DEPARTMENT OF ZOOLOGY

COURSE STRUCTURE & SYLLABI
(For the students admitted from year 2023-2024 onwards)

Programme : B.Sc. Zoology

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JAMAL MOHAMED COLLEGE (AUTONOMOUS)
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(Affiliated to Bharathidasan University)
TIRUCHIRAPPALLI – 620 020

B.Sc. ZOOLOGY

Sem	Course Code	Part	Course Category	Course Title	Ins. Hrs/ Week	Credit	Marks		Total
							CIA	ESE	
I	23U1LT1/LA1/LF1/ LH1/LU1	I	Language - I		6	3	25	75	100
	23UCN1LE1	II	English - I	English for Communication - I	6	3	25	75	100
	23UZO1CC1	III	Core - I	Biology of Invertebrates	5	5	25	75	100
	23UZO1CC2P		Core - II	Biology of Invertebrates - Practical - I	3	3	20	80	100
	23UCH1AC1:2		Allied - I	Inorganic, Organic and Physical Chemistry - I	5	4	25	75	100
	23UCH1AC2P		Allied - II	Volumetric Estimations - Practical	3	2	20	80	100
	23UCN1AE1	IV	AECC - I	Value Education	2	2	-	100	100
				Total	**30**	**22**			**700**
II	23U2LT2/LA2/LF2/ LH2/LU2	I	Language - II		6	3	25	75	100
	23UCN2LE2	II	English - II	English for Communication - II	6	3	25	75	100
	23UZO2CC3	III	Core - III	Biology of Chordates	6	6	25	75	100
	23UZO2CC4P		Core - IV	Biology of Chordates - Practical - II	3	3	20	80	100
	23UCH2AC3:2		Allied - III	Inorganic, Organic and Physical Chemistry - II	4	4	25	75	100
	23UCH2AC4 P		Allied - IV	Organic Analysis - Practical	3	2	20	80	100
	23UCN2SS	IV	Soft Skills Development	Soft Skills Development	2	2	-	100	100
	23UCN2CO	V	Community Outreach	JAMCROP	-	@	-	-	@
	23U2BT1 / 23U2AT1		Basic Tamil - I / Advanced Tamil - I	எழுத்தும் இலக்கியமும் அறிமுகம் - I / தமிழ் இலக்கியமும் வரலாறும் - I	-	-	-	100#	-
	@Only grades will be given			**Total**	**30**	**23**			**700**
III	23U3LT3/LA3/LF3/ LH3/LU3	I	Language - III		6	3	25	75	100
	23UCN3LE3	II	English - III	English for Communication - III	6	3	25	75	100
	23UZO3CC5	III	Core - V	Cell & Molecular Biology	4	4	25	75	100
	23UZO3CC6P		Core - VI	Cell & Molecular Biology - Practical - III	3	3	20	80	100
	23UBO3AC5		Allied - V	Applied Botany - I	4	4	25	75	100
	23UBO3AC6P		Allied - VI	Laboratory Course for Applied Botany - I - Practical	3	2	20	80	100
	23UZO3GE1	IV	Generic Elective - I		2	2	-	100	100
	23UCN3AE2		AECC - II	Environmental Studies	2	2	-	100	100
				Total	**30**	**23**			**800**
IV	23U4LT4/LA4/LF4/ LH4/LU4	I	Language - IV		6	3	25	75	100
	23UCN4LE4	II	English - IV	English for Communication - IV	6	3	25	75	100
	23UZO4CC7	III	Core - VII	Animal Physiology and Ethology	5	5	25	75	100
	23UZO4CC8P		Core - VIII	Animal Physiology and Ethology - Practical - IV	3	3	20	80	100
	23UBO4AC7		Allied - VII	Applied Botany - II	5	4	25	75	100
	23UBO4AC8P		Allied - VIII	Laboratory Course for Applied Botany - II - Practical	3	2	20	80	100
	23UZO4GE2	IV	Generic Elective - II		2	2	-	100	100
	23UCN4EL		Experiential Learning	Internship	-	2	-	100	100
	23UCN4EA	V	Extension Activities	NCC, NSS, etc.	-	1	-	-	-
	23U4BT2 / 23U4AT2		Basic Tamil - II / Advanced Tamil - II	எழுத்தும் இலக்கியமும் அறிமுகம் - II / தமிழ் இலக்கியமும் வரலாறும் - II	-	-	-	100#	-
				Total	**30**	**25**			**800**
V	23UZO5CC9	III	Core - IX	Biostatistics, Bioinformatics & Computer Application in Biology	6	6	25	75	100
	23UZO5CC10		Core - X	Genetics	5	5	25	75	100
	23UZO5CC11		Core - XI	Microbiology and Parasitology	5	5	25	75	100
	23UZO5CC12		Core - XII	Developmental Biology	5	5	25	75	100
	23UZO5DE1AP/BP		Discipline Specific Electives - I		5	4	20	80	100
	23UZO5SE1	IV	Skill Enhancement Course - I	Applied Zoology & Entomology	2	1	-	100	100
	23UZO5SE2		Skill Enhancement Course - II	Poultry Science	2	1	-	100	100
	23UZO5EC1		Extra Credit Course - I*	Online Course	-	*	-	-	-
				Total	**30**	**27**			**700**
VI	23UZO6CC13	III	Core - XIII	Biochemistry and Biophysics	6	6	25	75	100
	23UZO6CC14		Core - XIV	Immunology	6	6	25	75	100
	23UZO6CC15		Core - XV	Environmental Biology and Evolution	5	5	25	75	100
	23UZO6PW		Project Work	Project Work	3	2	-	100	100
	23UZO6DE2AP/BP		Discipline Specific Electives - II		5	4	20	80	100
	23UZO6DE3A/B		Discipline Specific Electives - III		4	4	25	75	100
	23UCN6AE3	IV	AECC - III	Gender Studies	1	1	-	100	100
	23UZO6EC2		Extra Credit Course - II*	Online Course	-	*	-	-	-
	23UZOECA		Extra Credit Course for all**	Online Course	-	**	-	-	-
	*** Programme Specific Online Course for Advanced Learners** **** Any Online Course for Enhancing Additional Skills**			**Total**	**30**	**28**			**700**
				Grand Total		**148**			**4400**

GENERIC ELECTIVE COURSES

Semester	Course Code	Course Title
III	23UZO3GE1	Human Nutrition and Health
IV	23UZO4GE2	Vermiculture Technology and Organic Farming

Self-Study Course – Basic and Advanced Tamil

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

Semester	Course Code	Course Title
II	23U2BT1	Basic Tamil – I (எழுத்தும் இலக்கியமும் அறிமுகம் - I)
	23U2AT1	Advanced Tamil – I (தமிழ் இலகக் ியமும் வரலாறும் - I)
IV	23U4BT2	Basic Tamil – II (எழுத்தும் இலக்கியமும் அறிமுகம் - II)
	23U4AT2	Advanced Tamil – II (தமிழ் இலகக் ியமும் வரலாறும் - II)

Mandatory

Basic Tamil Course - I and II are offered for the students who have not studied Tamil Language in their schools and college.

Advanced Tamil Course - I and II are offered for those who have studied Tamil Language in their schools but have opted for other languages under Part - I.

DISCIPLINE SPECIFIC ELECTIVES

Semester	Course Code	Course Title
V	23UZO5DE1AP	Biostatistics & Bioinformatics & Computer application in Biology, Genetics, Microbiology and Developmental Biology - Practical - V
	23UZO5DE1BP	Bioinstrumentation - I Practical
VI	23UZO6DE2AP	Biochemistry and Biophysics, Immunology, Economic Entomology and Environmental Biology and Evolution - Practical - VI
	23UZO6DE2BP	Bioinstrumentation - II - Practical
VI	23UZO6DE3A	Biotechnology
	23UZO6DE3B	Introduction to Research Methodology

ALLIED ZOOLOGY FOR B.Sc. BOTANY

Sem	Course Code	Part	Course	Course Title	Ins. Hrs/ Week	Credit	Marks		Total
							CIA	ESE	
III	23UZO3AC5	III	Allied - V	General Zoology	4	4	25	75	100
	23UZO3AC6P		Allied - VI	General Zoology - Practical - I	3	2	20	80	100
				Total	**7**	**6**			**200**
IV	23UZO4AC7	III	Allied - VII	Economic Zoology	5	4	25	75	100
	23UZO4AC8P		Allied - VIII	Economic Zoology - Practical - II	3	2	20	80	100
				Total	**8**	**6**			**200**
				Grand Total	**15**	**12**			**400**

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UZO1CC1	Core – I	5	5	25	75	100

Course Title	BIOLOGY OF INVERTEBRATES

SYLLABUS

Unit	Contents	Hours
I	**Taxonomy & Protozoa** **Principles and methods of taxonomy:** Concepts of species and hierarchical taxa, biological nomenclature, classical and quantitative methods of animal taxonomy. **Protozoa** : General characters and classification of Protozoa up to classes **Type study:** Paramecium - general organization, nutrition, and reproduction. **General topics:** Plasmodium life cycle, Protozoan diseases in Man; Malaria, Leishmaniasis * Trichomoniasis, and Amoebiasis. *	**15**
II	**Porifera & Coelenterata** General characters and classification up to classes. **Type study**: Sycon- general organization and reproduction. **Type study**: Obelia- Structure of Obelia colony, Medusa and reproduction in Obelia. **General topics:** Canal system in Sponges, Corals and * coral types * and Coral Reefs. Polymorphism in Coelenterates	**15**
III	**Platyhelminthes & Aschelminthes** General characters and outline classification up to classes. **Type study:** Liver fluke (Fasciola)-Morphology, excretory and reproductive System and lifecycle. **Type study:** Ascaris- Morphology, excretory and reproductive system. **General topics**: Helminth parasites in Man. *Economic importance of Nematodes*. Regeneration in Planaria	**15**
IV	**Annelida & Arthropoda** General characters and classification up to classes. **Type study:** Earthworm-Morphology, digestive, excretory and reproductive System. **Type study**: Grass Hopper morphology, digestive, Excretory and reproductive systems. **General topics:** Larval Forms in Crustacea, Mouth parts in Insects. * Evolutionary significance of Peripatus*	**15**
V	**Mollusca & Echinodermata** General characters and classification up to classes. **Type study:** Snail (Pila) – Morphology, Digestive, Respiratory, Excretory, and Reproductive systems. **Type study:** Starfish - Morphology, Water vascular system. Nutrition. **General topics:** Larval forms of Echinoderms. *Economic importance of Molluscs and Echinoderms *. Minor phyla: General account on Rotifera and Ectoprocta	**15**
VI	**Current Trends (For CIA only)** Hydra as experimental organism, Invertebrate fauna count in aquatic system, Pathological importance, Bio chemicals extraction from sepia, Glochidium larva culture and sauce preparation. Sea cucumber and its values, Protozoa and rotifers as bio indicators.	

……. Self Study

Text Book(s):
1. Ekambaranatha Ayyar, Outlines of Zoology. Vols. I & II S. Viswanathan (Printers &Publishers) Pvt. Ltd., Chennai. 1993.
Reference Book(s):
1. Jordan, E.L. and Verma. P. S. Invertebrate Zoology, S. Chand & Co. 3 rd Edition,2007. 2. Kotpal, R.L. Invertebrates, Rastogi Publication, Meerut. 11th Edition, 2017.
Web Resource(s):
1. Invertebrates | NOAA Fisheries 2. Invertebrate - an overview | Science Direct Topics 3. Invertebrate - New World Encyclopedia 4. DOCCM-3000682 Invertebrates: invertebrate identification aids 5. Biology of Invertebrate Chordates (thoughtco.com)

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Acquire knowledge on animal taxonomy and biology of Protozoans. Ability to classify Protozoans.	**K1**
CO2	Classify Porifera and Coelenterata and acquire knowledge on Poriferans and Coelenterates.	**K2**
CO3	Describe taxonomy of Platyhelminthes and Aschelminthes and acquire knowledge on the biology of Platyhelminthes and Aschelminthes.	**K3**
CO4	Classify Annelida and Arthropoda and acquire knowledge on the biology of Annelids and Arthropods.	**K4**
CO5	Report the classifying features of Mollusca and Echinodermata and acquire knowledge on the biology of Molluscs and Echinoderms.	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	3	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
CO2	**3**	3	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
CO3	**3**	3	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
CO4	**3**	3	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
CO5	**3**	3	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
										Mean Overall Score	**2.7**
										Correlation	**High**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Mr. S.N. Sheik Umar Sahith

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UZO1CC2P	Core – II	3	3	20	80	100

Course Title	BIOLOGY OF INVERTEBRATES - PRACTICAL - I

SYLLABUS	
Contents	**Hours**
Major Practical: Cockroach / Silk moth /Silkworm/ Earthworm -Nervous, Digestive and Reproductive systems Prawn – Nervous system	**45**
Minor Practicals: Identification of Mosquitoes (At genera level) Earthworm - Body setae & Penial setae Mouth parts -Honey Bee, Housefly, Mosquito, and Cockroach. Prawn - Appendages	
Spotters: **a) Classify giving reasons:** Entamoeba, Paramecium, Euglena, Sycon, Hydra, Obelia, Aurelia, Sea anemone, Planaria, Taenia, Ascaris, Nereis, Palaemon, Penaeus, Crab, Spider, Butterfly, Rhinoceros beetle, Pila, Freshwater mussel, Octopus, Chiton, Dentalium, Sepia, Starfish, Sea urchin and Sea cucumber **b) Draw Labelled Sketch:** T.S. of Taenia, T.S. of Fasciola, Ephyra larva, Nauplius larva, Zoea larva	
Spotters: **c) Biological Significance:** Sponge – Gemmule, Physalia, Leech, Peripatus, Limulus, Bipinnaria, **d) Relate structure and function:** Taenia –Scolex, Nereis – Parapodium, Penaeus –Petasma, Star fish –Tube feet and Pedicellariae, Earthworm - Body setae and Penial setae	
Group Project: Culture of Brine shrimp/ Drosophila/ Chironomous/ Plankton **Record:** A record of lab work shall be maintained and submitted at the time of Practical examination for valuation. **Field study:** Visit to any ecological park and submission of report with photographs Mosquito species identification Larval culture and importance	

Text Book(s):

1. Lal S S Practical Zoology of Invertebrates, Rastogi publications India 2010.

Reference Book(s):

1. Brusca&Brusca. Invertebrates, Second Edition. Sinauer Assoc., Inc. Sunderland, MASS, USA.2003.
1. Meglitsch,P.A. and Schram,F.R. Invertebrate Zoology (Third Edition). Oxford
2. UniversityPress,New York. 1991..

Web Resource(s):

1. http://www.itis.usda.gov/itis/status.html
2. http://www.bishop.hawaii.org/bishop/HBS/hbs1.html

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the different functional systems of Cockroach, Silk moth through dissection	**K1**
CO2	Identify and prepare slides of various Invertebrate species to study their structures	**K2**
CO3	Classify providing apt features for the taxonomy, draw labelled sketches along with their biological significance	**K3**
CO4	Relate the structure and functions of selected Invertebrates	**K4**
CO5	Culture a few live feed organisms; make a thorough study on given ecosystem.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**2.7**
CO2	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**2.7**
CO3	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**2.7**
CO4	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**2.7**
CO5	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**2.7**
Mean Overall Score											**2.7**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Mr. S.N. Sheik Umar Sahith

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UCH1AC1:2	Allied – I	5	4	25	75	100

Course Title	Inorganic, Organic and Physical Chemistry – I

SYLLABUS		
Unit	**Contents**	**Hours**
I	**PERIODIC PROPERTIES, INDUSTRIAL GASES AND INSECTICIDES** **1.1 Periodic properties**: Ionization potential, *electron affinity* and electro negativity - Definition, factors affecting and variation in the periodic table. **1.2 Industrial Gases:** Fuel gases composition and Preparation of Water gas, Producer gas, LPG, Gobar gas and Natural gas. **1.3 Insecticides:** Introduction – Lists of various pesticides, methods of pest control, methods of using pest control chemicals. Insecticides – Arsenic compounds, Bordeaux mixture DDT and BHC.	**15**
II	**BIOMOLECULES** 2.1. **Carbohydrates:** Classification. Glucose and fructose – Preparation, properties and uses. Sucrose –Manufacture and properties. Starch and cellulose – uses. 2.2. **Amino Acids and Proteins:** Amino acids – Definition, classification – Essential and non essential, preparation and properties of glycine – Peptide bond – Proteins – Classification based on physical properties and biological functions. 2.3. **Nucleic acids:** DNA and RNA – Differences between DNA and RNA, functions - *Structure of DNA*.	**15**
III	**BLOOD AND POLYMERS** 3.1. **Blood and Haematological agents:** Blood – Composition of blood, Blood grouping and matching, Clotting of blood. Haematological agents – Coagulants – Vitamin K and Protamine sulphate. Anticoagulants – Coumarine and Heparin. 3.2**. Polymers:** Definition, classifications of polymers – Natural and synthetic polymers, Thermoplastic and thermosetting polymer. Addition and condensation polymerization. Preparation, properties and uses of polyethylene, *PVC, Teflon*, polystyrene, nylon 6, 6, and Bakelite.	**15**
IV	**SEPARATION AND PURIFICATION TECHNIQUES** 4.1 **Separation Techniques:** Distillation-steam, *fractional* and azeotropic distillation, crystallization – principles, working techniques and applications. 4.2 **Chromatography** – Paper, thin layer chromatography, HPLC and GC-MS - principle, experimental techniques and applications.	**15**
V	**ACIDS - BASES AND CATALYSIS** 5.1. **Acids-Bases:** Arrhenius, Lowry-Bronsted and Lewis concepts of acids and bases, pH, buffer solution, Henderson-Hasselbalch equation and its importance (no derivation) - Biological importance of pH and buffer solutions in living system. 5.2 **Catalysis:** Catalysis – Importance of catalysis. Types of catalysis - Homogeneous and heterogeneous catalysis, factors affecting catalysis. Definitions of catalytic promoter, *catalytic inhibitor, catalytic poison*. Theory of enzyme catalysis.	**15**

……. Self Study

Text Book(s):

1. P. L. Soni, Text book of Inorganic Chemistry, S. Chand & Co., New Delhi, Revised Edition, 2017
2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co., New Delhi, First Edition, 2006
3. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Vishal Publications, Jalandhar, 48th Edition, 2019

Reference Book(s):
1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, Shoban Lal, Nagin Chand & Co. New Delhi, 23rd, 1993 2. Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Co., New Delhi, 19th Edition, 2005 3. R. L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, S. Chand & Co., New Delhi, 5th Revised and Enlarged, 2009
Web Resource(s):
1. https://onlinecourses.nptel.ac.in/noc22_cy03/preview 2. https://www.toppr.com/ 3. https://byjus.com/chemistry/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Describe the periodic properties, polymers and catalysis	**K1**
CO2	Classify the carbohydrates, amino acids, proteins and appraise their applications.	**K2**
CO3	Apply chromatographic techniques	**K3**
CO4	Analyse the blood groups	**K4**
CO5	Evaluate the value of pH of a solution	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	3	3	3	3	3	3	**3**
CO2	2	2	2	2	2	2	2	2	2	2	**2**
CO3	2	2	2	2	2	2	2	2	2	2	**2**
CO4	2	2	2	2	2	2	2	2	2	2	**2**
CO5	2	2	2	2	2	2	2	2	2	2	**2**
										Mean Overall Score	**2.2**
										Correlation	**Medium**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: Mr. M. Varusai Mohamed

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UCH1AC2P	Allied – II	3	2	20	80	100

Course Title	VOLUMETRIC ESTIMATIONS - PRACTICAL

List of Practicals	Hours
Volumetric Estimation Practicals 1. Estimation of Sodium Hydroxide (Na_2CO_3 *Vs* HCl *Vs* NaOH) 2. Estimation of Hydrochloric Acid ($H_2C_2O_4$ *Vs* NaOH *Vs* HCl) 3. Estimation of Oxalic Acid ($FeSO_4$ *Vs* $KMnO_4$ *Vs* $H_2C_2O_4$) 4. Estimation of Ferrous Sulphate ($H_2C_2O_4$ *Vs* $KMnO_4$ *Vs* $FeSO_4$) 5. Estimation of Ferrous Ammonium Sulphate ($H_2C_2O_4$ *Vs* $KMnO_4$ *Vs* $(NH_4)_2Fe(SO_4)_2 \cdot 6H_2O$ 6. Estimation of $KMnO_4$ ($K_2Cr_2O_7$ *Vs* FAS *Vs* $KMnO_4$) 7. Estimation of Zinc by EDTA ($MgSO_4$ *Vs* EDTA *Vs* $ZnSO_4$) 8. Estimation of Magnesium by EDTA ($MgSO_4$ *Vs* EDTA *Vs* $MgSO_4$) **Scheme of valuation** **Record** – 10 Marks **Procedure writing** – 10 Marks **For Estimation** – 60 Marks **For Estimation Results:** 1-2% - 60 marks 2-3% - 50 marks 3-4% - 40 marks >4% - 30 marks	**45**

Text Books:

1. Peter McPherson, Volumetric Analysis, Royal Society of Chemistry, 1st Edition 2014.
2. K.B. Baliga et al., College Analytical Chemistry, Himalaya Publishing House, 19th Edition, 2011
3. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, S. Chand & Co Pvt. Ltd, New Delhi, 2nd Edition1997.

Reference Books:

1. Handbook Of Inorganic Qualitative Analysis by Maharudra Chakraborty, Scifinity Publication; 1st Edition 2019.
2. Vogel, Text Book of Quantitative Chemical Analysis,, Pearson Education, 6th edition ,2009.
3. Day R A., Underwood A l., Quantitative Analysis, New York: Pearson Emory University. Print. 6th edition, 1991

Web Resources:

1.https://www.studiestoday.com/useful-resources-chemistry-class-12-chemistry-practicals-volumetric-analysis-estimation-oxalic-0
2.https://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/classXI/chemistry/kelm206.pdf

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recall the principle of volumetric techniques and to classify the methods of preparation of solutions with different concentration.	**K1**
CO2	Estimate the concentration of a various solution	**K2**
CO3	Apply the principle of volumetric concept in the estimation	**K3**
CO4	Analyze the quality of portability of water	**K4**
CO5	Assess the quantity of chemical substance in a solution	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**1**	**2**	**2**	**2.5**
CO2	**3**	**3**	**3**	**3**	**1**	**3**	**3**	**2**	**2**	**2**	**2.5**
CO3	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**1**	**2.5**
CO4	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.6**
CO5	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**2.7**
Mean Overall Score											**2.56**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. K. Periyasamy

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UCN1AE1	AECC - I	2	2	-	100	100

Course Title	Value Education for Men

SYLLABUS		
Unit	**Contents**	**Hours**
I	**VALUES IN LIFE:** Purpose and philosophy of life – Need for values –five fold moral culture. Values: truth, loyalty, integrity, humility, trustworthy, considerate, not being greedy, clean habits, punctuality, kindness, gratitude, patience, respect and character building.	6
II	**PERSONAL WELLBEING**: Social responsibility - taming a healthy mind and body – personal hygiene - Balanced diet – meditation – yoga - positive thinking – introspection - a passion for Nature- Win-win strategy.	6
III	**ROLE OF MEN IN FAMILY**: As a responsible student – committed employee - loyal husband - dedicated father – fatherhood- sacrificing human – considerate true friend.	6
IV	**MAN A SOCIAL BEING**: A friendly neighbour - living a life with definite motives – emotions and moral desire- uncompromising will power- puberty- secondary sexual characters- marriage: Purpose – marital life- Harmony with spouse- fidelity towards spouse.	6
V	**PROFESSIONAL VALUES**: More of a giver than a taker - being compassionate – patriotism - respecting culture - dependence on God – avoiding worry- professional ethics.	6

Hours of Teaching: 5 Hours and Hours of Activity: 25 Hours

Textbook(s):

1. Value Education for health, Happiness and harmony, the world community service centre, Vethathri Publications
2. N. Venkataiah, Value Education, APH Publishing Corporation, New Delhi, 1998
3. K.R. Lakshminarayanan and M. Umamageshwari, Value Education, Nalnilam Publication, Chennai.

Web References:

1. https://www.slideshare.net/humandakakayilongranger/values-education-35866000
2. https://www.ananda.org/blog/5-secrets-to-a-harmonious-marriage/
3. https://www.un.org/esa/socdev/family/docs/men-in-families

Activity:

- Assignment on Values (not less than 20 Pages)
- Multiple Choice Questions and Quiz
- Elocution - (Manners and good Habits for 3 to 5 minutes)
- Field Visit
- Debating - Current issues
- Essay writing: Proper use of e-gadgets, Ethics, Cyber ethics, Social media, etc.,
- Case Study / Album Making / Poster Presentation / Documentary- Celebrating National Days, Drug abuse & illicit trafficking, Independence Day, Secularism, Teachers Day, National Youth Awakening Day, Father's Day / Mother's Day and etc.,

EVALUATION COMPONENT: TOTAL: 100 MARKS

Component I:

Documentary (or) Poster Presentation (or) Elocution - 25 marks

Component II:

Quiz (or) Multiple choice questions Test - 25 marks

Component III:

Album Making (or) Case Study on a topic (or) Field visit - 25 marks

Component IV:

Assignment (or) Essay Writing (or) Debating - 25 marks

Course Coordinator: Dr. M. Purushothaman

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UCN1AE1	AECC - I	2	2	-	100	100

Course Title	Value Education for Women

SYLLABUS		
Unit	**Contents**	**Hours**
I	**VALUES IN LIFE:** Purpose and philosophy of life – Need for values –five fold moral culture - Imbibing values: truth, loyalty, integrity, humility, trustworthy, considerate, not being greedy, clean habits, punctuality, kindness, gratitude, patience, respect and character building.	6
II	**FAMILY**: Nuclear – cluster – significance - social functions - changing trend - role of women in family - obedient daughter - purposeful youth- dedicated wife - caring mother.	6
III	**PUBERTY**: Need of knowledge of menstruation- menstrual symptoms – handling – menstrual disorder - maintaining good personal hygiene - motherhood- Stages of pregnancy- post pregnancy care.	6
IV	**MARRIAGE**: Types of marriage - purpose of marriage- love and infatuation – need for marital preparation - pre and post marital counselling - conflicts in marital life - divorce single parenthood.	6
V	**HARMONY WITH SPOUSE**: Husband and wife relationship - fidelity towards spouse-relationship among the family members. Tenets of bride for healthy family – kindness, respect, patience, care, love.	6

Hours of Teaching: 5 hours and Hours of Activity: 25 hours

Textbook(s):

1. Value Education for health, Happiness and harmony, the world community service centre, Vethathri Publications
2. N. Venkataiah, Value Education, APH Publishing Corporation, New Delhi, 1998
3. Betty, Carten and Meg Goldric, The Changing family life style - A Framework for Family Therapy, 2nd Edition, 2000.
4. Marie, Madearentas, Family Life Education, CREST-Centre for research education service training for family promotion, Bangalore, 1999.

Web References:

1. https://www.slideshare.net/humandakakayilongranger/values-education-35866000
2. https://www.ananda.org/blog/5-secrets-to-a-harmonious-marriage/
3. https://www.nap.edu/read/2225/chapter/14

Activity:

- Assignment on Values (not less than 20 Pages)
- Multiple Choice Questions and Quiz
- Elocution - (Manners and good Habits for 3 to 5 minutes)
- Field Visit
- Debating - Current issues
- Essay writing: Proper use of e-gadgets, Ethics, Cyber ethics, Social media, etc.,
- Case Study / Album Making / Poster Presentation / Documentary- Celebrating National Days, Drug abuse & illicit trafficking, Independence Day, Secularism, Teachers Day, National Youth Awakening Day, Father's Day / Mother's Day and etc.,

EVALUATION COMPONENT: TOTAL: 100 MARKS

Component I:

Documentary (or) Poster Presentation (or) Elocution - 25 marks

Component II:

Quiz (or) Multiple choice questions Test - 25 marks

Component III:

Album Making (or) Case Study on a topic (or) Field visit - 25 marks

Component IV:

Assignment (or) Essay Writing (or) Debating - 25 marks

Course Coordinator: Dr. M. Purushothaman

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UZO2CC3	Core – III	6	6	25	75	100
Course Title	BIOLOGY OF CHORDATES						

SYLLABUS		
Unit	**Contents**	**Hours**
I	**Protochordates and Pisces** **General characters and outline classification.** **Type study**: Amphioxus – Digestive, excretory and reproductive systems. **Type study**: Scoliodon & Mullet - External characters, Digestive, Respiratory, Circulatory, Nervous and Urinogenital systems **General Topic**: Retrogressive Metamorphosis in Urochordates, Evolutionary significance of Ostracoderms, * Fish migration*, Accessory respiratory organs in Fishes, Edible fishes of India.	**18**
II	**Amphibia** **General characters and outline classification.** **Type study:** Frog - External characters, Digestive, Respiratory, Circulatory, Nervous and Urinogenital systems **General Topic**: *Parental care in Amphibians*, Neoteny and Paedogenesis.	**18**
III	**Reptilia** **General characters and outline classification.** **Type study:** Calotes - External characters, Digestive, Respiratory, Circulatory, Nervous and urinogenital systems. **General Topic:** *Snakes of India*; Identification of Venomous and Non-venomous snakes. Evolutionary significance of Archaeopteryx.	**18**
IV	**Aves** **General characters and outline classification.** **Type study:** Pigeon - External Characters, Digestive, Respiratory, Circulatory and Urinogenital systems. **General Topic:** Flight adaptation and Migration in Birds, Beak, Feet & *Nesting* in Aves.	**18**
V	**Mammalia** **General characters and outline classification.** **Type study:** Rabbit - External characters, Digestive, Respiratory, Circulatory, Nervous and Urinogenital systems. General Topic: Dentition in Mammals, Adaptations of Aquatic Mammals & *Flying mammals*.	**18**
VI	**Current Trends (For CIA only) –** Recent discoveries in Chordate phyla IUCN Status of Chordates	

……. Self Study

Text Book(s):

1. EkambaranathaAyyar.M&Ananthakrishnan.T.N., A Manual of Zoology Vol.II- Part I & II., S.VishwanathanPvt.Ltd, Chennai, 2010.

Reference Book(s):

1. Kotpal, R.L. Modern text book of Zoology - VERTEBRATA, 4 th Edition, Rastogi Publication, Meerut., 2017-2018.
2. Jordan, E.L. &Verma, P.S. Chordate Zoology. New Delhi: S. Chand. (2013).
3. Springer, J.T. & Holley, D. An Introduction to Zoology: Investigating the Animal World. Massachusetts. Jones& Bartlett Learning (2013)

Web Resource(s):

1. www.earthlife.net 2. www.iaszoology.com 3. www.sanctuaryasia.com 4. www.oercommons.org

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the general and specific characteristics of different classes and organization of Chordates	**K1**
CO2	Identify the general characters of Amphibians and relate them to their lifestyle.# - Self Study Portions	**K2**
CO3	Understand the taxonomy and morphology of Reptiles with reference to snakes in India	**K3**
CO4	Classify Aves and acquire knowledge on the biology and adaptations of Birds.	**K4**
CO5	Compare the Mammalian features with systems and significant adaptations.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	**2**	3	**1**	**2**	**1**	**3**	**3**	**3**	**3**	**2**	**2.3**
CO2	**2**	**3**	**1**	**2**	**1**	**3**	**3**	**3**	**3**	**1**	**2.3**
CO3	**2**	**3**	**1**	**2**	**1**	**3**	**3**	**3**	**3**	**2**	**2.4**
CO4	**2**	**3**	**1**	**2**	**1**	**3**	**3**	**3**	**3**	**2**	**2.4**
CO5	**2**	**3**	**1**	**2**	**1**	**3**	**3**	**3**	**3**	**1**	**2.3**
Mean Overall Score											**2.34**
Correlation											**Medium**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: P. A. ASHIQUE

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UZO2CC4P	Core – IV	3	3	20	80	100

Course Title	BIOLOGY OF CHORDATES – PRACTICAL - II

SYLLABUS	
Contents	**Hours**
Major Practicals: Virtual laboratory technique: Arterial system, Venous system, Digestive system and Reproductive system of Frog/ Rabbit. Dissection: Digestive system, Nervous system and Reproductive system of Fish. Demo : Taxidermy	**45**
Minor Practicals: Mounting: Placoid, Ctenoid, Cycloid scales, Gill of fish, Fins of fish, Quill feather	
Spotters: a) **Classify giving reasons:** Balanoglossus, Ascidia, Amphioxus, Anabas, Tilapia, Eel, Exocetus, Echeneis, Rhacophorus, Ambystoma, Hemidactylus, Viper, Cobra, Duck, Eagle, Owl, Bat, Loris. b) **Draw Labelled Sketches:** T.S of Amphioxus, Poison apparatus of Snake; Frog - Pectoral girdle, Pigeon - Pelvic girdle c) **Biological Significance:** Ascidian tadpole larva, Ichthiophis, Chameleon, Exocetus – flying fish d) **Relate structure and function:** Echeneis- Sucker, Synsacrum in Bird, Rabbit - Dentition.	
Field Visit Visit to any biodiversity centre / spots and submission of report. Survey of Vertebrates in college campus and submission of report.	
Record Note * A record of lab work shall be maintained and submitted at the time of Practical Examination for valuation.	

Text Book(s):
1. Jayasurya., Arumugam, N., Thangamani., Prasannakumar., Narayanan.L.M. Practical Zoology Volume -2. Saras publication, Nagercoil. 2013.
Reference Book(s):
1. Ekambaranatha Ayyar, Outlines of Zoology. Vol. I & II S.Viswanathan (Printers &Publishers) Pvt. Ltd., Chennai,1993
Web Resource(s):
1. https://books.google.co.in/books?id=tEhO

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Compare different functional systems of Frog through virtual laboratory techniques	**K1**
CO2	Evaluate the patterns of Contours of scales in different fishes; and describe the types of Feathers in birds	**K2**
CO3	Classify and provide reasons for taxonomy; Sketch and label parts together with their biological significance	**K3**
CO4	Relate the structure and function of fishes, birds and mammals	**K4**
CO5	Compare and report the ecosystem	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	2	3	2	3	2	2	2.6
CO2	2	3	3	3	2	3	3	3	2	2	2.6
CO3	3	3	3	3	2	3	3	3	3	2	2.8
CO4	3	3	3	3	1	3	3	3	3	2	2.7
CO5	3	2	3	3	3	2	3	2	3	3	2.7
Mean Overall Score											2.68
Correlation											High

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: P.A. ASHIQUE

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UCH2AC3:2	Allied – III	4	4	25	75	100

Course Title	Inorganic, Organic and Physical Chemistry – II

SYLLABUS		
Unit	**Contents**	**Hours**
I	**INDIAN MEDICINAL PLANTS AND BIOLOGICALLY IMPORTANT COMPOUNDS** 1.1 **Indian Medicinal Plants:** Hibisous Rosa Sinesis - Adathoda Vasica - Azadirachta Indica – Solanum Trolobatum – Active Constituents and Medicinal uses. 1.2 **Biologically important compounds:** Haemoglobin and Chlorophyll- structure and biological role.	**12**
II	**NUCLEAR CHEMISTRY** 2.1 **Structure of nucleus -** Composition of nucleus, nuclear forces, nuclear stability-mass defect, binding energy, n/p ratio and magic numbers, *Definition of isotopes, isobars, isotones and isomers* 2.2 **Radioacitivity**- Definition, types of radioactivity, Properties of α, β and γ rays: Detection and measurement – Wilson cloud chamber and G.M. Counter, nuclear fusion and fission reactions, applications of radio isotopes – in analytical chemistry, in medicine, rock dating and carbon dating	**12**
III	**VITAMINS AND DRUGS** 3.1 **Vitamins –** Definition, classification. Sources and deficiency diseases of vitamins A, D, E, K, B_6, B_{12} and C. 3.2 **Drugs:** Sulpha drugs - Definition, structure and uses of sulphapyridine and sulphathiazole. Antibiotics – Definition, structure and uses of penicillin and Chloromycetin. Antipyretics - Definition, structure and uses of paracetamol and aspirin. Anti inflammatory - Definition, structure and uses of ibuprofen and Naproxen.	**12**
IV	**ENZYMES AND HORMONES** 4.1 **Enzymes**- Classification of enzymes, chemical nature, factors affecting rate of enzyme action, specifity of enzyme action, mechanisms of enzyme action – lock and key, biological functions of enzymes, applications of enzymes- therapeutic, analytical, industrial uses. 4.2. **Hormones**- introduction, structure and physiological functions - Adrenaline, thyroxine, oxytocin and insulin.	**12**
V	**COLLOIDS** 5.1. **Colloids:** Definition, colloidal solution and suspension, phases of colloidal solution-Electrical properties – *Electrophoresis and Electro osmosis (definition and uses only)* - protection of colloids – Gold number- medicinal applications of colloids. 5.2 **Emulsion:** definition, types, preparation, properties and applications. 5.3. **Gels:** definition, types, preparation, properties and applications.	**12**

……. Self Study

Text Book(s):

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, Shoban Lal, Nagin Chand & Co. New Delhi, 23rd, 1993
2. P. L. Soni and H.M. Chawla, Text Book of Organic Chemistry, S. Chand & Co., New Delhi, 28th Edition, 1999
3. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co., New Delhi, First Edition, 2006

Reference Book(s):
1. R. D Madan, Modern Inorganic Chemistry, S. Chand & Co., New Delhi, 2nd reprint, 1987 2. A .K. Srivastava, Organic Chemistry, New Age International Publishers, New Delhi, 1st Edition, 2002 3. R. L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, S. Chand & Co., New Delhi5th revised and enlarged Edition, 2009
Web Resource(s):
1. https://onlinecourses.nptel.ac.in/noc22_cy20/preview 2. https://www.toppr.com/ 3. https://byjus.com/chemistry/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Describe the Indian medicinal plants, types of radioactivity and physiological functions of hormones	**K1**
CO2	Discuss the properties of alpha, beta and comma rays	**K2**
CO3	predict the sources and deficiency diseases of vitamins and illustrate the various drugs	**K3**
CO4	Classify the enzymes and explain the mechanism of enzyme action	**K4**
CO5	Compare the phases of colloidal solutions and predict the applications	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	3	3	3	3	3	3	**3**
CO2	2	2	2	2	2	2	2	2	2	2	**2**
CO3	2	2	2	2	2	2	2	2	2	2	**2**
CO4	2	2	2	2	2	2	2	2	2	2	**2**
CO5	2	2	2	2	2	2	2	2	2	2	**2**
										Mean Overall Score	**2.2**
										Correlation	**Medium**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: Dr. R. Abdul Vahith

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UCH2AC4P	Allied - IV	3	2	20	80	100

Course Title	Organic Analysis - Practical

List of Practicals	Hours
Qualitative analysis of the following organic compounds: 1. Carbohydrate 2. Amide 3. Aldehyde 4. Ketone 5. Monocarboxylicacid 6. Dicarboxylic acid 7. Amine **Scheme of valuation** **Record** – 10 Marks **Procedure writing** – 10 Marks **For Organic Analysis** – 60 Marks **For Organic Analysis Results Marks Distribution:** (i) Special Elements Present/ Absent - 20 marks (ii) Aromatic/ Aliphatic - 10 marks (iii) Saturated/ Unsaturated - 10 marks (iv) Functional Group Present - 20 marks	**45**

Text Books:

1. Ganapragasm N S and Ramamurthy G, Organic Chemistry Lab Manual, S. Vishwanathan Printers and Publishers (P) Ltd., Chennai, 2nd Edition, 2007.
2. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, S. Chand & Co Pvt. Ltd, New Delhi, 2nd Edition, 1997.
3. Furniss B S, et al., Vogel's Textbook of Practical Organic Chemistry, ELBS Longman, London, 7th Edition, 1984.

Reference Books:

1. A. I. Vogel's, Text Book of Practical Organic Chemistry, Prentice Hall, 5th Edition, 1989.

Web Resources:

1.https://jru.edu.in/studentcorner/lab-manual/bpharm/Lab%20Manual%20-%20%20Pharmaceutical%20Organic%20Chemistry.pdf
2.https://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/classXII/chemistry/lelm108.pdf
3.https://faculty.chas.uni.edu/~manfredi/860-121/ORG%20LAB%20MAN%20S08.pdf

Course Outcomes

Upon successful completion of this course, the student will be able to:

CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Recall the preliminary tests of organic qualitative analysis.	**K1**
CO2	Differentiate the aliphatic and aromatic nature of the organic compounds	**K2**
CO3	Examine the nature of the organic compound	**K3**
CO4	Separate the functional groups through appropriate chemical reactions	**K4**
CO5	Summarize their results of the organic analysis in a scientific way.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	2	3	3	3	2	2	2.7
CO2	3	2	3	3	3	3	3	2	3	1	2.6
CO3	3	2	3	3	2	3	3	3	2	2	2.4
CO4	3	2	1	3	3	3	3	3	3	2	2.6
CO5	3	2	3	1	2	3	3	2	3	1	2.3
Mean Overall Score											2.52
Correlation											High

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Syed Abuthahir

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UCN2SS	Soft Skills Development	2	2	-	100	100
Course Title	Soft Skills Development						

SYLLABUS		
Unit	**Contents**	**Hours**
I	**Communication Skills:** Verbal and Non - Verbal communication - The active vocabulary - Conversational Etiquette - KOPPACT syndrome	6
II	**Emotional Skills:** Emotional Intelligence - The five steps to Emotional Quotient - Self Awareness and Regulation - Empathy - Social Intelligence - stress management - coping with failures	6
III	**Functional Skills:** Using the tools of communicatory and emotional skills - Resume writing - Preparation of Curriculum Vitae - interview skills - Acing the interview - Group dynamics - Mock interviews and Group discussions	6
IV	**Interpersonal Skills:** Synergising relationships - SWOT analysis - SOAR analysis - The social skills - Time Management - Decision making - problem solving - prioritising and Implementation	6
V	**Personality Skills:** Leadership skills - Attributes and Attitudes - Social leader Vs The Boss - critical and creative thinking	6

Hours of Teaching : 5 hours and Hours of Activity: 25 hours

Textbook(s):

1. Social intelligence: The new science of human relationships - Daniel Goleman; 2006.
2. Body Language in the workplace - Allan and Barbara Pease; 2011.
3. Student's Hand Book: Skill Genie - Higher education department, Government of Andhra Pradesh.

Web References:

1. https://nptel.ac.in/courses/109105110

EVALUATION CRITERIA

Work Book (Each unit carries 10 marks) - 50 Marks
Examination - 50 Marks

1. Teacher who handles the subject will award 50 marks for work book based on the performance of the student.
2. On the day of examination the examiners (Internal & External) will jointly award the marks for the following categories:

- Self-Introduction - 20 Marks
- Resume - 10 Marks
- Mock Interview - 20 Marks

To assess the self-introduction, Examiners are advised to watch the video presentation submitted by the students. If they failed to submit the video presentation, the Examiners may direct the student to introduce himself orally and a maximum 10 marks only will be awarded.

Mock Interview Marks Distribution (**20-Marks**)

Attitude (self interest, confidence etc.) (4 Marks)	Physical appearance including dress code (4 Marks)	Communication Skills (6 Marks)	Answering questions asked from the resume and work book (6 Marks)

Course Coordinator: Dr. M. Syed Ali Padusha

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UZO3CC5	Core - V	4	4	25	75	100

Course Title	CELL & MOLECULAR BIOLOGY

SYLLABUS		
Unit	**Contents**	**Hours**
I	**Cell Organization:** Prokaryote and Eukaryote cell - Cell organization and components, Ultra structure of Plasma membrane – *Unit membrane*, Fluid mosaic model and functions. Cytoplasm: Components and functions.	**12**
II	**Cell Organelles:** Ultra structure and functions of Endoplasmic Reticulum, Ribosomes, Golgi complex, *Lysosomes* and Mitochondria.	**12**
III	**Nucleus and Cell Division:** Structure and functions of Nucleus, Nucleolus, Nuclear envelope, *Nuclear pore complex* and Chromosomes. Cell Cycle and Cell division - Mitosis and Meiosis.	**12**
IV	**Nuclear Material and Protein Synthesis:** DNA and RNA: Molecular structure, Types and functions of DNA and RNA. DNA replication. Protein synthesis: Transcription and *Translation*.	**12**
V	**Cancer Biology:** Cancer cells: Characteristics, causes and types, treatment and prevention- Oncogenes – *Apoptosis*- Theories on Carcinogenesis -Tumor suppressor Gene.	**12**
VI	**Current Trends * (For CIA only) –** DNA Finger Printing Technology, Nano based delivery system in Cancer treatment.	

***…..*Self-study**

Text Book(s):

1. Verma, P.S. and Agarwal, V.K., Cytology, 3rd Edition, Chand & Co., Ltd. Delhi. 2020.
3. Ajoy Paul. Text Book of Cell and Molecular Biology. IV Edition, Books and Allied (P)Ltd.2015
4. Gupta, P.K. Cell and molecular Biology. Rastogi Publications, Meerut, 2004

Reference Book(s):

1. De Robertis, E.D.P., and De Robertis, E.M.F., Cell and Molecular Biology, VIII Ed., Lippincott Williams & Wilkins, A Wolters Kluwer India Pvt., Ltd. 2020,
2. Geoffrey, M. Cooper and Robert E. Hausman., The Cell – A Molecular Approach. 5th Edition. Asm Press, Sinauer, Washington D.C. USA. 2007.
3. Alberts et al., Molecular Biology of the Cell. 4th Edition, Garland Science, A Member of the Taylor and Francis group, New York, USA. 2002.
4. Cooper, G. M. "The Cell – A Molecular Biological Approaches". ASM Press, Washington, 2013.

Web Resource(s):

1. https://en.wikipedia.org/wiki/Cell_(biology)
2. https://www.ncbi.nlm.nih.gov/books/NBK9940/
3. http://marjoriebrandlab.com/sitebuildercontent/sitebuilderfiles/hfspworkshop.pdf
4. http://genome.tugraz.at/MolecularBiology/WS11_Chapter_12.pdf
5. https://en.wikipedia.org/wiki/Cell_cycle

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Analyse the mechanism of cell organization and regulation of cellular components how cells are functioning.	**K1, K2**
CO2	To construct and simulate the role of different cytological tools to explain the structure and complexity of cells and cell organelles.	**K2, K3**
CO3	Integrate the knowledge of Nucleus and their components and Define the cell cycle processing and division of Mitosis and Meiosis..	**K3,K5**
CO4	Generate the knowledge of the Nucleic acids and Analyse the role of DNA and RNA and Advanced knowledge of the protein synthesis.	**K4, K5**
CO5	Compare the different tissue samples of cancer cells and processing and chemistry of cancer cells	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	2	2	3	2	2	2	3	3	**2.3**
CO2	1	2	2	2	3	1	2	2	2	3	**2.0**
CO3	2	2	2	2	3	3	3	3	3	3	**2.6**
CO4	2	2	3	3	3	2	2	3	3	3	**2.6**
CO5	1	2	2	2	3	2	2	2	3	3	**2.2**
Mean Overall Score											**Medium**
Correlation											**2.34**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. K. Prabakar

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UZO3CC6P	Core - VI	3	3	20	80	100

Course Title	CELL & MOLECULAR BIOLOGY – PRACTICAL - III

SYLLABUS		
Unit	**Contents**	**Hours**
	Major Practical: 1. Squash preparation of Onion root tip for study of Mitotic stages. 2. Squash preparation of grasshopper testis for Meiotic stages. 3. Smear preparation of human blood for RBC and WBC studies. 4. Isolation of DNA from blood samples **Minor Practical:** 1. Squash preparation of Salivary gland of Chironomous larva for Polytene Chromosome studies 2. Squash preparation of Salivary gland of Drosophila larva for Polytene Chromosome studies. **Mounting:** 1. Mounting of muscle fibers 2. Measurement of cell dimensions by using stage and ocular micro meter 4. Skeletal muscle: Sarcomeres and myofibrils Cardiac muscles: Heart muscles Smooth muscles: CS of artery Fibrous muscles: CS of tendon **Demo:** 1. Study of Compound Microscope: Setting and Handling Procedure. 2. Separation of DNA using Agarose gel electrophoresis **Models:** 1. DNA, tRNA and DNA replication. 2. Cancer **Spotters:** Types of Microscope: Compound microscope, Electron microscope (TEM &SEM), Phase contrast microscopy, Confocal microscopy, Dark-field microscopy, Fluorescence microscopy, Scanning probe microscopy. Epithelial, Muscular, Vascular tissues. Cancer cells, sarcoma, myeloma, Lymphoma and Leukemia **Record Work** A record of lab work shall be maintained and submitted at the time of PracticalExamination for valuation.	**45**
	Current Trends (For CIA only) – Nutrient composition of vermicompost – Advantages of sea food – Health benefits of egg.	

Text Book(s):
1. Chaitanya, K.V. A Lab Manual of Cell and Molecular Biology, Prentice Hall India Learning Private,2013.
Reference Book(s):
1.Trigunayat, M.M. A Manual of Practical Zoology: Biodiversity, Cell Biology, Genetics & Developmental Biology, Scientific Publishers 2019. 2.Mehdi Laboratory Procedures In Haematology Manual, Jaypee Brothers Medical Publishers 2006.
Web Resource(s):
1 https://www.bjcancer.org/Sites_OldFiles/_Library/UserFiles/pdf/Cell_Biology 2.https://sjce.ac.in/wp-content/uploads/2018/04/Cell-Biology-Genetics-Labor 3.https://byjus.com/physics/types-of-microscope/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Apply the knowledge on Microscope and Analyse the stages of Onion root tip of Mitotic and Meiotic stages.	**K1, K2**
CO2	Analyse the Human blood to study of blood components	**K2, K3**
CO3	Integrate the knowledge of Salivery gland of Chironomous Larva and Drosophila processing of polytene chromosome	**K3,K4**
CO4	Analyse the DNA by Blood samples and separate the molecules by using AGE	**K4, K5**
CO5	Compare the different muscles and creating models of bio molecules	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	2	2	3	2	2	2	3	3	**2.3**
CO2	1	2	2	2	3	1	2	2	2	3	**2.0**
CO3	2	2	2	2	3	3	3	3	3	3	**2.6**
CO4	2	2	3	3	3	2	2	3	3	3	**2.6**
CO5	1	2	2	2	3	2	2	2	3	3	**2.2**
										Mean Overall Score	**Medium**
										Correlation	**2.34**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. K. Prabakar

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UBO3AC5	Allied – V	4	4	25	75	100
Course Title	**Applied Botany – I**						

Syllabus

Unit	Contents	Hours
I	**Algae:** General characteristics and outline classification of algae (F. E. Fritsch, 1935). Thallus organization, food reserve and habitats of algae. A detailed study of structure, reproduction, life cycle (excluding development stages) and economic uses of the following genera – **Oscillatoria**, *Chlorella, Sargassum* and *Gracilaria*. Cultivation methods of fresh water (*Spirulina*), and marine (*Kappaphycus*) algae.	12
II	**Fungi and Lichens:** General characteristics and outline classification of fungi (Alexopoulos and Mims, 1979). Detailed study of occurrence, morphology, reproduction and life cycle of the following genera – *Albugo,* Brief account on cultivation of edible mushroom (*Pleurotus*). Introduction to medicinal mushrooms (*Ganoderma*) and antibiotic producing fungi (*Penicillium*). Brief account on production of citric acid and acetic acid from fruit peel waste. *Lichens – General characters, types and economic importance of Lichens*.	12
III	**Bryophytes:** General characteristics and outline classification of Bryophytes (Watson, 1971). Structural description (excluding development stages) of the following genera – *Marchantia* and *Polytrichum*. A brief mention of use of bryophytes for antibiotics, anti-cancer, food, ornamental, non-absorbant bandage and pesticides. Environmental importance of mosses in pedogenesis and *peat bog*.	12
IV	**Pteridophytes**: General characteristics and outline classification of Pteridophytes (Sporne, 1975). Structural description (excluding developmental stages) of the following genera – *Lycopodium* and *Adiantum*. and *Economic importance of Pteridophytes*. Cultivation of *Azolla*.	12
V	**Gymnosperms**: General characters and outline classification of gymnosperms (Sporne, 1967). Morphology, anatomy, reproduction, life cycle (excluding developmental stages) and economic uses of *Cycas*. Importance of gymnosperms as wood and resins (*Pinus*), anti-cancer drug (*Taxus* and *Ephedra*). A brief study of types and application of fossil plants in paleoclimatology and *climate models*.	12

..... Self-Study

Text Book(s):

1. Vasishta PC, Sinha AK and Kumar A, Botany for Degree Students (Volumes), 2nd Edition, Chand & Company Pvt Ltd, New Delhi, India, 2010.
2. Hait G, Bhattacharya K and Ghosh AK, A Text Book of Botany, 5th Edition, New Central Book Agency Pvt Ltd, Kolkata, India, 2011.
3. Sharma OP, Plants and Human Welfare, Prakathi Prakashan Publications Pvt Ltd, Meerut, India, 2015.

Reference Book(s):

1. Alexopoulos CJ, Mims CW and Blackwell M, Introductory Mycology, 4th Edition, Wiley Publishers, New Delhi, India, 2007.
2. Sharma OP, A Text Book of Algae, 1st Edition, Tata McGrew Hill Education Pvt Ltd, New Delhi, India, 2011.

Course Outcomes		
Course Outcomes: Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-level)**
CO1	Outline the diversity of cryptogams and seed plants.	K1
CO2	Identify the economic uses of natural wealth from cryptogams and seed plants.	K2
CO3	Perceive the alternative uses of and applications of cryptogams and seed plants.	K3
CO4	Appraise the values of natural wealth from cryptogams and seed plants.	K4
CO5	Recommend alternative bio resources for human welfare.	K5

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	2	1	1	3	1	1	3	2
CO2	2	2	2	2	1	3	1	1	3	2	1.9
CO3	1	1	3	3	2	1	1	2	2	1	1.7
CO4	2	2	2	3	1	1	1	1	1	1	1.5
CO5	2	2	2	3	1	1	1	1	1	1	1.5
										Mean Overall Score	1.7
										Correlation	Medium

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. A. Aslam

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UBO3AC6P	Allied - VI	3	2	20	80	100
Course Title	**Laboratory Course for Applied Botany - I – Practical**						

Syllabus		
	Contents	**Hours**
	1. Generic level identification of algal specimens in a mixture. *a. Oscillatoria* *b. Chlorella* *c. Spirulina* *d. Sargassum* *e. Gracilaria* 2. Identification of following fungi in both host as well as permanent slides *a. Albugo* *b. Saccharomyces* 3. Observation of external and internal structure of *a. Marchantia* *b. Polytrichum* *c. Lycopodium* *d. Adiantum* *e. Cycas* *f. Pinus* 4. Identification of spotters related to economic uses of species mentioned in theory	45

Text Book(s):

1. Santra SC, Chatterjee TP and Das AP, College Botany Practical (Volume II), 1st Edition (Reprinted), New Central Book Agency Pvt Ltd, Kolkata, India, 2001.
2. Pandey BP, Modern Practical Botany, 1st Edition (Reprinted), Chand & Company Pvt Ltd, New Delhi, India, 2011.
3. Sharma OP, Practical Botany, 7th Edition, Pragati Prakashan Educational Publishers Pvt Ltd, Meerut, India, 2014.

Course Outcomes		
Course Outcomes: Upon successful completion of this course, the student will be able to:		
CO No.	**Course Outcomes**	**Cognitive Level (K-level)**
CO1	Experience laboratory skills of handling botanical specimens.	K1
CO2	Describe diversity of plants.	K2
CO3	Demonstrate preparation and curation of botanical specimens.	K3
CO4	Identify commercial potential of cryptogams.	K4
CO5	Appraise the traits and key characters of cryptogams.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	1	3	1	3	1	3	3	2	1	1	1.9
CO2	1	3	1	1	2	3	3	2	1	1	1.8
CO3	2	1	1	3	1	1	3	2	1	1	1.6
CO4	1	3	2	1	1	1	3	2	1	1	1.6
CO5	1	3	1	3	1	1	3	2	1	1	1.7
										Mean Overall Score	1.7
										Correlation	Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. A. Aslam

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UZO3GE1	Generic Elective - I	2	2	-	100	100

Course Title	Human Nutrition and Health

SYLLABUS		
Unit	**Contents**	**Hours**
I	**UNIT I: Human Nutrition:** Definition – Dimensions of health. Health education: Definition – objectives – principles. Nutrition and health: -Balanced diet: macronutrients – micronutrients – vitamins and minerals, Malnutrition - Hygiene Practices of the different categories of family members Food hygiene: perishable – nonperishable – shelf life – sterilization – *food poisoning*.	6
II	**UNIT II: Environment and 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 - Food adulteration: common adulterants, and health hazards. *Food standards and food laws*. National and International; PFA, FSSAI, HACCP, ISI.	6
III	**UNIT III: Concept of Disease**: Phases of disease – Pre-pathogenesis and Pathogenesis –concept of prevention and control – Common Protozoan, Helminthic and *Arthropod borne diseases* Communicable and Non-communicable diseases. Immunity: Types of vaccinations– Live – Attenuated – Killed – Toxoid – Transgenic. Immunization schedule in India.	6
IV	**UNIT IV: Communicable Diseases:** Bacterial and Viral diseases – Causative agents and control measure. Mode of transmission: air – water – droplets – contact - Symptoms and treatment of Cholera, Tuberculosis, Typhoid, Hepatitis A & B and AIDS. Environmental Sanitation - *Family planning*: Definition – scope – contraceptive devices - Vitamin deficiencies.	6
V	**UNIT V: Mental Health:** Definition - characteristics – causes and prevention of mental health - Occupational health & hazards– prevention. Basic aspects of personal hygiene – Alzheimer - Parkinson's. Health care services – Primary health care – Super Speciality Hospitals – *Principles of First Aid* – First aid procedures for Accidents, food poisoning, snakebites and heart attacks.	6
VI	**Current Trends * (For CIA only) –** Contemporary developments related to the course during the semester concerned.	

..... Self-Study

Text Book(s):

1. E. Park & Park: Textbook of Preventive and Social Medicine, Published by Banarsidos Bhanot, 2019
2. Ananthanarayanan,R and Jayaram Panicker, C. K. Text Book of Microbiology, Orient Longman, Chennai-2000.
3. Sharma.P.D Environmental Biology and Toxicology, Rastogi Publication 2003

Reference Book(s):

1. Richard.t Wright, Dorothy F,Boorse, Environmental Science, PHI Learning Publication, New Delhi,2011.
2. Dubey R.C and Maheswari D.K. Text book of Microbiology, S.Chand and Company Ltd, New Delhi.2009.
3. Thomas, C.G.A. Medical Microbiology, ELBS Publications. 1988.
4. Sarada Subramanyam and Madavankutty.K, Text book of Human Physiology S.Chand Publication-2014.

Web Resource(s):
1. 1. https://Mal 2. https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_(Kaiser) 3. https://www.pdfdrive.com/medical-microbiology-d18737002.html 4. https://markmanson.net/5-books-for-dealing-with-anxiety-and-depression. **5.** https://protect.iu.edu/environmental-health/public-health/communicable-diseases/index.html.

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	1. Understand the dimensions of Health education, importance of Balanced diet and Food hygiene.	**K3**
CO2	2. Demonstrate the relationship between Environment and Health and control measures of Life style diseases.	**K2**
CO3	3. Classify the common infectious disease & control and preventive measures.	**K4**
CO4	4. List the basic principles of medical microbiology; it covers mechanisms of disease transmission, diagnosis andcontrol.	**K2**
CO5	5. Acquire knowledge on Human Mental Health and able to apply these principles to understanding and provideFirst Aid.	**K3**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	1	2	2	2	3	2	2	3	2	2	2.1
CO2	3	3	3	3	2	3	2	2	2	2	2.5
CO3	2	2	3	3	3	2	3	3	3	3	2.7
CO4	3	3	2	3	2	2	3	2	2	3	2.5
CO5	3	2	3	2	3	3	2	3	3	3	2.7
Mean Overall Score											**2.50**
Correlation											High

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator : Dr. R. Krishnamoorthy

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UCN3AE2	AECC – II	2	2	-	100	100
Course Title	**Environmental Studies**						

Unit	Contents	Hours
I	The multidisciplinary nature of environmental studies Definition, scope, importance, awareness and its consequences on the planet.	6
II	**Ecosystems:** Definition, structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	6
III	**Natural Resources: L**and use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Heating of earth and circulation of air; air mass formation and precipitation. Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies. renewable energy resources significance of wind, solar, hydal, tidal, waves, ocean thermal energy and geothermal energy.	6
IV	**Biodiversity and Conservation:** Levels of biological diversity: genetic, species and ecosystem diversity; Biogeography zones of India; biodiversity hot spots. mega-biodiversity countries; Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: *In situ* and *Ex situ* conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.	6
V	**Environmental Pollution & Conservation:** Environmental pollution: types, causes, effects and controls; Air, water, soil, chemical and noise pollution Waste to wealth - Energy from waste, value added products from waste, fly ash utilization and disposal of garbage, solid waste management in urban and rural areas, Swachh Bharat Abhiyan, recent advances in solid waste management, modern techniques in rain water harvesting and utilization.	6

Text books:

1. Asthana DK and Meera A, Environmental studies, 2nd Edition, Chand and Company Pvt Ltd, New Delhi, India, 2012.
2. Arumugam N and Kumaresan V, Environmental studies, 4th Edition, Saras Publication, Nagercoil, Tamil Nadu, India, 2014.

Activity – I:

1. Assignments – Titles on Environmental awareness to be identified by teachers from the following (scripts not less than 20 pages)
2. Elocution – (Speech on "Environment beauty is the fundamental duty" of citizen of the country for 3 to 5 minutes)
3. Environment issues – TV, Newspaper, Radio and Medias messages – Discussion ϖ Case Studies/Field Visit/Highlighting Day today environmental issues seen or heard
4. Debating/Report Submission – Regarding environment issues in the study period Activity II
5. Environmental awareness through charts, displays, models and video documentation.

Celebrating Nationally Important Environmental Days

National Science Day – 28th February
World wild life Day – 3rd March
International forest Day – 21st March
World Water Day – 22nd March
World Meteorological Day – 23rd March
World Health Day – 7th April
World Heritage Day – 18th April
Earth / Planet Day – 22nd April
Plants Day – 26th May
Environment Day – 5th June Activity III Discipline specific activities

EVALUATION COMPONENT:

Component I: (25 Marks) Document (or) Poster presentation or Elocution
Component II: (25 Marks) Album making (or) case study on a topic (or) field visit
Component III: (25 Marks) Essay writing (or) Assignment submission
Component IV: (25 Marks) Quiz (or) multiple choice question test

Course Outcomes		
Course Outcomes: Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-level)**
CO1	To understand the multi-disciplinary nature of environmental studies and its importance	K1
CO2	To obtain knowledge on different types of ecosystem	K2
CO3	To acquire knowledge on Renewable and non-renewable resources, energy conservation	K3
CO4	To understand biodiversity conservation	K4
CO5	To analysis impact of pollution and conversion waste to products	K5

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	02	02	02	02	02	03	03	03	03	03	2.5
CO2	02	03	03	02	03	03	03	03	03	03	2.8
CO3	02	03	03	03	03	03	03	03	03	03	2.9
CO4	02	02	03	03	03	03	03	03	03	03	2.8
CO5	02	03	03	03	03	03	03	02	03	03	2.8
									Mean Overall Score		2.7
									Correlation		High

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. B. Balaguru

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UZO4CC7	Core - VII	5	5	25	75	100

Course Title	Animal Physiology and Ethology

SYLLABUS		
Unit	**Contents**	**Hours**
I	**Nutrition and Digestion** Nutritional requirements and Balanced Diet – Carbohydrates, Proteins, Lipids, Minerals and Vitamins. Human digestive System – Digestive glands and enzymes – Physiology of Digestion – Absorption – *Assimilation*.	**15**
II	**Respiration and Circulation** Respiration: External and Internal respiration – Respiratory organs and pigments - Transport of O2 and CO2 – Respiratory Quotient – Anaerobiosis – Adaptations to high altitude and diving. Circulation: Types, Composition and functions of Blood. Human heart - Cardiac Cycle and Rhythm – *ECG and Blood Pressure*.	**15**
III	**Excretion and Homeostasis** Excretion: Types and products - Human Kidney - Structure of Nephron – Ornithine cycle - Physiology of Urine formation – Dialysis. Homeostasis: Regulatory mechanisms: Osmoregulators and Osmoconformers – Osmoregulation in Crustaceans and fishes – Mechanism of Thermoregulation – *Acclimation and acclimatization*.	**15**
IV	**Muscle, Nerve and Endocrine** Types of muscles – Ultra structure of skeletal muscle – Mechanism of muscle contraction. Neuron: Structure and types – Transmission of nerve impulse through neuron – Endocrine glands : Pituitary , Hormonal regulation in human reproduction. – *Reflex action and reflex arc* –Photo, Phono, Tango and Mechanoreceptors.	**15**
V	**Ethology** Introduction to ethology – Mechanism of behavior – Learning and Instinct : Conditioning , habituation, Sensitization, reasoning – Social organization : Honey bee colony, foraging – Bee dance Communication: Songs of Birds & behavior – territory defending – Alarm calls in animals – signals , Crypsis & Mimicry.	**15**
VI	**Current Trends (For CIA only) –** National Organ Transplantation Programme – Medical achievement.	

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Text Book(s):

1. Rastogi, S.C., Essentials of Animal Physiology, IV Edition, New Age International (P) Ltd, Publishers, 2007.
2. P.D.Sharma., Ecology and Environment, Rastogi Publication, Meerut. 2012

Reference Book(s):

1. R. Nagabhushanam, M.S. Kodarkar, R. Sarojini, Textbook of Animal Physiology. Second
2. Edition, Oxford & IBH Publishing Co. PVT. LTD. 2002
3. Guyton and Hall, Text book of Medical Physiology- Elsevier Health – INR; second Edition (2016).
4. Hoar, W.S., General and Comparative Physiology (3rd Edition), Prentice Ha ll of India, New Delhi. 1991,
5. Ladd, C. Prosser and Frank A. Brown, Comparative Animal Physiology, W.B. Saunders Co., Philadelphia, 2002.
6. Schmit - Nelson.K.(1997) Animal Physiology Adaptation and environment, Cambridge Univ. Press.
7. Beck, Human Design, Harcourt Brace Joranorich Inc. 1971.
8. Dawson, H. General Physiology, Little Brown Co. Boston. . 1964.
9. Echert, R. and Randall, D., Animal Physiology, CBS Publishers and Distributors,1987.

10. Prosser, CL. and Brown Fo. Comparative Animal Physiology Second Edition. WB Saunders Co Philadelphia, Toppa Co Tokyo, Japan (1961).
11. Reena mathur., Animal Behaviour, Rastogi Publication, Meerut. 2010
12. Mohan P. Arora., Animal Behavior, Himalaya Publishing House, 1995.

Web Resource(s):

1. https://nptel.ac.in/courses/102/104/102104042/
2.https://courses.lumenlearning.com>digestive system/Anatomy and Physiology
3.https://www.lung.ca>lung .infor>respiratory system
4. https://www.khanacademy.org/science/biology/behavioral-biology/animal-behavior/a/intro-toanimal- behavior
5. https://www.nature.com/scitable/knowledge/library/an-introduction-to-animal

Course Outcomes

Upon successful completion of this course, the student will be able to:

CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Record the significance of nutrition and balanced diet; report the physiology of digestion, absorption and assimilation.	**K3**
CO2	Appraise the components of the respiratory and circulatory systems and their role.	**K2**
CO3	Summarize the excretory products; demonstrate the structure and functions of kidney and homeostatic mechanisms.	**K3**
CO4	Interpret the muscle types, mechanisms in neurotransmission and hormonal role in reproductive physiology	**K4**
CO5	Social organization and behaviroal patterns in animal	**K3**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	3	3	3	2	2	3	2.7
CO2	3	3	3	3	3	3	3	2	2	3	2.7
CO3	3	3	3	3	3	3	3	2	2	3	2.7
CO4	3	3	3	3	3	3	3	2	2	3	2.7
CO5	3	3	3	3	3	3	3	2	2	3	2.7
Mean Overall Score											2.7
Correlation											High

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. A. Sadiq Bukhari

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UZO4CC8P	Core - VIII	3	3	20	80	100

Course Title	ANIMAL PHYSIOLOGY AND ETHOLOGY – PRACTICAL - IV

SYLLABUS		
Unit	**Contents**	**Hours**
	Experiments: 1. Human Salivary Amylase activity in relation to Temperature and pH. 2. Identification of Nitrogenous Waste Products. 3. Total count of RBC in human blood. 4. Total count of WBC in human blood. 5. Differential count of WBC in human blood. 6. Quantitative tests for Carbohydrates, Proteins, and Lipids. 7. Simple tests for Sugar, Albumin, and Urea in Human Urine. 8. Estimation of Haemoglobin in human blood. 9. Estimation of the rate of O2 consumption in fish with reference to body weight. 10.Focal animal sampling & preparation of ethogram. 11.Multimedia demonstration of social behaviour in monkeys, lions & elephants. 12. Multimedia demonstration of courtship and brood behaviour in birds. **SPOTTERS** Centrifuge, pH meter, Colorimeter, ECG, Sphygmomanometer, pregnancy test kit, Haemoglobinometer, Haemocytometer, Amino acids Model , Mimicry Model. **Record Work** A record of lab work shall be maintained and submitted at the time of PracticalExamination for valuation.	**45**
	Current Trends * (For CIA only) – Nutrient composition of vermicompost – Advantages of sea food – Health benefits of egg.	

* A record of lab work to be maintained and submitted at the time of Practical examination for valuation.

Text Book(s):

1. Verma. P.S and Srivasthava. P.C Advanced Practical Zoology, S .Chand Publication, 2000.

Reference Book(s):
Rastogi, S. C. Essentials of Animal Physiology. Wiley Eastern Limited. New Delhi.1979. 2. Hoar, S. Williams. General and Comparative Physiology. Prentice Hall.1987. 3. Parameswaran, R., Anantha Krishnan, T. N. Anantha Subramanian. Outlines of Animal Physiology, K. S. Viswanathan Pvt. Ltd. Chennai. 4. Singh, H. R. Animal Physiology and Related Biochemistry. SHOBAN Lal Nagin Chand and co., Educational Publishers, New Delhi. 5. Rajan .S and Selvi Christy. Environmental Procedure in Life Sciences, Anjanaa Book House, Chennai, 2012 6. Chausgari. A.R, Text book of Practical Physiology, Paras Publication, Bangalore, 200
Web Resource(s):
1. http://www.phys.szote.u-szeged.hu/edu/angla/labprac1+2.pdf 2. https://www.slideshare.net/vidhyakalaivani29/animal-physiology-and-biochemistry-lab-manual-647180

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Analyze the physiological processes that regulates body functions	**K3**
CO2	Understand and evaluate the physiology of circulation, respiration and excretion.	**K2**
CO3	Analyse the adaptations, mechanism of homeostasis in invertebrates and vertebrates.	**K4**
CO4	Estimate the quantum of different nutrients and the determine nitrogenous waste products	**K3**
CO5	Adopting sampling process and demonstration of social behaviour through Multimedia.	**K2**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	2	2	3	2	2	2	3	3	**2.3**
CO2	1	2	2	2	3	1	2	2	2	3	**2.0**
CO3	2	2	2	2	3	3	3	3	3	3	**2.6**
CO4	2	2	3	3	3	2	2	3	3	3	**2.6**
CO5	1	2	2	2	3	2	2	2	3	3	**2.2**
										Mean Overall Score	**2.3**
										Correlation	**Medium**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. A. Sadiq Bukhari

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UBO4AC7	Allied – VII	5	4	25	75	100
Course Title	**Applied Botany – II**						

Syllabus		
Unit	**Contents**	**Hours**
I	**Plant morphology:** Parts of a plant – root, Stem and Leaf and their modifications with examples – Simple and compound leaves - Phyllotaxy - Inflorescence - Racemose, Cymose, Mixed and Special types - Terminology of floral parts, diagram and formula. **Anatomy:** Primary internal structure of root and stem in dicots and monocot.	15
II	**Systems of Classification:** Artificial (Linnaeus system) - Natural (Outline of Bentham and Hooker's system; its merits and demerits). Plant Nomenclature - Brief account of ICN, Herbarium technique. Study of the general characteristics and economic importance of Annonaceae, Rutaceae, Caesalpiniaceae, Rubiaceae, Cucurbitaceae, Apocynaceae, Euphorbiaceae and Arecaceae.	15
III	**Economic Importance of plants:** Plant diet for cardio, renal, hypertention, aging, bone, detox and mental health. Non-alcoholic beverage plants – Coffee, Tea therapy (green tea) Tea extract capsules, Cocoa, Chocoloate, Gano-coffee, herbal 'teas' (*Psidium*, *Mangifera*). Prebiotic fibre plants (*Murayya*, *Cyamopsis*), Cereals, pseudo-cereals and *small grain cereal and their value addition as food supplements and snacks*.	15
IV	**Oil yielding plants:** Essential oils – applications – perfumes (rose, ylang-ylang, jasmine, lemon grass oil, rosemary and sandalwood oil). Food supplement oils – linseed, flax seed oils as source of omega-3-fatty acid. Vegetable oils – coconut, palm oil. Soapbark, soapwort, soap berries, soap pods. Preparation of organic herbal soap. *Importance of herbal cosmetics*.	15
V	**Plant physiology** Water relations in plants – osmosis, transpiration and hydrological cycle. Types and factors affecting transpiration. Water footprint of products and processes. Photosynthesis: apparatus, pigments – light (z-scheme) and dark reaction – outline of Calvin cycle. A brief mention of difference between C3, C4 and CAM pathway and their relevance to indoor gardening. Introduction to carbon sequestration and *carbon banking*. – Aerobic and anaerobic respiration (fermentation - and its importance). Plant growth regulators – types. *Commercial application of auxin in horticulture*.	15

..... Self-Study

Text Book(s):

1. Rao KN, Krishnamurthy KV and Rao GS, Ancillary Botany, 1st Edition, Viswanathan Pvt Ltd, New Delhi, India, 1983.
2. Shukla RS and Chandel PS, Ecology and utility of plants, 2nd Edition, Chand & Company Pvt Ltd, New Delhi, India, 2008
3. Sharma OP, Plants and Human Welfare, 2nd Edition, Prakathi Prakashan Publications Pvt Ltd, Meerut, India, 2015.

Reference Book(s):

1. Jeffrey C. An Introduction to Plant Taxonomy, 1st Edition, Cambridge University Press, United Kingdom, 1982.
2. Pandey BP. Taxonomy of Angiosperms, 2nd Edition, Chand & Company Pvt Ltd, New Delhi, India, 1999.

Course Outcomes

Course Outcomes: Upon successful completion of this course, the student will be able to:

CO No.	CO Statement	Cognitive Level (K-level)
CO1	Outline the diversity of cryptogams and seed plants.	K1
CO2	Identify the economic uses of natural wealth from cryptogams and seed plants.	K2
CO3	Perceive the alternative uses of and applications of cryptogams and seed plants.	K3
CO4	Appraise the values of natural wealth from cryptogams and seed plants.	K4
CO5	Recommend alternative bio resources for human welfare.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	1	1	1	2	1	1	2	1.6
CO2	3	2	2	1	1	2	1	1	3	2	1.8
CO3	1	1	2	1	1	1	1	3	3	1	1.5
CO4	3	2	2	1	1	1	1	1	3	2	1.7
CO5	3	2	2	1	1	1	1	1	3	2	1.7
									Mean Overall Score		1.6
									Correlation		Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. A. Aslam

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UBO4AC8P	Allied - VIII	3	2	20	80	100
Course Title	**Laboratory Course for Applied Botany - II – Practical**						

Syllabus	
Contents	**Hours**
List of Practical **A. Angiosperm morphology and taxonomy (drawing and description of specimens only):** 1. Parts of a dicot plant (*Amaranthus*) 2. Phyllotaxy (*Annona*, *Psidium*, *Quisqualis*, *Nerium*, *Allamanda*, *Acalypha* and *Mollugo*) 3. Compound leaves (*Azadirachta*, *Butea*, *Albizzia*, *Moringa*, *Cleome*) 4. Parts of a flower (*Tribulus*) 5. Racemose inflorescence (*Crotalaria*, *Mangifera*, *Caesalpinia*, *Achyranthes*,*Cocos*, *Allium*, *Tridax*) 6. Cymose inflorescence (*Jasmine*, *Clerodendron*, *Hamelia*, *Heliotropium*,*Mollugo*) 7. Mixed and special (*Ficus, Leucas, Euphorbia cyathophora, Ocimum*, *Zizyphus*) 8. Description and identification features for the families (Annonaceae, Rutaceae, Caesalpiniaceae, Rubiaceae, Apocynaceae, Cucurbitaceae, Euphorbiaceae, and Arecaceae). **B.** T.S of stem and root in dicots (*Tridax*) and monocots (*Zea mays*) **C. Nutritional quality analysis of plants (Minor experiments):** 1. Analysis of nutritional quality of plants using chart 2. Estimation of ascorbic acid (vitamin-C) 3. Determination of moisture content in plant samples. 4. Observation of oxidative darkening of vegetables and fruits. 5. Observation of glutan formation in natural foods. **D. Physiology experimental set up** 1. Ganong's photometer 2. Light screen experiment 3. Demo of paper chromatography 4. Bell jar experiment for oxygen evolution 5. Observation of Kranz anatomy of leaves 6. Observation of transpiration in leaves.	45

Text Book(s)

1. Mehta AS and Verma AP, Experiments in Plant Physiology, 1st Edition, Chand & Company Pvt Ltd, New Delhi, India, 1987.
2. Pandey BP, Modern Practical Botany, 1st Edition (Reprinted), Chand & Company PvtLtd, New Delhi, India, 2011.
3. Sharma OP, Plants and Human Welfare, 2nd Edition, Prakathi Prakashan Publications PvtLtd, Meerut, India, 2015.

Course Outcomes		
Course Outcomes: Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-level)**
CO1	Illustrate the external characters of flowering plants.	K1
CO2	Classify the flowering plants based on their external characters.	K2
CO3	Appraise the plants as useful resources for human use and welfare.	K3
CO4	Recommend unique food supplements and herbal value-added products.	K4
CO5	Solve the problems related with human environment applying physiology principles.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	1	1	2	3	1	3	1	2	1	1.8
CO2	3	1	1	2	3	1	3	1	2	1	1.8
CO3	3	2	1	2	3	1	3	1	2	1	1.9
CO4	3	2	1	2	3	1	3	1	2	1	1.9
CO5	3	1	1	2	3	1	3	1	2	1	1.8
Mean Overall Score											1.8
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. A. Aslam

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UZO4GE2	Generic Elective - II	2	2	-	100	100

Course Title	VERMICULTURE TECHNOLOGY AND ORGANIC FARMING

SYLLABUS		
Unit	**Contents**	**Hours**
I	Distribution- Different types of earthworms. General body structure- External characters- Body Setae- Food and feeding habits, digestive system - *Gut microflora and their importance* - Reproductive system..	6
II	Advantages of Vermiculture – Vermicast - Decomposition of bio - degradable Wastes and vermicomposing - Selection of suitable species - Basic characteristics of suitable species - Description of suitable species Maintenance of Base culture	6
III	Vermicomposting - Advantages of vermicomposting - small scale and large scalevermicomposting. Type of Vermicomposting - Worm-casts, vermicompost, vermiwash- production techniques. Requirements for Vermicomposting - maintenance of vermicomposting.	6
IV	Recycling of different wastes by vermicomposting - Organic wastes - Solid wastes - Municipal wastes - Animal Dung - Agricultural wastes. Application of Vermicompost - In horticulture and agriculture.	6
V	Role of earthworms in sustainable agriculture - organic farming - Earthworm activities - soil fertility and texture - soil aeration. Effect of vermicompost application on soil and plant growth, Vermicompost and organic manure and a good substitute for chemical fertilizers.	6
VI	**Current Trends (For CIA only) –** Contemporary developments related to the course during the semester concerned.	

…….. Self study

Text Book(s):

1.Seethalekshmy,M. & Dr.R. Santhi. Vermitechnology, Saras Publications, Nagercoil. 2012.

Reference Book(s):

1. Edwards CA & Bater JE. Biology of Earthworms. Chapman and Hall.1977
2. Edwards CA. Earthworm Ecology. CRC Press.1998.
3. Sultan Ahmed Ismail,. The Earthworm book. 2nd Revised Edition. India Press, Goa, India.2005.

Web Resource(s):

1. https://www.researchgate.net/publication/281632191_Vermiculture_Technology_An_Option_for_Organic_Recycling.

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Remember the concepts on the significance of earthworms.	**K1**
CO2	Understand the importance of Basic characteristics of suitable species	**K2**
CO3	Apply the significance of Vermicomposting methods.	**K3**
CO4	Analyze the importance of Recycling different wastes	**K4**
CO5	Evaluate the role of earthworms in sustainable agriculture and organic farming	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	3	**3**	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**2.6**
CO2	**2**	3	**2**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.5**
CO3	**3**	3	**3**	**2**	**3**	**3**	**2**	**2**	**3**	**2**	**2.6**
CO4	**3**	3	**2**	**3**	**3**	**2**	**2**	**2**	**3**	**2**	**2.5**
CO5	**3**	3	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
										Mean Overall Score	**2.58**
										Correlation	**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Mohamed Hussain

Allied Zoology for B.Sc. Botany

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UZO3AC5	Allied – V	4	4	25	75	100

Course Title	GENERAL ZOOLOGY

SYLLABUS		
Unit	**Contents**	**Hours**
I	**Invertebrates** Classification of Invertebrates upto phyla with salient features and suitable examples. Cockroach: *External morphology*, mouth parts, Digestive system, respiratory system, circulatory system, nervous system and reproductive system.	**12**
II	**Chordates** General classification of Chordates – salient features of chordates with suitable examples. **Frog** – *External features*, digestive system, respiratory system, circulatory system, Nervous system and urino-genital system.	**12**
III	**Animal Physiology** Physiology of digestion, Composition and functions of human blood, Respiration; Transport of oxygen and carbon-dioxide, Structure of neuron, nerve impulse conduction, *Structure of kidney* and nephron in Human – Reproduction in man.	**12**
IV	**Endocrinology** Endocrine glands, Structure and functions of Pituitary, Thyroid, Islets of Langerhans, Adrenal and Sex glands – *Menstrual cycle*.	**12**
V	**Embryology & Evolution** Gametogenesis – spermatogenesis and oogenesis, Fertilization, cleavage - cleavage patterns. Blastulation, Gastrulation in Frog. Origin of life and evolution of cell - Theories on evolution by Lamarck and Charles Darwin, organic evolution, *Evidences of evolution*.	**12**

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Text Book(s):

1. Nair,N.C., Leelavathy,S., Soundara Pandian, N., Murugan,T., Thangamani, A., Prasannakumar,S., Narayanan,L.M., and Arumugam,N., Animal Diversity Invertebrata and Chordata. Saras Publication, Nagercoil. Fifth Ed., 2013
2. Arumugam, N. and Mariakuttikan,A., Animal Physiology. Saras Publication, Nagercoil. 2011.
3. Arumugam, N, A Text Book of Embryology, Saras Publication, Nagercoil. Fourteenth Ed., 2013.
4. Arumugam, N, Organic Evolution, Saras publication, Nagercoil. 2010

Reference Book(s):

1. Ekambaranatha Ayyar, Outlines of Zoology. Vol. I & II S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai,1993

Web Resource(s):

1. http://www.itis.usda.gov/itis/status.html
2. http://www.bishop.hawaii.org/bishop/HBS/hbs1.html
3. http://www.itis.usda.gov/itis/status.html
4. http://www.bishop.hawaii.org/bishop/HBS/hbs1.html
5. https://nptel.ac.in/courses/102/104/102104042/
6. https://courses.lumenlearning.com>digestive system/Anatomy and Physiology
7. https://www.lung.ca>lung .infor>respiratory system

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the emergence and diversity of Invertebrate fauna and to realize the structural features and physiological processes in Invertebrates.	**K1 & K2**
CO2	Classify the taxonomy among chordates and to study the structure and function of chordate systems.	**K2**
CO3	Develop knowledge on physiological processes in human beings and role of organ systems.	**K3**
CO4	Analyze the integrated functions of endocrine glands in reproduction.	**K4**
CO5	Evaluate the biological processes involved in development and the fundamental complex processes leading to evolutionary changes	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**2.7**
CO2	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**2.7**
CO3	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**2.7**
CO4	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**2.7**
CO5	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**2.7**
Mean Overall Score											**2.7**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. H. E. Syed Mohamed

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UZO3AC6P	Allied – VI	3	2	20	80	100

Course Title	GENERAL ZOOLOGY - PRACTICAL - I

SYLLABUS		
Unit	**Contents**	**Hours**
	DISSECTION: Invertebrates Cockroach: Mouthparts, Digestive and Nervous systems. Chordates Frog – Pro-dissector software: Digestive, Arterial and Venous systems. Animal Physiology Blood Grouping Preparation of Blood Smear and Observation of RBC and WBC. Qualitative estimation of excretory products: Ammonia, Urea and Uric acid. **SPOTTERS:** Invertebrates *Paramecium, Ascon, Obelia, Aurelia, Fasciola hepatica, Taenia solium,* Ascaris male and female, *Nereis,* Earthworm, Prawn, Butterfly, Freshwater Mussel, Snail, Sea urchin, Starfish. Chordates Shark, Tilapia, Frog, Salamanders, Viper, Cobra, Duck, Pigeon, Rabbit, Loris. Embryology Examination of prepared slides to study the following: Frog: Egg – cleavage – blastula – yolk plug stage Evolution Fossil: Nautiloid, Ammonoid Endocrinology Pituitary, Thyroid, Islets of Langerhans - models **RECORD** A record of lab work shall be maintained and submitted at the time of Practical examination for valuation.	**45**

Text Book(s):

1. Jayasurya., Arumugam, N., Nair, N.C., Leelavathy,S., Soundara Pandian,N., Murugan,T. Practical Zoology Volume - 1. Invertebrata. Saras publication, Nagercoil. 2013.
2. Jayasurya., Arumugam, N., Thangamani., Prasannakumar., Narayanan.L.M. Practical Zoology Volume -2. Saras publication, Nagercoil. 2013.
3. Jayasurya., Arumugam, N., Dulsy Fatima., Narayanan,L.M., Meyyan, R.P., Nallasingam,K., Kumaresan,V., Mani,A., Selvaraj,A.M., Mariakuttikan,A. Practical Zoology Volume -3. Cell Biology – Embryology – Animal Physiolohy – Immunology – Ecology – Genetics – Evolution – Microbiology – Biochemistry – Biophysics. Saras Publication. 2013

Reference Book(s):

1. Nair,N.C., Leelavathy,S., Soundara Pandian, N., Murugan,T., Thangamani, A., Prasannakumar,S., Narayanan,L.M., and Arumugam,N., Animal Diversity Invertebrata and Chordata. Saras Publication, Nagercoil. Fifth Ed., 2013
2. Arumugam, N. and Mariakuttikan,A., Animal Physiology. Saras Publication, Nagercoil. 2011.
3. Arumugam, N, A Text Book of Embryology, Saras Publication, Nagercoil. Fourteenth Ed., 2013.
4. Arumugam, N, Organic Evolution, Saras publication, Nagercoil. 2010

Web Resource(s):

1. http://www.itis.usda.gov/itis/status.html
2. http://www.bishop.hawaii.org/bishop/HBS/hbs1.html
3. http://www.itis.usda.gov/itis/status.html
4. http://www.bishop.hawaii.org/bishop/HBS/hbs1.html

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the anatomy and physiology of selected animal systems.	**K1 & K2**
CO2	Apply the techniques in blood grouping and the components of blood and nitrogenous wastes testing.	**K3**
CO3	Classify chordates and determine the characteristics of chordates.	**K2**
CO4	Analyze the biological processes involved in embryonic development and describe the fundamental processes leading to evolutionary changes.	**K4**
CO5	Evaluate the integrated functions of endocrine glands.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	3	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
CO2	**3**	3	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
CO3	**3**	3	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
CO4	**3**	3	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
CO5	**3**	3	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
										Mean Overall Score	**2.7**
										Correlation	**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. H. E. Syed Mohamed

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UZO4AC7	Allied - VII	5	4	25	75	100

Course Title	ECONOMIC ZOOLOGY

SYLLABUS		
Unit	**Contents**	**Hours**
I	**Poultry farming and Vermiculture:** Poultry farming: Types of fowls – Rearing methods of Broilers and Layers – Poultry nutrition – Poultry diseases (NCD, IBV). Issues and limitations of poultry farming. Vermiculture: Classification, Species of Earthworms – Life cycle of *Lampito mauritii* – Preparation of vermin bed; vermiwash; Vermicompost – Economic importance; Physicochemical parameters. *Organic farming*.	15
II	**Apiculture and Sericulture:** Apiculture: Classification- Species - colonial structure– Biology of Honey bee –Bee hives (Newton hive, Langstroth hive) – Honey : Extraction – Nutritive and medicinal values. Sericulture: Classification; Species; Life cycle(Bombyx mori). Rearing of silk worm: Paraffin paper rearing – Box rearing. Diseases of silk worm: Protozoan (Pebrine) – Bacterial (Septicemia) - Reeling of silk – *Economic importance of silk*.	15
III	**Aquaculture:** Aquaculture: Freshwater fishes (Indian major carps) – Site selection and construction of pond – Fish feed (Live feed and formulated) – Induced breeding – rearing methods. Fish diseases –: Furunculosis, Epizootic Ulcerative Syndrome (EUS) and *Vibriosis* – Fresh water Prawn culture. *Ornamental fish culture.*	15
IV	**Insect Vectors and Pests:** Insects pests of crops: Classification, biology nature of damage and control measures of Pests: Paddy (*Scirpophaga incertulas*), Cotton (*Helicoverpa armigera*), sugarcane (*Scirpophaga excerptalis*), Coconut (*Oryctes rhinoceros*). Insects as Vectors of Human Diseases: Classification and Biology, disease spread and control measures of Mosquito *Housefly *	15
V	**General Principles of Insect Control:** Physical, Mechanical, Chemical and Biological Control and their Advantages limitations. Pesticide uses in India – Precaution in handling pesticides. Integrated Pest Management. Non-conventional Methods of Pest Control. *Organics pesticides and their advantages*	15

..... Self Study

Text Book(s):

1. Shukla.G.S. and Upadhya.V.B. Economic Zoology (Rastogi publications).
2. Ganga.G and Sulochana Chetty. J., An introduction to Sericulture(2nd edition)Oxford & IBH Publishing company.

Reference Book(s):

1. Ahsan, J and Sinha, S.P. A handbook on economic zoology, S.Chand& Co.
2. Sardersingh – Bee keeping in India.
3. Santhanam – Aquaculture.
4. Ullal.S.R. and Narasimhanna, M.N – Central Silk Board, Govt. of India, Bombay.
5. Singh – Livestock and poultry production.
6. Jhingran – Fish and fisheries.
7. T.V.R. Pillai – Coastal Aquaculture.
8. Maine product export development authority – Freshwater fishes, Ornamental fishes, Shrimph culture – MPEDA Publication series.

Web Resource(s):

https://www.agropustaka.id/wp-content/uploads/2020/04/agropustaka.id_buku_Modern-Livestock-and-Poultry-Production-8th-Edition-by-James-R.-Gillespie-Frank-B.-Flanders.pdf

2. https://www.pdfdrive.com/poultry-fisheries-apiculture-and-sericulture-d52750733.html

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the concepts of poultry farming and vermiculture	**K2**
CO2	Learn the benefits and economic value of animal products from apiculture and sericulture.	**K3**
CO3	Record the significance of Aquaculture and fish farming	**K3**
CO4	Classify insects vectors and pests; create awareness of spread of diseases and control methods.	**K4**
CO5	Apply entrepreneurial skill and illustrate pest management types.	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
Mean Overall Score											**2.7**
Correlation											**High**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. M. Meeramaideen

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UZO4AC8P	Allied - VIII	3	2	20	80	100

Course Title	ECONOMIC ZOOLOGY - PRACTICAL - II

SYLLABUS		
Unit	**Contents**	**Hours**
	Dissections: 1. Dissect and display the Earth worm/ Cockroach nervous system 2. Dissect and display the Prawn appendages 3. Dissect and display the Prawn nervous system 4. Dissect and display the silk gland of silk moth larva (Demo) **Mountings** 1. Mounting of Earth worm: Body setae, Pineal setae. 2. Mounting of honey bee sting apparatus 3. Mounting of scales: Cycloid, Cteinoid, Placoid 4. Mounting the Mouth parts: Mosquito, Honey bee, **Spotters** Vermiculture- *Lampito mauritii, Perionyx excavates.* Apiculture – *Apis indica* ; Sericulture – *Bombyx mori ;* Aquaculture – Major carps : Catla, Rohu and Mrigal: Prawn – Macrobrachium. Poultry : Layers & Broilers. **Animal products**: Honey, Bee wax, Lac, Silk, and Hen's egg. **Record Work** A record of lab work shall be maintained and submitted at the time of PracticalExamination for valuation.	**45**
	Current Trends (For CIA only) – Nutrient composition of vermicompost – Advantages of sea food – Health benefits of egg.	

Text Book(s):

1. Jayasurya., Arumugam, N., Nair, N.C., Leelavathy,S., Soundara Pandian,N., Murugan,T. Practical Zoology Volume - 1. Invertebrata. Saras publication, Nagercoil. 2013.
2. Jayasurya., Arumugam, N., Thangamani., Prasannakumar., Narayanan.L.M. Practical Zoology Volume -2. Saras publication, Nagercoil. 2013.
3. Jayasurya., Arumugam, N., Dulsy Fatima., Narayanan,L.M., Meyyan, R.P., Nallasingam,K.,
4. Kumaresan,V., Mani,A., Selvaraj,A.M., Mariakuttikan,A. Practical Zoology Volume -3. Cell
5. Biology – Embryology – Animal Physiolohy – Immunology – Ecology – Genetics – Evolution –
6. Microbiology – Biochemistry – Biophysics. Saras Publication. 2013

Reference Book(s):

1. Nair,N.C., Leelavathy,S., Soundara Pandian, N., Murugan,T., Thangamani, A., Prasannakumar,S., Narayanan,L.M., and Arumugam,N., Animal Diversity Invertebrata and Chordata. Saras Publication, Nagercoil. Fifth Ed., 2013
2. Arumugam, N. and Mariakuttikan,A., Animal Physiology. Saras Publication, Nagercoil. 2011.
3. Arumugam, N, A Text Book of Embryology, Saras Publication, Nagercoil. Fourteenth Ed., 2013.
4. Arumugam, N, Organic Evolution, Saras publication, Nagercoil. 2010

Web Resource(s):

1. http://www.itis.usda.gov/itis/status.html
2. http://www.bishop.hawaii.org/bishop/HBS/hbs1.html
3. http://www.itis.usda.gov/itis/status.html
4. http://www.bishop.hawaii.org/bishop/HBS/hbs1.html

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the different functional systems of earthworm and honey bee through dissection.	**K3**
CO2	Identify and prepare slides of fish scales and compare the appendages of prawn.	**K2**
CO3	Classify giving reasons, draw labelled sketch and bring out their biological significance	**K3**
CO4	Relate the nature of damage and the life cycle of pests	**K3**
CO5	Report the economic importance of animal products and their significance.	**K4**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2.7**
										Mean Overall Score	**2.7**
										Correlation	**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. M. Meeramaideen