimation of Calcium.
4. Mounting and identification of plankton (fresh water / marine)
4. Spotters: Animal association, Intertidal fauna, Secchidisc,Maximum and minimum thermometer, Barometer, Luxmeter.
5. Visit to a local polluted area – Solid waste / sewage treatment plant
6. Construction of a food web diagram based on a field visit.

Spotters: Animal association, PH meter, Turbidity meter, Electrical conductivity meter.

SEMESTER – V

MAJOR BASED ELECTIVE I-ECONOMIC ENTAMOLOGY

Course Code: 18UZO5MBE1 **Total Marks: 100**
Hours: 5 **External Marks: 75**
Credit: 5 **Internal Marks: 25**

OBJECTIVES:

- To enlighten the students on beneficial and harmful insects, their biology, their nature of damage and their management measures.
- To teach our students about pests which attack our crops and their management measures.

UNIT I

Insect Pests: Definition - Classification- Primary and Secondary pests – Major and Minor pests – Pests of Paddy, Sugarcane, Cotton – Their Biology, Nature of damage and management methods (Any four Major pests for each crop) – Pest outbreak - Pest resurgence - Pests of stored products and their Management methods.

UNIT II

Principles of insect control: Prophylactic measures – An overview of cultural, mechanical, physical, biological and chemical methods. Pesticides – classification, types of pesticide formulation, mode of action, toxicity. – Nonconventional methods of Insect Management – Insect Growth Regulators (IGRs), Repellents, Antifeedents, Pheromones, Chemosterilants, Irradiation, Quarantine methods– Botanical Pesticides and their use in management of insect pests of crops

UNIT III

Integrated Pest Management (IPM): Definition and Integration of methods.Potential components of IPM and its application.Insect plant interactions. Pest – Predator Complex - Ecological balance – Economic Threshold Levels (ETLs)

UNIT IV

Beneficial insects: Economic importance of honey bee; silk worm and lac insect - Pollinators, soil builders and scavengers. Biological control agents of Insect Pests – Pathogens, Parasites and Predators – Utilization of Bio-control agents in managing insect pests.

UNIT V

Insects and Diseases: Biology of insect vectors *i.e.*, Housefly, Mosquito, Flea and Cockroaches. Mode of transmission pathogens and epidemiology of typhoid fever, dengue, plague.

TEXT BOOKS

1. David, B.V.2001. Elements of Economic Entomology. Popular Book Depot, Chennai.
2. Fenemore, P.G. and Prakash, A. 2006. Applied Entomology. New Age International (P) Limited Publishers, New Delhi.

REFERENCES

1. Chapman, R. F. 1988. The Insects Structure and function. Cambridge University Press, U.K.
2. Kumar, A. and Nigam, P.M. 2003. Economic and Applied Entomology.Emkay Publications, Delhi.
3. Pedigo, L.P.2003. Entomology and pest management.Pearson Education (Singapore) Pvt. Ltd., Delhi.
4. Prakash, I and Mathur, R.P.1987. Management of Rodent Pests. ICAR, New Delhi.
5. Singh, R. and Sachan, G.C. 2004. Elements of Entomology.Rastogi Publications, Meerut.
6. Fitzwater, W.D. and Prakash, I. 1989. Handbook of vertebrate pest control. ICAR, New Delhi.
7. Ambrose, D.P. 2004.General Entomology. Kalyan Publishers, West Bengal.
8. Rathinasamy, T.K.1986. Medical Entomology.SViswanathan and Co., Madras, India.

SEMESTER – V

SKILL BASED ELECTIVE 11 – APPLIED ZOOLOGY

Course Code: 18UZO5SBE2 **Total Marks: 100**
Hours: 2 **External Marks: 75**
Credit: 2 **Internal Marks: 25**

OBJECTIVES:

- To disseminate information on economic aspects of Zoology and thereby motivate for self-employment.

UNIT I

Vermiculture: Classification of earthworm; Species of Earthworms – Life cycle of *Lampitomauritii*– Preparation of vermin bed; vermiwash; Vermicompost – Economic importance. Earthworms in medicine – bio waste management -Organic farming.

UNIT II

Apiculture: Classification of honey bee; Species of Honey Bees – colonial structure of honey bee – Biology of Honey bee – Types of bee hives –Extraction of honey – Nutritive and medicinal value of honey.

Lac culture: Classification of lac insect – species of lac insect – host plant; Types; Life cycle of Lac insect – Extraction of Lac – Processing – purification – Economic importance of Lac, Uses of Lac: Medicinal – Industrial – Ornamental.

UNIT III

Sericulture: Classification; Species; Life cycle of *Bombyxmori*. Rearing of silk worm: Paraffin paper rearing – Box rearing – New net method – Co-operative methods.Moriculture – types of mulberry plants – planting methods. Diseases of silk worm: Protozoan – Bacterial - Viral diseases (each two) - Reeling of silk –Economic importance of sericulture.

UNIT IV

Aquaculture: Freshwater fishes (Indian major carps) – Site selection and construction of pond – Fish feed – Induced breeding – Fish diseases – rearing methods: Furunculosis, Epizootic Ulcerative Syndrome (EUS) and Vibriosis – Fresh water Prawn culture. Ornamental fish culture.

UNIT V

Poultry farming: Types of fowls – Rearing methods of Broilers and Layers –Poultry nutrition – Poultry diseases (NCD, IBV & Fowls). Issues and limitations of poultry farming.

Dairy farming: Breeds of Dairy animals (Cow, Buffalo and Goat) and their characteristics.

TEXT BOOK

1. Ganga.G and SulochanaChetty. J., An introduction to Sericulture(2nd edition) Oxford & IBH Publishing company.

REFERENCES

1. Shukla.G.S. andUpadhya.V.B. Economic Zoology (Rastogi Publications).
2. Ahsan, J and Sinha, S.P. A Handbook on Economic Zoology, S.Chand& Co.
3. Sardersingh – Beeking in India.
4. Santhanam – Aquaculture.
5. Ullal.S.R. andNarasimhanna, M.N – Central Silk Board, Govt. of India, Bombay.
6. Singh – Livestock and poultry production.
7. Jhingran – Fish and fisheries.
8. T.V.R. Pillai – Coastal Aquaculture.
9. Maine product export development authority – Freshwater fishes, Ornamental fishes, Shrimph culture – MPEDA Publication series.

SEMESTER – V

SKILL BASED ELECTIVE 111 – HEALTH EDUCATION

Course Code: 18UZO5SBE3 **Total Marks: 100**
Hours: 2 **External Marks: 75**
Credit: 2 **Internal Marks: 25**

OBJECTIVES:

- To impart awareness on Public Health and Hygiene and to create knowledge on Health Education.

UNIT I

Health: Definition – Dimensions of health. Health education: Definition – principles. Nutrition and health: Balanced diet: macronutrients –micronutrients – vitamins and minerals. Food hygiene: perishable – nonperishable –shelf life – sterilization – food poisoning.

UNIT II

Environment & Health: Water, Air and Noise pollution. Pollutants: Effects,prevention and control. Effects of smoking and alcoholism. Causes effects and control measures of Life style diseases: Stroke - Obesity – type 2 diabetes

UNIT III

Concept of disease: Phases of disease – Prepathogenesis and Pathogenesis –concept of prevention and control – Common Helminthic and Arthropod borne diseases. Immunity: Types of vaccinations – Live – Attenuated – Killed – Toxoid –Transgenic vaccines.

UNIT IV:

Air and Water Born Diseases: Bacterial and Viral diseases – Causative agents and factors. Mode of transmission: air – water – droplets – contact. Symptoms and treatment of Tuberculosis, Typhoid, Hepatitis A & B.

UNIT V

Mental Health: Definition - characteristics – causes and prevention of mental health - Occupational health & hazards – prevention. Health care services – Primary health care – Hospitals – Principles of First Aid – First aid procedures for Accidents, food poisoning, snake bites and heart attacks.

TEXT BOOK:

1. E. Park & Park: Textbook of Preventive and SocialMedicine (Published by BanarsidosBhanot, 1st Edition, 1278 Napier Town.)

REFERENCES:

1. Leelavathy. S. Nair, Revised enlarged edition. A Text book of Invertebrates, Saras Publications. 2001

SEMESTER – V1

CORE COURSE V111- DEVELOPMENTAL BIOLOGY

Course Code: 18UZO6CC8 **Total Marks: 100**
Hours: 6 **External Marks: 75**
Credit: 6 **Internal Marks: 25**

OBJECTIVES:

- Developmental Biology is an experimental science, which provides understanding of the processes of early embryonic development,
- To analyze the mechanisms of development by experimental manipulation of developing embryos and to review current developments in the field of embryology.

UNIT I

Gametogenesis: Spermatogenesis – Cells in seminiferous tubules, Spermiogenesis, structure and types of sperm. Oogenesis – Growth of oocyte, vitellogenesis, organization of egg cytoplasm. Polarity and symmetry – Maturation of egg, egg envelops - Types of eggs.

UNIT II

Fertilization: External and Internal fertilization, sperm – egg interaction, physiological changes in the organization of egg cytoplasm - Theories of fertilization. Cleavage – Patterns of cleavage – radial, spiral and bilateral; Types – meroblastic, holoblastic and superficial - Factors affecting cleavage - Chemodifferentiation.

UNIT III

Blastulation – Types of blastula. Fate maps.Presumptive organ forming areas in Frog and Chick.Gastrulation in Frog and Chick - Morphogenetic movements - Development of brain and eye in Frog. Developmental stages of Chick embryo up to 96 hours and organogenesis.

UNIT IV

Foetal membranes in Chick and Mammals - Placentation in Mammals- types and physiology.Organizer concept and embryonic induction.Regeneration in Planarians and Amphibians.Metamorphosis in Amphibians.

UNIT V

Precautions and health care during Human Pregnancy and Gestationinfertility. Artificial Insemination – Concept of test tube baby - Birth control methods - Factors involved in Teratogenesis.

TEXT BOOK:

1. Beril., N. J.1974. Developmental Biology. Tata McGraw-Hill PublishingCompany Ltd. New Delhi.
2. Berry.A.K.2007. An Introduction to Embryology, Emkay Publications, NewDelhi-51.

REFERENCES:

1. Arumugam.N. 1998. Developmental Biology, Saras Publications,2. Balinsky, B.I. 1981. An Introduction to Embryology. W.B. SaundersCompany. Philadelphia.
3. S.Banerjee, Development Biology, Dominant Publishers, New Delhi
4. Verma, P.S. And Agarwal V.K. 2005. Chordate Embryology (DevelopmentalBiology) S. Chand&Company Ltd., New Delhi.

5. Veer balarastogi, Developmental biology, Kedarnath Ram nath publishers, meerut.
6. Rastogi, V.B and Jayaraj, M.S. 2002. Developmental Biology KedarNath Ram Nath, Meerut.
7. Twymann, R.M. 2003. Developmental Biology. Viva Books Private Ltd., New Delhi.

SEMESTER – V1

CORE COURSE 1X - EVOLUTION

Course Code: 18UZO6CC9 **Total Marks: 100**
Hours: 6 **External Marks: 75**
Credit: 6 **Internal Marks: 25**

OBJECTIVES

- To introduce the major principles of evolutionary theory, and ranges from the origins of life, through the evolution of animal to the evolution of behaviour.
- To have a clear understanding about the concept and theories of evolution.

UNIT I

Lamarckism:Postulates of Lamarckism:,Summary of four postulates of Lamarckism, Evidences in favour of Lamarckism, Neo-Lamarckism Significance:Criticism of Lamarckism.

UNIT II

Darwinism- Theory of Natural Selection, Postulates of Darwinism,Evidences in favour of Darwinism:Evidences against Darwinism. Neo-Darwinism or Modern Concept or Synthetic Theory of Evolution: Postulates of Neo-Darwinism:

UNITIII

Hugo de Vries- Mutation Theory of Evolution, Evidences in favour of Mutation theory Evidences against Mutation theory.

UNIT- IV

Concept and theories of evolution: Evidences of Evolution: Morphological and Anatomical (Homologous,Analogous and vestigial organs), Embryological evidences, Paleontological, Physiological and Biochemical evidences – Elemental forces of evolution: Selection, Recombination, Isolation, Migration, Mutation and Genetic drift. Patterns of Evolution; Sequential Evolution, Divergent Evolution, Microevolution and Macroevolution, Mimicry.

UNIT - V

Evolutionary time scale and evolution of man: Geological time scale: Eras, Periods and Epochs – Fossils: Types and Formation – Dating of fossils. Extinction: Types, causes – Extinct animals- Living fossils – Connecting Links – Missing Links. Evolution of Man – Cultural and Biological evolution– Future evolution.

TEXT BOOKS

1. Savage. Evolution, Modern Biology Series, 3rdEdotion, 1969.
2. Simpson,G.G. The major features of Evolution, CUP.(1953).
3. Arumugam, N, 2006. Organic Evolution, Saras publication, Nagercoil.

REFERENCE

1. Unlocking the Mystery of Life," documentary by Illustra Media, 2002.
2. Michael Denton, "Evolution: A Theory in Crisis," 1986, p. 250.

SEMESTER – V1

CORE PRACTICAL -IV
DEVELOPMENTAL BIOLOGY AND EVOLUTION

Course Code: 18UZO6CP4 **Total Marks: 100**
Hours: 5 **External Marks: 60**
Credit: 5 **Internal Marks: 40**

OBJECTIVES:

- To learn the Developmental stages of animals.To learn the genetic importance of animals.

Developmental Biology

1. Observation of the structure of live spermatozoa of Bull.
2. Observation of prepared micro slides to study
a. Egg, cleavage, blastula and yolk plug stage in frog.
b. Egg, 24 hrs, 36 hrs, 48 hrs, 72 hrs and 96 hrs developmental stages in frog

Evolution

1. Animals of evolutionary importance: Peripatus, Limulus, Archaeopteryz.
2. Homologous organs: Forelimbs of Frog.
3. Analogous organs: Wings of Insects and Birds.
4. Fossils: Trilobite, Nautilus.
5. Mimicry: Leaf insects, Stick insects, Monarch and Viceroy butterfly.
6. Colouration: Chameleon, Lycodon.

SEMESTER – V1

MAJOR BASED ELECTIVE –II
BIOPHYSICS AND BIOSTATISTICS

Course Code: 18UZO6MBE2 **Total Marks: 100**
Hours: 6 **External Marks: 75**
Credit: 5 **Internal Marks: 25**

OBJECTIVES:

- The objective of Biostatistics is to emphasis basic idea about the Biostatistics and its application.
- The Biophysics course is to emphasis the principle and biological applications of Microscope, chromatograph, electrophoresis and spectroscope.

UNIT I
Scope of Biophysics in Biology- structure and properties of atoms and molecules- chemical bonds – types – molecular interactions – Colloids description andproperties.Thermodynamic principles – Membrane biophysics– diffusion, active transport.Tyndall effect, Surface tension, Brownianmovement, filtration, osmosis, and dialysis.

UNIT II
Biophysical instruments: Introduction- Principles-, description and applications of pH meter, analytical and ultracentrifuge, colorimeter, visible spectroscopy, electrophoresis, chromatography and Micrometry.

UNIT III
Biostatistics: Collection of Data – Types - Classification and tabulation of data - Presentation of data: Bar diagram and its types, Pie diagram, Histogram, Frequency polygon, Frequency curve and Ogives - Types of variables: Continuous and discontinuous variables, Qualitative and quantitative variables.

UNIT IV
Measures of Central tendency: Mean, Median and Mode - Uses and calculation of Mean, Median and Mode. Measures of dispersion: Range and Standard deviation calculations and uses. Co-efficient of variation and Standard Error.

UNIT V
Correlation analysis: Types and methods of studying correlation – Scatter diagram, Karl Pearson's co-efficient of correlation and Rank correlation. Regression analysis based on biological data. Testing of hypothesis: Chi-square test, Student *t* test – ANOVA: one way and two way analysis.

TEXT BOOK:

1. Daniel, M. 1992 – Basic Biophysics and Biologists, Wiley International, New Delhi.
2. Gupta S.P. Statistical Methods, Sultan Chand & Sons Publishers, New Delhi
3. Palanichamy S, and Manoharan M, Statistical Methods for Biologists, Palani Paramount Publications, Palani.

REFERENCES:

1. Das, D. 1996 – Biophysics and Biological Chemistry, Academic Publishers, Calcutta.
2. Bailey, N.T.J (1997) Statistical methods in Biology, III Ed., Cam. University Press, N.Y.
3. Ramakrishnan 2007 Biostatistics, Saras Publications, Periavilai, Nagaercoil
4. Khan &Khanum 1994 Fundamental of Bostatistics, Ukaaz Publications, Hyderabed
5. Snadecor, G.W. and W.G.Cochran (1967) – Statistical methods, Oxford &IBH Publishing, New Delhi.
6. Sokal, R and James, F (1973), Introduction to Biostatistics, W.H. Freeman and Company Ltd., Tokyo, Japan.
7. Zar, J.H. (1974) – Bio statistical analysis – Prentice Hall Inc., New Jersey, USA.

SEMESTER – V1

MAJOR BASED ELECTIVE 111 – HUMAN DISEASES

Course Code: 18UZO6MBE3 **Total Marks: 100**
Hours: 6 **External Marks: 75**
Credit: 5 **Internal Marks: 25**

OBJECTIVES

- To help the students study the human diseases and causative agents.
- To make them examine and understand proper control procedures.

UNIT- I
Communicable Diseases: Symptoms, Prevention and Control of Communicable Diseases and Community Diagnosis: Tuberculosis, HIV, Anemia's.
UNIT-II
Non-Communicable Diseases: Symptoms, Prevention and Control of Non-Communicable Diseases and Community Diagnosis:Alzheimer's,Asthma,Chronic Kidney Disease,Diabetes.
UNIT-III
Hereditary disease: Symptoms, Prevention and Control of Diseases and Community Diagnosis:cystic fibrosis, sickle cell anemia,Marfan syndrome
UNIT-IV
Zoonatic disease-Symptoms, Prevention and Control measures: Anthrax,Animalinfluenza,Avian influenza.
UNIT-V
Nutritional deficiency-Symptoms, Prevention and Control of Diseases and Diagnosis:RicketsGoiter,Beriberi.

TEXT BOOKS:

Textbook of human disease in dentistry*by M. Greenwood, R. A. Seymour & J. G. Meechan* UK: Wiley-Blackwell price £39.99; pp 325 ISBN 9781405170338.

REFERENCES

1 White, Tim (19 December 2014). "What is the Difference Between an 'Injury' and 'Disease' for Commonwealth Injury Claims?".TindallGask Bentley. Archived from the original on 27 October 2017.Retrieved 6 November 2017.
2. "What is the deadliest disease in the world?".WHO. 16 May 2012. Archived from the original on 17 December 2014.Retrieved 7 December 2014.