A.VEERIYA VANDAYAR MEMORIAL SRI PUSHPAM COLLEGE (AUTONOMOUS),
POONDI, THANJAVUR DIST.

Question Pattern for UG and PG Programmes for students to be admitted during 2014 – 2015 and afterwards

Total Marks: 75

QUESTIONS PATTERN

SECTION – A
(Question 1 to 10)

10 x 2 = 20 Marks

1. Short Answer Questions
2. Two Questions from each units (All are answerable)

SECTION – B
(Question 11 to 15)

5 x 5 = 25 Marks

1. 5 Paragraph type questions with "either / or" type choice.
2. One question from each unit of the Syllabus.
3. Answer all the questions.

SECTION – C
(Question 16 to 20)

3 x 10 = 30 Marks

1. 5 Essay type questions – any three are answerable.
2. One questions from each unit of the Syllabus.

Semester	Subject Code	Title Of The Paper	Hours Of Teaching / Week	No. of Credits
I	**14U1ZOT1**	√ℜ|ς⌈ √⌈ ℜ⌋BΔ (χ|↔Σ| *f*, E→||>, Σς*f*|Δ, √⌈ ℜ⌋B κ↔⌈ ς→)	**6**	**3**

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•>⊆]↔ …>σλ[μ])

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5. ℘®\|ℜ…\|ς®\| *f* \|_Bς□ •⊆>↔Δ □Σς\|

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\|[♠*f* Σς\|, ∴\|⌈Bς⟨ Σς\|))

6. \|κ↔ξ⇑μ □ \|σ↔ς⇔[\|\|> (\|ςυ→Δ \|σΘ∠Δ ∴⟩♥ ℘]_\|⌈)

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ζ.¬κ. ℘ς⌈•♥÷↔∴⦄B[□ ¬∣⟨>∴ A⇑>⌈

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…∑↔Δ: 18

E→∣∣>, A]♠Δ, ∑ς*f*∣Δ, ∣σ∣>, χ∣↔Σ∣ *f*

Semester	Subject Code	Title Of The Paper	Hours Of Teaching/ Week	No. of Credits
I	**14U1ZOE1**	**PART – II ENGLISH PROSE, POETRY AND COMMUNICATION SKILLS**	**6**	**3**

Objective

- To initiate the Students to understand English through Prose, Poetry and Basic Communicative Grammar

Unit – I

1) The Running Rivulets of Man,
2) Parliament is Marking Time,
3) The Lady in Silver Coat,
4) Mr. Applebaum at Play.

Unit – II

1) The Feigning Brawl of an Impostor,
2) Thy Life Is My Lesson,
3) Solve The Gamble,
4) The Stoic Penalty.

Unit – III

1) Nobility In Reasoning,
2) Malu the Frivolous Freak,
3) Bharath! Gird Up Your Loins!
4) Honesty is the Cream Of Chastity

Unit – IV

John Milton – On His Blindness.

Oliver Goldsmith – The Village Schoolmaster.

William Wordsworth – The Daffodils.

P.B.Shelley – Ozymandias.

Keats – La Belle Dame Sans Merci.

Hopkins – Thou Art Indeed, Just Lord.

Unit – V

Parts of Speech, Nouns, Pronouns, Conjunctions, Adjectives, Articles, Verbs, Adverbs, Interjection – sentence.

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
I	**14U1ZOC1**	**CORE – INVERTEBRATA**	**6**	**6**

Objectives:

1. To know the nomenclature, systematic position, classification of Invertebrates with suitable examples.
2. To study the economic importance of protozoans, insects and molluscs.
3. To study the parasitic adaptation of invertebrates.

Unit I **Hrs 18**

Principles of Taxonomy. General Characters and detailed classification of Phylum Protozoa upto classes with suitable examples of biological interest.

Detailed study – Paramecium

General topics – Protozoan diseases in human.

Parasitic protozoans of Man – Plasmodium, Entamoeba, Trypanosoma, Giardia and Leishmania, mode of infection and its control

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Unit II **Hrs 18**

General characters and detailed classification of phylum Porifera and Coelenterata up to classes with suitable examples.

Detailed study – Ascon, Obelia.

General topics: 1. Canal system in sponges.
2. Coral and coral reefs.

Unit III **Hrs18**

General characters and detailed classification of phylum Platyhelminthes and Nemathelminthes upto classes with suitable examples.

Detailed study – Taenia solium, Ascaris.

General topics: 1. Parasitic adaptation of platyhelminthes.
2. Nematodes parasites in Man.

Unit IV **Hrs 18**

General characters and detailed classification of Phylum Annelida and Arthropoda.

Detailed study – Earthworm, Prawn

General topics : 1. Economic importance of insects.
2. Excreting mechanism in Annelids.
3. Peripatus and its affinities.
4. Insects as vectors – Mosquito, Housefly, Sand fly, Tsetse fly

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Unit V **Hrs 18**

General characters and detailed classification of Phylum Mollusca and Echinodermata.

Detailed study–Lamellidens marginalis, Asterias rubens.

General topics: 1. Economic importance of Mollusca.
2. Larval forms of Echinoderms.

References

1. R.D. Barnes, Invertebrate Zoology.
2. M. Ekambaranatha Iyyer – A Manual of Zoology (Vol.I).
3. Jordon – Invertebrata Zoology.

4. L.H. Hyman – The Invertebrates.
5. E.J.W. Banington – Invertebrate Structure and Functions.
6. R.L. Kotpal – Zoology Phylum Series (Rastogi Publications).

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
I	**14U1ZOCP1**	**Core – PL – INVERTEBRATA**	**3**	**4**

Objectives:
1. To know the evolutionary trend in the digestive, nervous systems of Earth worm, Cockroach, Pila and Freshwater mussel.
2. To understand the mode of feeding in the insects observing the mouthparts.

Dissections

Earthworm : Digestive and nervous Systems.

Prawn : Nervous system.

Cockroach : Digestive, nervous and reproductive systems

Pila : Alimentary Canal and nervous system

F.W. Mussel : Digestive system

Mountings

Earthworm : Body setae and penial setae

Prawn : Appendages

Cockroach : Mouthparts

Honeybee : Mouthparts

Housefly : Mouthparts

Pila : Radula

Freshwater mussel : Pedal ganglion

LIST OF SPOTTERS

Protozoa **:** Entamoeba,Trypanosoma. Paramecium – Binary fission and Conjugation, Plasmodium

Porifera **:** Sponge - Gemmules, spicules,

Coelenterata **:** Obelia – entire, medusa; Physalia, Aurelia, Sea anemone and Corals

Platyhelminthes **:** Fasciola hepatica entire and T.S. Redia, Cercaria, Taenia solium – entire, T.S. and Scolex.

Nematoda **:** Ascaris male and female, T.S. of male and female, Dracunculus, Ancylostoma and Wuchereria.

Annelida **:** Neries entire, Parapodium, Heteroneries, Earthworm entire, Leech entire , T.S. of Leech, nephridium, Trochophore larva, Peripatus.

Arthropoda **:** Daphnia, Cyclops, Sacculina, Limulus.

Larvae **:** Nauplius, Zoea, Mysis, Megalopa, Phyllososma, Alima,

Beneficial insects **:** Honey bee, *Bombyx mori.*

Mollusca **:** Chiton, Dentalium, Sepia, Nautilus, Mytilus, Loligo Glochidium Larva.

Echinodermata **:** Starfish, Sea urchin, Sea–Cucumber. Bipinnaria larva, Auricularia Larva, Pluteus Larva,

Pedicellaria, Aristotle's Lantern.

Mark Details:

Methodology	**=**	20
Execution	**=**	30
Result	**=**	10
Total	**=**	60

Reference:

1. G.S. Sandhu – Advanced Practical Invertebrate Zoology,
2. Gurdarshan Singh – Manual of Laboratory specimens – Invertebrates.
3. H.S. Bharmah – Practical Zoology : Invertebrates.
4. K.R. Aneja – Experiments in Microbiology.
5. Gunasekaran P. – Lab manual in microbiology.

Candidates will be required to identify and comment upon specimen of Zoological interest Microscopic preparations, pertaining to types and examples studied under classification. A record of laboratory work and a report on local field trip should be maintained and submitted at the time of practical examination for valuation.

Semester	Subject Code	Title of the Paper	Hours of Teaching /Weeks	No. of Credits
I	**14U1ZOBOA1**	**Allied Botany – I**	**5**	**4**

Objectives:

- To make the students more competent in plant science and acquire skills to engage themselves in self-employment especially in different fields like Horticulture and Mushroom culture. To expose avenues of opportunities in the field of Plant Biotechnology which is growing phenomenally.

Unit I **Hrs 15**

Elementary knowledge of bacteria, Classification. Ultrastructure of *E.coli*. Economic importance of bacteria. General account of plant viruses (TMV).

Unit II **Hrs 15**

Classification of cryptogams. Study of *Nostoc, Chlorella, Ectocarpus, Polysiphonia, Albugo*.

Unit III **Hrs 15**

Penicillium, Polyporus, Polytrichum, Lycopodium, Cycas (excluding developmental studies).

Unit IV **Hrs 15**

Types of tissues, Primary structure of dicot stem, root and leaf. Secondary thickening in dicot stem. Structure of mature anther and ovule, fertilization, structure of dicot embryo.

Unit V **Hrs 15**

Absorption of water, photosynthesis: Light reaction, dark reaction (Calvin cycle); Respiration: Glycolysis, Kreb's cycle.

Books for Reference:

1. Ganguly, A.K., (1971). General Botany, Vol. II, The New Book Stall, Calcutta.
2. Rao, K.N., Krishnamurthy, K.V. and Rao, G., (1979). Ancillary Botany, Viswanathan Private Ltd.
3. Dutta, A.C., College Botany, Vol. I & II.

Semester	Subject Code	Title of the Paper	Hours of Teaching /Weeks	No. of Credits
I & II	**14U2ZOBOAPL**	**Allied Botany – Practical (NS)**	**3**	**-**

Objectives:

- To identify the families from locally available plants.
- To know the various forms of algae, fungi, bryophytes, pteridophytes and gymnosperms
- To study the various aspects of internal structures of root, stem and leaves.
- To make the students to understand the various principles of physiological experiments.
- To understand the techniques of horticulture and mushroom cultivation.

A study of the vegetative and reproductive structures of the following genera – *Nostoc, Chlorella, Ectocarpus, Polysiphonia, Albugo, Penicillium, Polyporus, Polytrichum, Lycopodium, Cycas.*

A study of the simple and complex permanent tissues. – Internal structures of stem, root, leaf (both dicot and monocot).

To Critically comment on simple experimental setup in physiology.

Observe the morphological characters of the following families - Annonaceae, Rutaceae, Rubiaceae, Apocynaceae, Euphorbiaceae and Poaceae.

Acquire elementary practical knowledge on Biotechnology, Horticulture and Mushroom cultivation (photos/diagrams/techniques/implements/tools).

Semester	Subject Code	Title Of The Paper	Hours Of Teaching / Week	No. of Credits
II	**14U2ZOT2**	√| *f*ℜ|ς⌈ √⌈ℜ⌋B∆ – ℘B[ξ| ⊕⇑ >τ∝ –√⌈ℜ|□ κ↔⌈ς→	**6**	**3**

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   ]∫ℜ\|∫\|ς∅⌈ ℘]\|∆
3. •⊆>↔⌈ □…>κς↔∆ □]∫κς™⌈ ℘]\|∆ (√\| ⊕\|…⟨ς ||⊗⊆> √[℘∆ ...)
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¬⊗ς_oB_ □ ¬⊗ς_ κ\| \| □ √⌈ℜ\|□ κ\| \| □ √⌈ℜ⌋B κ\| \| □ ¬ ℘B⌈⇓¬⊗ς_ □ √\|ζ⁄□ \| ς↔□∆ □ ∂→¬ ℘ς∫® ¬ ℘B⌈ (¬ ℘ς∫⊥, √*f*∆, \|ς⌈∆, E\| ♠, ζ□∆, ¬>ςα_) □ σ\| ♠⇓¬⊗ς_ □ √\| *f*⇓ ¬⊗ς_ □ χ⟩⇓¬⊗ς_ □ ξυ→ □ ♦⇓⊗∆ □ σζ]\|⊥ □ √\| *f*Ω\|⌈ □ >[σ\| ♠ □ ÷⊕σ\| ♠ □ ¬>⟩Ω\|⌈ σ\| ♠□ζ⁄♥A σ\| ♠□κ↵κ\| ∴].

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Semester	Subject Code	Title Of The Paper	Hours Of Teaching/ Week	No. of Credits
II	**14U2ZOE2**	**PART – II ENGLISH EXTENSIVE READERS AND COMMUNICATIVE SKILLS**	**6**	**3**

Objective

- To impart language and communicative skills through short stories, one act plays and communicative grammar

Unit – I **Hrs 18**

K.A.Abbas – The Sparrows

O'Henry – The Cop and the Anthem.

Guy de Maupassant – The Necklace.

R.K.Narayan – Engine Trouble.

Unit – II **Hrs 18**

Anton Chekov – The Proposal

O'Henry – While the Auto Watts

Unit – III **Hrs 18**

Saki – The Death Trap

Mahesh Dattani –The Girl who touched the stars

Claudia I.Haas – The Cellphone Epidemic

Unit – IV **Hrs 18**

Tense, Question Tag, Dialogue Writing, Paragraph Writing, Adjectives, Adverb

Unit – V **Hrs 18**

Voices, Degress of Comparison, Direct and Indirect

Book Prescribed:

Unit IV & V – Communicative grammar by the Department of English

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
II	**14U2ZOC2**	**Core – MICROBIOLOGY**	**6**	**6**

Objectives:

1. To study about the Microscope – structure and function of various microscopes.
2. To study the classification of microorganisms and their structure.
3. To study about the preparation of bacterial culture medium and Gram's staining techniques.
4. To study the pathology of various microbes.
5. To study the role of microbes in agriculture, food and dairy industries.

Unit I **Hrs 18**

Scope of Microbiology–Microscopy–optical, TEM and SEM; Sterilization methods – dry heat, moist heat, radiation, chemical, filteration; significance of Pasteur's experiment.

Unit II **Hrs 18**

Classification of Microorganisms, Prokaryotic and eukaryotic microorganisms – viruses, bacteria, algae, fungi, protozoans. Nutritional classifications of microorganisms. Basic structure – Virus, Bacteria and yeast.

Unit III **Hrs 18**

Bacterial culture technology – Bacterial culture medium – composition and preparation. Types of Media. Bacteria - Isolation and pure cultures. Gram staining technique – Gram positive and Gram negative bacteria.

Unit IV **Hrs 18**

Human diseases caused by microbes.

a. Viral diseases: Influenza, Mumps, Viral Hepatitis, Poliomyelities, AIDS, and Chicken pox.
b. Bacterial diseases: Pneumonia, whooping cough; Typoid, Cholera, Diphtheria, Tuberculosis and Leprosy.
c. Fungal Diseases: Mycoces, Aspergillosis;
d. Vaccines: Types of Vaccines and Vaccination Schedule.

Unit V **Hrs 18**

Microbial biofertilizers in Agriculture. Fermenters–Design–Stirred and Airlift fermentor–Fermentation Products. Role of microbes in Dairy and Food industry. Production of single cell proteins (SCP)

References:

1. Ross, F.C.–Introductory Microbiology (Bell and Howell Co, London).
2. Pelzer, M.J.Reid, R.D and Chan, E.C.S–Microbiology (Mc Graw Hill).
3. Purohitm S.S. Microbiology–Fundamentals and Applications, (Agro Bios).
4. Dubey, R.C. & Maheshwari, D.K. A Text Book of Microbiology. (S.Chand & Co.)
5. Sharma, P.D. – Microbiology (Rastogi Publication).
6. Powar, C.B and Daginawala, H.E–General Microbiology (Himalaya Publishing House Meerut).
7. Anita Rozar – Practical methods for Environmental Microbiology and Biochemistry.
8. Bisen – Handbook of Microbiology (CBS Pulishers, New Delhi).
9. Michael, J.Waites–Industrial Microbiology–and Introduction (Blackwell Sciences,New York)
10. Patel, A.H. – Industrial Microbiology (Tata Mc Graw Hill Publishers).
11. Power, C.B. and Dagina Wala–Industrial Microbiology (Tata Mc Graw Hill).

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
II	**14U2ZOCP2**	**Core –PL – MICROBIAL TECHNIQUES**	**3**	**4**

Objectives:

1. To study about the Microscope – structure and function of various microscopes.
2. To study the classification of microorganisms and their structure.
3. To study about the preparation of bacterial culture medium and Gram's staining techniques.
4. To study the pathology of various microbes.
5. To study the role of microbes in agriculture, food and dairy industries.

PRACTICALS

1. Cleaning and preparation of glasswares.
2. Sterilization of glasswares and media.
3. Preparation of fungal culture media – PDA and Rose Bengal Agar medium.
4. Preparation of Bacterial culture media – NA and Nutrient broth medium.
5. Identification of microorganisms in water and soil samples.
6. Pure culture technique – Serial dilution, Streak plate and pour plate technique.
7. Staining techniques – Gram's staining and Lactophenol cotton blue staining.
8. Biochemical test – Fermentation of Carbohydrate and Amylase test.

SPOTTERS

Hot air oven, Autoclave, Pressure cooker, Agar plate, Inoculation needle, Petri plates, Laminar air flow, Colony counter, Haemocytometer.

HIV, Bacteriophage, Yeast, E.coli, Pseudomonas, Bacillus subtilis, Streptococci, Vibrio cholera, Aspergillus niger**,** A.flavous, Pencillium janthinelum, P.citrinum and Fusarium sp.,

Semester	Subject Code	Title of the Paper	Hours of Teaching /Weeks	No. of Credits
II	**14U2ZOBOA2**	**Allied Botany – II**	**5**	**4**

Objectives:

- To enable the students to get a fair knowledge of morphology and taxonomy of angiosperms.
- To learn the applied aspects of biotechnology, horticulture and mushroom cultivation.

Unit I **Hrs 15**

Morphology – leaf and its modifications, inflorescence, flower & fruits. General outline of Bentham and Hooker's system of classification.

Unit II **Hrs 15**

Study of the range of characters and economic importance of Annonaceae, Rutaceae, Apocynaceae, Euphorbiaceae, Poaceae.

Unit III **Hrs 15**

Biotechnology– definition, principles of genetic engineering, rDNA technology.

Unit IV **Hrs 15**

Horticulture, scope and importance; Propagation methods (Cuttage, Layerage and Air layering). Gardening and Landscaping, Lawns, Indoor plants, Bonsai techniques.

Unit V **Hrs 15**

Mushroom cultivation–Introduction, Nutritive value and importance of mushrooms. Cultivation of Oyster mushroom, spawn preparation, preservation of mushrooms, Receipes made from mushrooms (Mushroom soup and omelette).

Books for Reference:

1. Ganguly, A.K., (1971). General Botany, Vol. II, The New Book Stall, Calcutta.
2. Rao, K.N., Krishnamurthy, K.V. and Rao, G., (1979). Ancillary Botany, Viswanathan Private Ltd.
3. Dutta, A.C., College Botany, Vol. I & II.
4. Gupta, P.K., Elements of Biotechnology Rastogi and Company.
5. Suman, B.S. and Sharma, V.P., Mushroom Cultivation and used Agrobios (India), Jodhpeq.
6. Kumar, N., (1999). Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.

Semester	Subject Code	Title of the Paper	Hours of Teaching /Weeks	No. of Credits
I & II	**14U2ZOBOAPL**	**Allied Botany – Practical (NS)**	**3**	**2**

Objectives:

- To identify the families from locally available plants.
- To know the various forms of algae, fungi, bryophytes, pteridophytes and gymnosperms
- To study the various aspects of internal structures of root, stem and leaves.
- To make the students to understand the various principles of physiological experiments.
- To understand the techniques of horticulture and mushroom cultivation.

A study of the vegetative and reproductive structures of the following genera – *Nostoc, Chlorella, Ectocarpus, Polysiphonia, Albugo, Penicillium, Polyporus, Polytrichum, Lycopodium, Cycas.*

A study of the simple and complex permanent tissues. – Internal structures of stem, root, leaf (both dicot and monocot).

To Critically comment on simple experimental setup in physiology.

Observe the morphological characters of the following families - Annonaceae, Rutaceae, Rubiaceae, Apocynaceae, Euphorbiaceae and Poaceae.

Acquire elementary practical knowledge on Biotechnology, Horticulture and Mushroom cultivation (photos/diagrams/techniques/implements/tools).

Semester	Subject Code	Title Of The Paper	Hours Of Teaching / Week	No. of Credits
III	**14U3ZOT3**	⏐ς♥÷B≡⏐⊥, ⏐®‖↔⏐⊥, √⌈ℜ⌋B κ↔⌈ς→	**6**	**3**

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3. ⌈κ⏐ E⊆>ς∴⟨ □ σ∴⏐⌈B⌈ √⌈Δ℘⏐Δ

4. ⏐Δ℘↔ς∴ςB□Δ □ •⊆>↔ ⏐ς⌋ƒΔ □ ⌈ƒς∴⟨♥ ℘ƒ⌈Δ (84 ℘ςƒ_⏐⊥)

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3. …>Δ℘ςκ⟨ □ ∑ς®⏐♥ ℘ƒ⌈Δ (ξ>_ 10 ℘ςƒ_⏐⊥)

4. ⌈⊕ς♥A↔ς□Δ □σ⌈ς>⇑μℜ ⏐ς⌋ƒΔ □ ∑÷ ∂κ>ς↔♥ ℘ƒ⌈Δ (ξ>_ 10 ℘ςƒ_⏐⊥)

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Semester	Subject Code	Title Of The Paper	Hours Of Teaching / Week	No. of Credits
III	**14U3ZOE3**	**PART – II ENGLISH SHAKESPEARE, EXTENSIVE READERS AND COMMUNICATIVE SKILLS**	**6**	**3**

Objective

- To introduce the language of the world renowned dramatist and novelist to enhance the vocabulary and communicative skills of the learners.

Unit – I **Hrs 18**

Funeral Oration – Julius Caesar

Trial for a Pound of Flesh – The Merchant of Venice

Unit – II **Hrs 18**

He Kills Sleep – Macbeth

A Real Love at First Sight – Twelfth Night

Unit – III **Hrs 18**

When the Moor Kills, "So Good a wife" – Othello

In Love is a "Midsummer Madness" – Tempest

Unit – IV **Hrs 18**

The Mayor of Casterbridge (Abridged) – Thomas Hardy

Unit – V **Hrs 18**

Note making, Hints Developing, Expansion of Ideas and Proverbs, Sequence of Sentences Synonyms, Antonyms.

Book Prescribed:

Unit–I : II & III: Selected scenes from Shakespeare.

Unit IV: The Mayor of Casterbridge Abridged by E.F.Dodd

Unit V : Communicative Grammar.

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credits
III	**14U3ZOC3**	**Core – CHORDATA**	**6**	**6**

Objectives:

1. To study about the chordate animals upto orders with suitable examples.
2. To study about the accessory respiratory organs and migration of fishes.
3. To study the parental care in Amphibia, poisonous and non-poisonous snakes of South India.
4. To study the flight adaptation and migration of birds.
5. To study prototheria , metatheria and dentition in mammals.
6. To study the detailed information about Amphioxus, Scoliodon, Frog, Pigeon and Rat.

Unit I **Hrs 18**

General characters of Chordata and its outline classification – Origin of Chordates – General characters of Prochordates and its classification.

Detailed study – Amphioxus

External features of Balanoglossus and Ascidia.

Unit II **Hrs 18**

Vertebrata–General characters and its outline Classification. External features of Petromyzon; Pisces–General characters and classification upto orders with suitable examples.

Detailed study – Cyclostomata, Gnathostomata, Scoliodon

General topics: 1. Accessory respiratory organs of fishes
2. Migration of fishes.

Unit III **Hrs 18**

Amphibia and Replitia–General characters and classification upto orders with examples.

Frog – External features only

Detailed study – Calotes.

General topics: 1. Parental care in Amphibia
2. Poisonous and non-poisonous snakes in South India.

Unit IV **Hrs 18**

Aves – General characters and classification upto orders with examples.

Detailed study – Pigeon

General topics : 1. Flight Adaptation
2. Migration of birds.
3. Flightless birds.

Unit V **Hrs 18**

Mammalia – General characters and classification upto orders with examples.

Detailed study : Rat

General topics : 1. Prototheria and Metatheria – Salient features and examples.
2. Dentition in Mammals.
3. Adaptations of Aquatic Mammals.

References

1. Alexander – The Chordates.
2. M. Ekambaranatha Iyyer – A Manual of Zoology (Vol.II)
3. Goodrich – Structure and Development of Vertebrata (Vol.I and II)
4. Jothie, M. – Chordate Morphology.

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III	**14U3ZOCP3**	**Core – PL - CHORDATA**	**3**	**4**

Objectives:

1. To know the various systems of Calotes and Rat.
2. To study the important chordate animals as spotters.

1. Calotes : Digestive System, Arterial system and venous system
2. Rat : Digestive System, Arterial system and venous system
3. Mounting : Placoid scale of shark, Brain of Calotes and Rat.

Candidates are required to indentify and comment upon specimen of Zoological interest, microscopic preparations pertaining to types and examples studied under classifications and osteology of types.

LIST OF SPOTTERS - CHORDATES

Amphioxus, Balanoglossus, Tornaria larva, Ascidia, Petromyzon, Shark, Mullet, Eel, Arius, Exocoetus, Saccobranchus, Synapta, Echenies, Gambusia, Clarias, Anabas, Rana, Hyla, Ichthyophis, Rhacophorus, Varanus, Draco, Calotes, Hemidactylus, Chaemeleon, Oligodon, Cobra, Viper, Python, Pit viper, Pigeon, Owl, Parrot, Kingfisher, Rat, Bat, Loris, Dentition – Rabbit.

Pectoral, girdle : Frog, Calotes, Pigeon and Rabbit
Pelvic Girdle : Frog, Calotes, Pigeon and Rabbit
Fore and Hind Limbs : Frog, Calotes, Pigeon and Rabbit
Skull : Frog, Calotes, Pigeon and Rabbit

A record of lab work and report on field trip should be maintained and submitted at the time of practical examination for valuation.

Reference:

1. G.S. Sandhu – Advanced Practical Chordate Zoology
2. Gurdarshan Singh – Manual of Laboratory specimens – Chordates
3. H.S. Bharmah – Practical Zoology; Chordates.

Semester	Subject Code	Title of the paper	Hours of Teaching/ week	No. of Credits
III	**14U3ZOCHA1**	**ALLIED CHEMISTRY –I**	**5**	**4**

Unit –I **Hrs 15**

Atomic Structure : Atomic number and mass number – isotopes (hydrogen, oxygen , chlorine and uranium) - Orbit and orbital – shapes of s, p, d orbitals - Aufbau principle Hund's rule – electronic configuration of hydrogen carbon, nitrogen, oxygen, - stability of half filled and completely filled orbitals with the examples if Cr, Cu and Ag.

Types of chemical bonds : Octet rule – formation of ionic, covalent , co-ordinate covalent bond with the examples of NaCl, H_2, Cl_2, HF molecules and BF_3 – NH_3 - VSEPR theory -shapes of $BeCl_2$, BF_3, H_2O, PCl_5, XeF_6 - inter and intra molecular hydrogen bonds and their consequences

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Unit –II **Hrs 15**

Kinetics: Definition with suitable examples of rate, rate law, rate constants, order, molecularity, pseudo first order and half life period - factors that influence the rate of chemical reactions – effect of temperature on rate .

Catalysis: General characteristics of a catalyst –types (homogeneous & heterogeneous, positive & negative and enzyme) – catalytic promoter and catalytic poisoning - intermediates compound theory and adsorption theory.

Energetics: Units of heat - concept of internal energy, enthalpy, entropy – exothermic and endothermic reactions.

Unit –III **Hrs 15**

Acid – base concept: Arrhenius, Lowry – Bronsted and Lewis concepts – strong & weak acids - pH, buffer solution – buffer action.

Colloids: Types- properties (Tyndall effect, Brownian movement, electrophoresis, electro osmosis) – purification by dialysis and ultrafiltration. Types of emulsions and gels

Water chemistry: Hard water – soft water, temporary and permanent Hardness – removal of hardness by reverse osmosis and ion exchange method.

Soaps and detergents – cleaning action of soap - merits and demerits of soap and detergent.

Unit – IV **Hrs 15**

Separation and purification techniques: Solvent extraction with Soxhlet apparatus - crystallization, fractional crystallization, distillation, fractional distillation, steam distillation with suitable examples.

Chromatography: adsorption and partition principles – column (preparation of column, development and elution), paper (sampling, ascending & descending developments , R_f values) and TLC (preparation of plate, sampling, ascending & descending developments) chromatography.

Unit –V **Hrs 15**

Organic compounds: Classification - functional groups – nomenclature of simple organic compounds.

Isomerism : Definition – types (structural & stereo) - position, chain, functional isomerism and metamersm shown by butyl alcohol - Geometrical isomerism exhibited by maleic & fumaric acids - optical activity – condition for optical activity - optical isomerism exhibited by lactic acid & tartaric acid – racemisation – resolution .

Dye chemistry: chromophore–chromogen–auxochrome-classification of dyes according to application- requisites of dye-washing, light, rubbing and sweating fastness.

References

1. Puri B.R. Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, Milestone Publishers, Delhi (2008)
2. Puri B.R..,Sharma L.R., Pathania M.S., Principles of Physical Chemistry, Vishal PublishingCo., Jalandar, (2004)
3. Bahl B.S. Arun Bahl, Advanced Organic Chemistry, S. Chand & Company ltd., New Delhi, (2005).
4. Usharani S., Analytical Chemistry, Macmillian India Ltd., NewDelhi(2000)

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III & IV	**11U4ZOACHP**	**Allied chemistry practical** (Non – semester)	**3+3**	**-**

A. Volumetric Analysis

1. Estimation of HCl (or H_2SO_4) by NaOH using a standard oxalic acid solution
2. Estimation of NaOH by H_2SO_4 (or HCl) using a standard Na_2CO_3 solution
3. Estimation of oxalic acid by $KmnO_4$ using a standard Mohr's salt solution
4. Estimation of Ferrous sulphate by $KmnO_4$ using a standard oxalic acid solution.
5. Estimation of Mohr's salt by $KmnO_4$ using a standard oxalic acid solution.
6. Estimation of KMnO4 by thio using a standard $K_2Cr_2O_7$ solution.
7. Estimation of $K_2Cr_2O_7$ by thio using a standard $CuSO_4$ solution
8. Estimation of $CuSO_4$ by thio using a standard $K_2Cr_2O_7$ solution

B. Organic qualitative analysis

Systematic analysis of an organic compound, Preliminary tests, detection of element present, Aromatic or aliphatic, Saturated or unsaturated, nature of the functional group and exhibiting confirmatory tests for given organic compounds.

The following substance are prescribed:

Benzoic Acid, Cinnamic acid, Phenol, Cresol, Aniline, Toludine, Urea, Benzaldehyde, Glucose

Reference:

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, Sultan Chand & sons, New Delhi, (1997)

Semester	Subject Code	Title Of The Paper	Hours Of Teaching /Week	No. of Credits
IV	**14U4ZOT4**	⊗≡⏐ √⌈ℜ⌋B∆ – ∂⊕ √⌈ℜ⌋B∆ – ¬⊗∆¬∴ς∝ – √⌈ℜ⌋B κ↔⌈ς→	**6**	**3**

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Semester	Subject Code	Title of The Paper	Hours of Teaching/ Week	No. of Credits
IV	**14U4ZOE4**	**PART – II ENGLISH ENGLISH FOR COMPETITIVE EXAMINATIONS**	**6**	**3**

Objective

- To prepare the learners for competitive examinations and to know the fundamentals of practical communication.

Unit – I **Hrs 18**

Grammar – Number, Subject, Verb, Agreement, Articles, Sequence of Tenses, Common Errors.

Unit – II **Hrs 18**

Word Power - Idioms & Phrases, one word substitutes, Synonyms, Antonyms, Words we often confuse, foreign words & phrases, spelling.

Unit – III **Hrs 18**

Reading & Reasoning – Comprehension, Jumbled Sentences.

Unit – IV **Hrs 18**

Writing Skills – Paragraph, Precis Writing, Expansion of an idea, Report Writing, Essay, Letters, Reviews (Film & Book)

Unit – V **Hrs 18**

Speaking- Public speaking, Group Discussion, Interview, Spoken English.

Prescribed Text:

1. V.Saraswathi, English for Competitive Examinations, Chennai, Emerald Publishers, 2000.

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
IV	**14U4ZOC4**	**Core - BIO-CHEMISTRY, BIO-PHYSICS AND BIO-STATISTICS**	**6**	**6**

Objectives:

1. To study the classification, structure and biological importance of carbohydrates, protein, lipid.
2. To study the basic structure of nucleic acids.
3. To study the classification, kinetics of enzymes and it's role in food industries and also to know the significance of ELISA test in immuno technology
4. To study the principles of colorimetry and Spectroscopy and its working mechanisms and also to known about ECG, EEG and NMR Scanning.
5. To study the basics of biostatistics.

Unit I **Hrs 18**

Carbohydrates: Classification of carbohydrates–Monosaccharide's, Disaccharides and Polysaccharides. Basic molecular structure, Peptidoglycans. Lipids–Triglycerides – Fatty acids and glycerol – steroids and cholesterol.

Unit II **Hrs 18**

Proteins : Basic structure and classification. Classification of aminoacids with examples – simple, acidic, basic, hydroxylic, sulphated and aromatic aminoacids. Nucleic acids - Basic molecular structure of DNA, RNA and their types.

Unit III **Hrs 18**

Enzymes : Classification of enzymes and mode of Action – Enzyme Kinetics. Enzymes in the production of new compounds. Enzymes in food industry and food processing. Enzymes as research tools ELISA method.

BIOPHYSICS **Hrs 18**

Unit IV

Colloids–types and its properties, Tyndall effect, Surface tension, Brownian movement, filteration, osmosis and dialysis. Beer and Lambart's law–Principles of Colorimeter and Spectrophotometer and their applications. Radiology–Applications of UV, fluorescence, atomic absorption, infrared, Raman spectra, X-ray, ECG, EEG, NMR scanning.

Unit V **Hrs 18**

Biostatistics –Types of data, Collection of data; Measures of central tendency: Mean, median and mode – Standard deviation.

Graphical and diagramatic representation – bar types, pie diagram and histogram.

Reference:

1. Biochemistry – J.L.Jain
2. Biological chemistry – Conn and Stump; Tata McGraw Hill Publishers
3. Biochemistry – Power and Chatwall; Himalaya Publishing House, New Delhi
4. The Text Book of Biochemistry – A.V.S.S. RamaRao
5. An Introduction to Practical Biochemistry – David T.Plummer

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
IV	**14U4ZOCP4**	**Core-PL-BIOCHEMISTRY, BIOPHYSICS AND BIO-STATISTICS**	**3**	**4**

Objectives:

1. To understand the level of sugar, proteins, and lipids in biological samples by qualitative and quantitative estimation.

A. Bio-Chemistry

1. Qualitative test for Carbohydrate.
2. Qualitative test for Protein.
3. Qualitative test for Lipid**.**
4. Quantitative estimation of sugar in biological samples (Anthrone Method).
5. Quantitative estimation of proteins in biological samples (Folin-Phenol/Biuret method).
6. Separation of amino acids by circular paper chromatography.
7. Extraction and separation of lipids (TLC).
8. Measurement of pH of the given sample.

B. Biostatistics

1. Determination of mean, median and mode.
2. Determination of standard deviation.

C.Biophysics

1. Verification of Beer's and Lambert's law.
2. Estimation of soluble sugar in the given sample – Colorimetric method (Phenol Sulphuric acid method).

Spotters

Colorimeter, Spectrophotometer, NMR, ECG, EEG, pH meter, TLC, Homogenizer, Centrifuge, SDS-PAGE, ELISA – kit, Micro pipette.

Mark Details:

Practical = 50

Record = 10

Total = 60

Semester	Subject code	Title of the paper	Hours of Teaching / Week	No. of Credits
IV	**14U4ZOCHA2**	**ALLIED CHEMISTRY –II**	**5**	**4**

Unit – I **Hrs 15**

Concept of mole : Definition of mole - Avagadro number - calculation of molecular masses of Urea, Glucose, HCI, H_2SO_4, NaOH, Na_2CO_3 and sucrose - Molar volume, equivalent masses of acid and base (HCI, H_2SO_4, NaOH, Na_2CO_3)

Concentration terms: % by weight, molarity, molality, normality, mole fraction - simple problems to prepare different normal / molar solution for the substances NaOH and Glucose - simple problems to prepare different normal / molar solution from the given strength of solutions using $V_1V_2 = V_2N_2$ formula for the HCI, H_2SO_4, NaOH, solutions.

Co-ordination compounds: Double salts (Mohr's salt, potash alum) and complex salt – terminology in co-ordination chemistry – Werner's theory – IUPAC names simple co-ordination compounds –structure and uses of haemoglobin and chlorophyll.

Unit – II **Hrs 15**

Nuclear chemistry: Nuclear fission, fusion, carbon dating – tracer techniques – atom bomb and hydrogen bomb.

Industrial chemistry : Fertilizers: Essential nutrients for plants –functions N,P,K nutrients- micronutrients and their role in plant life -preparation of urea, calcium superphosphate, super phosphate of lime, potassium sulphate - mixed fertilizers - **Pesticides**: Insecticides (stomach & contact poison and fumigant), fungicides, herbicides, rodenticides and their adverse effect – alternative methods for pest control - **Fuel Gases:** Water gas, natural gas, bio gas and producer gas (no manufacture).

Unit – III **Hrs 15**

Natural products :*Alkaloids* - Definition- classification – occurrence and extraction– general physical properties – isolation, properties and structure (no structural elucidation) of Conine and Nicotine - *Terpenes*: Definition- classification – general physical properties - uses and structure (no structural elucidation) of Citral α – Pinene. Camphor and Menthol.

Bio molecules: *Amino acids* : Classifications – peptide formation – isoelectric point *Protein*: Classification based on chemical composition and molecular shape – primary and secondary structures – denaturation - *Lipid***:** classification –structure of glycerides – explanation for solid state of animal fat and liquid state of vegetable oil.

Unit – IV **Hrs 15**

Carbohydrates :Definition -classification –D,L notations - rections of glucose - mutarotation – invertsugar – reducing and non reducing sugars - structure of starch and cellulose(no structural elucidation)- Gun cotton, cellulose acetate and viscose rayon.

Fundamental concepts in organic chemistry: Homolytic and heterolytic fissions – substitution, addition, elimination, and condensation reactions, electrophiles-nucleophiles and free radicals with suitable examples. Mechanism of chlorination of CH_4 - Electron displacement effect- inductive and mesomeric effects.

Petroleum refinery products **-** Rectified spirit – methylated spirit - vinegar – formalin

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Unit –V **Hrs 15**

Chemotherapy: Drugs–sulpha drugs (structures of sulphapyridine, sulphadiazine, sulphaguanidine, sulphathiozole, sulphaacetamide) – mode of action – uses –Definition of antimalarials, antipyretics , analgesics tranquilizers and sedatives , anti septics and disinfectants – structure , uses and side effects of Aspirin, Paracetamol Phenacetin - local and general anesthetics - *Antibiotics* : Definition – structure ,mode of action and side effect of Penicillin , Chloram phenicol and tetracycline.

Polymers: Homo and co- polymers with the examples of polythene and polyester, thermoplastic and thermosetting polymers (PVC and backelite).

References:

1. Puri B.R. Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, Milestone Publishers, Delhi (2008)
2. Puri B.R..,Sharma L.R., Pathania M.S., Principles of Physical Chemistry, Vishal PublishingCo., Jalandar, (2004)
3. Bahl B.S. Arun Bahl, Advanced Organic Chemistry, S. Chand & Company ltd., New Delhi, (2005).
4. Jaya shree Ghosh , A text book of pharmaceutical chemistry, 3rd ed., S.Chand &Company Ltd.,NewDelhi (2008)

Semester	Subject Code	Title of the Paper	Hours of Teaching/ Week	No. of Credits
III & IV	**11U4ZOACHP**	**ALLIED CHEMISTRY PRACTICAL** (Non – semester)	**3+3**	**2**

A. Volumetric Analysis

1. Estimation of HCl (or H_2SO_4) by NaOH using a standard oxalic acid solution
2. Estimation of NaOH by H_2SO_4 (or HCl) using a standard Na_2CO_3 solution
3. Estimation of oxalic acid by $KmnO_4$ using a standard Mohr's salt solution
4. Estimation of Ferrous sulphate by $KmnO_4$ using a standard oxalic acid solution.
5. Estimation of Mohr's salt by $KmnO_4$ using a standard oxalic acid solution.
6. Estimation of KMnO4 by thio using a standard $K_2Cr_2O_7$ solution.
7. Estimation of $K_2Cr_2O_7$ by thio using a standard $CuSO_4$ solution
8. Estimation of $CuSO_4$ by thio using a standard $K_2Cr_2O_7$ solution

B. Organic qualitative analysis

Systematic analysis of an organic compound, Preliminary tests, detection of element present, Aromatic or aliphatic, Saturated or unsaturated, nature of the functional group and exhibiting confirmatory tests for given organic compounds.

The following substance are prescribed:

Benzoic Acid, Cinnamic acid, Phenol, Cresol, Aniline, Toludine, Urea, Benzaldehyde, Glucose

Reference:

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, Sultan Chand & sons, New Delhi, (1997)

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credits
V	**14U5ZOC5**	**Core – CELL BIOLOGY AND GENETICS**	**6**	**6**

Objectives:

1. To study the structure and functions of plasmambrane and cytoplasmic organelles.
2. To study the ultra structure and functions of nuclear components and importance of cell division.
3. To know the Mendelian principles, crossing over, linkage, chromosomal mapping, mutations, sex linked inheritance, non disjunction of chromosome, and sex determination.
4. To study the fine structure of gene, Operon concept, and Inborn error metabolism in man.

CELL BIOLOGY **Hrs 18**

Unit I

Cell fractionation, Centrifugation – Differential and Density gradient - Principles, types and applications. Cytoplasm – Organization of Cytoplasmic matrix and functions. Ultra structure and functions of plasma membrane.

Unit II **Hrs 18**

Structure and functions of Cytoplasmic organelles – Mitochondria, Golgi complex, Endoplasmic reticulum, Centrosome, Ribosomes, Lysosomes.

Unit III **Hrs 18**

Nucleus: Organization and Functions. Nucleolus, Chromosomes and their role, Giant Chromosomes – Polytene and lamp brush, Cell Divisions – Mitosis and Meiosis.

GENETICS **Hrs 18**

Unit IV

Mendelian Principles – Monohybrid and Dihybrid cross. Linkage and crossing over. Chromosomal mapping. Multiple alleles. Sex–Linked inheritance. Non-disjunction of Chromosomes. Sex determination in Animals.

Unit V **Hrs 18**

Fine structure of Genes – Cistron, Recon, Muton – operon model. Gene mutation. Chromosomal aberration – Population Genetics – Hardy Weinberg law – Inborn error metabolism in man – Genetic Counseling.

Reference:

1. Loewy, A. g and P. Seikovitz–Cell structure and function (Half Rinchart and Winstion) 1969.
2. Ambrose, E.J, and Easty, D.M – Cell Biology (ELBS).
3. Derobertis – Cell Biology.
4. Swanson, C.F. and P.L. waster – The cell (4^{th} Edn), Prentice Hall of India, 1978.
5. Langley – Cell function.
6. Stern and Nancy – The Biology of the cells.
7. Livine, R.P. – Genetics (Hort R.W.N.Y 1969).
8. Swanson, C.P.T.Marg. – Cytogenetics.
9. Waddington, C.H – The strategy of Genes.
10. Garber, Ed. – Cyto – Genetics – An introduction (McGraw Hill).
11. Stent, G.S. – Molecular Genetics.
12. Witeheusel, H.L.K. – Towards on understanding of the mechanism of Heriditary.
13. Watson, J.O. – Molecular Biology of the genes (3^{rd} Edn).

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
V	**14U5ZOC6**	**Core – DEVELOPMENTAL BIOLOGY AND EVOLUTION**	**6**	**5**

Objectives:

1. To study the various theories of developmental biology and gametogenesis.
2. To study parthenogenesis, types of eggs, cleavage, blastulation, and gastrulation in amphioxus, Frog, Chick, and Mammals.
3. To study the organogenesis of chick and placenta in mammals.
4. To study about the origin of life and evidences of evolution.
5. To study the speciation and isolation, mimicry and colouration and evolution of Horse and Man.

DEVELOPMENTAL BIOLOGY **Hrs 18**

Unit I

Scope of Embryology. Theories on development–Epigenesis, Beer's Law, Germplasm Theory, Mosaic theory, Regulative theory, Gradient theory and Spemann and Manglod's Theory of organizers. Spermatogenesis, Oogenesis. Fertilization – Physico-chemical changes during fertilization – Parthenogenesis.

Unit II **Hrs 18**

Types of eggs in chordates, cleavage–Patterns of cleavage Blastulation in Amphioxus, Frog and chick. Gastrulation in Amphioxus, Frog and Chick. Fate map.

Unit III **Hrs 18**

Organogenesis: Development of Heart, Brain, eye and ear of Frog, Extra embryonic membranes in Chick. Placenta in mammals.

EVOLUTION **Hrs 18**

Unit IV

Origin of Life–theories. Evidences of evolution-Palaentological, Anatomical, Embryological, Physiological and Biochemical evidences. Theories of evolution- Lamarkism, Darwinism and Devries.

Unit V **Hrs 18**

Speciation–isolation. Mimicry and colouration. Evolution of Horse. Evolution of Man

Reference:

1. Balinsky – An introduction to embryology V Edn, Saunders Co, Philadelphia, 1981.
2. Rayam, C.P.–An outline of developmental Physiology, I Edn, Bergman, London, 1961.
3. Weber, R. – The biochemistry of animal Development, Vol. I and III, academic Press.
4. Ebert,J.C. Interacting systems in Development, Holt Rainbart and Winston, New York, 1965.
5. Berril, N.J. – Deelopmental Biology, TMH Edn., New Delhi 1961.
6. Bodemes, C.W. – Modern Embryology, Holt Rinebert Winston, New York, 1968.
7. Rough, R – Experimental Embryology, Burgress, Minneopolis, 1945.
8. Needham, J – A History of embryology, Burgress, Minneopolis, 1945.
9. Savage – Evolution (Modern Biology Series, 1969).
10. Stabbins – Process of Organic Evolution (Prentice Hall).
11. Dowdeswell, W.H. – The mechanism of Evolution (Helmann, London, 1956).
12. Shappart, P.M. – Natural Selection and Heredity (Hutchinson).
13. Ehrlich / Holin / Pauell – The process of evolution (McGraw Hill).
14. Mayr, El, Animal Species and Evolution (Harvard Uni, Harvad Uni, Press, 1963.
15. Simpson, G.G. – The major adaptation (CUP).
16. Huxley, J – Evolution, The modern synthesis (Harpers N.Y), 1942.

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credits
V	**14U5ZOCP5**	**Core – PL – CELL BIOLOGY, DEVELOPMENTAL BIOLOGY, GENETICS AND EVOLUTION**	**6**	**4**

Objectives:

1. To learn the handling of microscope and to observe the cell divisions.
2. To observe the various hours of chick embryo.
3. To identify the blood groups and Mendelian characters of Man.
4. To know the evolutionary significance with suitable examples.

1. Cell Biology

1. Mitosis - Squash preparation of onion root tip.
2. Meiosis - Squash preparation of grasshopper testis.
3. Giant chromosome - Squash preparation of salivary gland of Chironomous larva.

2. Development Biology

3. Observation of various stages of chick embryo.
4. Observation of early developmental stages of Frog (Metamorphosis).
5. Temporary mounting of the invertebrate larvae (From Plankton Collection).

3. Genetics

Blood grouping.

Drosophila – sex differences – identification of different mutant.

Mendelian traits – tasters and non–tasters, tongue rollers and non–rollers and other common human traits.

4. Evolution

Comments on animals of Evolutionary significance (Palaentological evidences).

Reference:

1. Taylor, R.G.W – Practical Cytology, Academic Press, London.
2. Michael, A. Tribe, Michael, R. Erant and Roger, K. Snook – Electron Microscopy and cell Structure: Basic Biology course, Cambridge University Press, London.
3. Benjamin, H. Willies and Sane, M. Oppenheimer, - Foundations of Experimental Embryolog, Eastern Economy Edn.

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
V	**14U5ZOEL1A**	**Major Elective – I PRINCIPLES OF IMMUNOLOGY**	**4**	**4**

Objectives:

1. To study about different immunities and Lymphoidal organs.
2. To study about the Biosynthesis of Immunglobulins with functions and Theories of antibody formation.
3. To study the structure and functions of Antigens and Antibodies.
4. To study about the antigen-antibody reactions.
5. To study about the Vaccines for infectious disease, blood grouping, and transplantation.

Unit I **Hrs12**

Immunity: Kinds of immunity – Natural and acquired. Primary lymphodial organs – Thymus, Bursa Fabricii, Bone marrow. Secondary Lymphoidal organs–Spleen, Lymphnodes, Payer's Patches.

Unit II **Hrs 12**

Antigens and Antibodies: Antigens and Haptens, Size, Solubility and Chemical nature of immunoglobulins. 1gG, 1gA, 1gM, 1gD, 1gE, Basic structure of antibody (1gG).

Unit III **Hrs12**

Biosynthesis of immunoglobulins. Functions of immunoglobulins. Theories of antibody formation. Immune response. Humoral and cell mediated immune response–phagocytosis.

Unit IV **Hrs12**

Antigen–Antibody interactions: Precipitation, Agglutination, Cytolysis, Complement fixation, Flocculation, Opsonization, Fluorescence – MHC - Hypersensitivity.

Unit V **Hrs12**

Immunity to infectious diseases : Vaccines and their role–Application of immunology in Blood grouping, Rh Factor and Transplantation–Auto immune diseases.

References:

1. Jean Francis Bach–Immunology, 6thEd. Wiley Medical Publication, New York, 1982.
2. Jean Fracis Bach–Immunology, 6thEd. Wiley Medical Publication, New York, 1982.
3. Glynn, L. and Steward, M.W,-Structure and functions of Antibodies, John Wile Sons, NY.
4. Hildermann, W.H. – Essentials of Immunology, Elsevier publications, Oxford.
5. Joshi, K.R – Immunology, Agrobios Publication jodhpur, 2002.
6. K.R. Joshi and N.O. Osama – Immunology, Agrobios, India.
7. Rastogi, S.C. – Elements of Immunology.
8. Jean Francis Bach–Immunology, 6th Ed. Wiley Medical Publication, New York, 1982
9. Joshi, K.R – Immunology, Agrobios Publication, Jodhpur, 2002.

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credits
V	**14U5ZOEL1B**	**Major Elective – I** **NANOTECHNOLOGY IN HEALTH CARE**	**4**	**4**

Objectives:

1. To know the human physiology and modern trends in Nanobiotechnology.
2. To understand the antibody based diagnostic techniques.
3. To learn the improved diagnostic products and techniques.
4. To know the new generations of prosthetic and medical implants.
5. To learn about the nanoparticles and targeted drug delivery.

Unit I **Hrs12**

NANOTECHNOLOGY IN PHARMACEUTICAL APPLICATIONS: Human anatomy – Form function and physiology – Developmental prolog - principle of development – Neurophysiology–sensory physiology and muscle physiology -Trends in nanobiotechnology - Protein and peptide based compounds for cancer, diabetes, infectious diseases and organ transplant-therapeutic classes- focused pharmaceutical deliverysystems.

Unit II **Hrs12**

IMMUNOASSAY TECHNIQUES: Understanding of antibody based diagnostic techniques (immunoassay) - micro and nano immunosensors-Bio-Barcode Assay-use of magnets, gold, DNA and antibodies - therapies and diagnostics for cancer and central nervous system isorders.

Unit III **Hrs12**

IMPROVED MEDICAL DIAGNOSTICS: Improved diagnostic products and techniques - in vivo imaging capabilities by enabling the detection of tumors, plaque, genetic defects and other disease states - ability to control or manipulate on the atomic scale- Nanobot medical devices- logic and intelligence embedded into medical devices- standalone sensing and computing devices.

Unit IV **Hrs12**

PROSTHETIC AND MEDICAL IMPLANTS: New generations of prosthetic and medical implants-artificial organs and implants- artificial scaffolds or biosynthetic coatings-biocompatibility and reduced rejection ratio-retinal, cochlear and neural implants-repair of damaged nerve cells and replacements of damaged skin, tissue, or bone.

Unit V **Hrs12**

METHODS FOR DIAGNOSIS: Animation of the PCR-DNA Profiling-Cantilever Sensors-Targeted Drug Delivery-Magnetic Nanoparticles-Cancer cell targeting-Stem Cell Scaffolds-Electrochemical Impedance Spectroscopy (EIS)-Tethered Lipid Membranes.

REFERENCES:

1. Brian R.Eggins, "Chemical Sensors and Biosensors", John Wiley & Sons, 2002.
2. Ed. L Gorton "Biosensors and Modern Biospecific Analytical Techniques", & Ed. D.Barcelo, "Comprehensive Analytical Chemistry", Wilson & Wilson's, 2005.
3. Ed. David Wild, "The Immunoassay Handbook", Elsevier, 2005.
4. Allen J Bard and Larry R Faulkner, "Electrochemical Methods, Student Solutions Manual: Fundamentals and Applications", Wiley, 2002.
5. Ed. Vladimir M.Mirsky, "Ultrathin Electrochemical Chemo and Biosensors: Technology and Performance" Springer, 2004.

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
V	**14U5ZOEL2A**	**Major Elective –II AQUACULTURE**	**4**	**3**

Unit I **Hrs12**

Scope of Aquaculture – Aquaculture in India – Extensive – Intensive and Semi-intensive fish culture – Inland fisheries – Marine Fisheries – Ornamental fisheries.

Unit II **Hrs12**

Water quality management – Selection of site – construction and preparation of pond – Fertilization of pond – Control of aquatic vegetation and predators.

Unit III **Hrs12**

Monoculture, Monosex culture, Polyculture, Composite fish culture – Carp culture – Murrel culture – Integrated fish farming – Hypophysation techniques.

Unit IV

Hrs12

Prawn culture – Food and feeding of prawns – Types of prawn fishery – Prawn culture in freshwater and marine water – Techniques in Prawn culture – Economics of Prawn culture.

Unite V **Hrs12**

Harvest technology - Processing and Preservation of fish and Prawns – Bye-products of fishes – Marketing Systems of fishes – Role of MPEDA.

References

1. Fish and Fisheries – Kamaleshwar Pandey and J.P. Shukla, Rastogi Publications.
2. Fishery Biology and Aquaculture – K. Shanmugam (Leo Padhippagam).

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
V	**14U5ZOEL2B**	**Major Elective - II APICULTURE**	**4**	**3**

Unit I **Hrs 12**

Honeybee – Systematic position – Species of Honey bee – Life history of honey bee – behaviour – swarming – Pheromone.

Unit II **Hrs12**

Bee colony – Castes – natural colonies and their yield – Types of bee hives – Structure – location, care and management.

Unit III **Hrs12**

Apiary – Artificial bee hives – types – construction of space frames – Selection of sites – Handling –Instruments employed in Apiary – Extraction instruments.

Unit IV

Hrs12

Honey – Composition – uses – Quality of honey - Bee wax and its uses – yield in national and international market – Enemies - Diseases of honey bees and their control methods.

Unit V **Hrs12**

Apiculture as Self-employment venture – Preparing proposals for financial assistance and funding agencies – Economics of bee culture – Merits and demerits of Apiculture.

Reference

1. Cherian, R. & K.R. Ramanathan, 1992 – Bee keeping in India.
2. Mishra, R.C., 1985 – Honey bees and their management in India, ICAR.
3. Singh, S., 1982 – Bee Keeping – ICAR.
4. Sharma, P. and Singh, L., 1987 – Hand Book of bee keeping, Controller Princiting and Stationery, Chandigarh.
5. Rare, S., 1998 – Introduction to bee keeping, Vikas Publishing House.

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credits
VI	**14U6ZOC7**	**Core – COMPARATIVE ANIMAL PHYSIOLOGY AND ENVIRONMENTAL BIOLOGY**	**6**	**6**

Objectives:

1. To study the types of food components, metabolism of carbohydrate, protein and lipid, Blood composition and it's function, respiratory pigments and transport of 02 and CO2.
2. To study the structure and functions of Heart and Kidney, Osmo – ionic regulation in aquatic animals and modes of excretion.
3. To study the different types of effectors and receptors, muscle contractions and transmission of nerve impulse.
4. To study the physico–chemical parameters in eco system and to know the animal relationship and population.
5. To study about the animal association and various types of pollution.

Unit I **Hrs 18**

Nutrition: Food–Physiology of digestion (Man)–Chemistry and Metabolism of Carbohydrates, Proteins and lipids. Blood–Composition and functions. Respiratory pigments–Transport of O_2 and CO_2

Unit II **Hrs 18**

Vertebrate heart – Structure and physiology of circulation (man). Osmoionic regulation in Aquatic animals. Mode of Excretion – Ammonotelism, Ureotelism and Uricotelism. Vertebrate kidney (Man) – Structure and functions.

Unit III **Hrs 18**

Muscles – Types – Chemistry of muscle contraction. Transmission of nerve impulse, Reflex action. Role of Reproductive hormones. Physiology of photo receptors (Eye).

ENVIRONMENTAL BIOLOGY

Unit IV **Hrs18**

Abiotic Factors of the environment –temperature, light. Pond as an Ecosystem - Trophic levels, Food Chain and Food Web, Ecological pyramids, Energy flow. Animal population.

Unit V **Hrs 18**

Animal Associations: Symbiosis/Mutualism, Commensalism, Parasitism. Antagonism. Pollution: Water pollution, Noise pollution, air pollution, Soil Pollution and radioactive pollution.

Reference

1. Geise, A.C–Cell Physiology 95th Edn) (Saunders, Phill) 1979.
2. Knut, Schinidt, Nelson – Animal Physiology 3rd Edn, (prentice Hall, 1977).
3. Hoar, S.W–General and Comparative physiology (Prentice Hall, 1976)
4. Prosser and Brown – Comparative Animal Physiology, 1961.
5. Verma, P.S, Tyagi, B.S., and Agarwal, V.K.–Animal Physiology, 3rd Edn, S, Chand and Company, New Delhi.
6. Nagabushnam.R, and R. Sarojini – Animal Physiology.
7. Odum, E.P – Ecology (Hr. and W.)
8. Odum, E.P – Fundamentals of Ecology. (W.B. Saunders, Philadelphia).
9. Mallamby, K. – The Biology of Pollution, Edward Arnold.
10. Dowdeswell, W.H – An introduction to Animal Ecology.
11. Allee, W.C. Emerson, A.E., Park, O. and Park, T. and Schmidt, - Principles of Animal Ecology, W.B. Saunders, Philadelphia.

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
VI	**14U6ZOC8**	**Core – MOLECULAR BIOLOGY AND r-DNA TECHNOLOGY**	**6**	**5**

Objectives:

1. To study the DNA replication, denaturation, renaturation, hybridization, mutations, recombinations, and functions of prokaryotes and eukaryotes and role of enzymes.
2. To study different types of RNA and its role in protein synthesis.
3. To study Gene cloning and construction of r-DNA and also different types of cloning vectors.
4. To know about different methods of gene transfer techniques.
5. To study Hybridoma Technology for the production of Monoclonal antibodies.
6. To study about the application of r-DNA Technology and genetically engineered microbes in agriculture.

Unit I **Hrs 18**

DNA replication in prokaryotes (Virus, Bacteria) and Eukaryotes. DNA denaturation and renaturation, hybridization, Functions of Nucleases, ligases, DNA polymerases, Restriction endonucleases.

Unit II **Hrs 18**

Role of RNAs in Transcription and Translation of protein synthesis. Post transcriptional and translational modifications, Genetic code, Codon and anticodons. Cloning vectors – Plasmids, Phagemids, Cosmids, YAC vectors and Shuttle vectors.

Unit III **Hrs 18**

r DNA Technology–Gene cloning by Recombinant–DNA Technology, Construction of r-DNA, preparation of desired gene. Blotting techniques – Southern, Northern and Western. cDNA Library.

Unit IV **Hrs18**

Genetic Engineering: Methods of Gene transfer, Elecroporation, Shot gun method, microinjection, protoplast fusion in plant, cell fusion in animal cells. Hybridoma technology.

Unit V **Hrs 18**

Applications of r-DNA technology – Artificial insulin and Growth Hormone production – Genetically modified organisms – Biochips – Biosensor.

Reference

1. Primorse – Molecular Biochemistry, AMS Press, 2000.
2. Purohit, S.S,-Molecular Biology and Biotechnology, Daya Publishing House, New Delhi, 2002.
3. Agarwal, K.C.–Fundamental of Molecular Biology and Biotechnology, Daya Publishing House, New Delhi.
4. Helen Kreuzer–Recombinant DNA and Biotechnology, 2nd Edn, ASM Press, Washington DC.
5. Purohit, S.S–A text book of Biotechnology for Indian Universities, Agrobios, Jodhpur 2002.
6. Dubey, R.C.– A text book of Biotechnology, S.Chand and Co, New Delhi, 2002.
7. Gupta, P.K.– Biotechnology and Genomics, Rastogi Publications, 2004.
8. Joshi, P–Genetic Engineering and its applications, Agrobios, ISBN, India, Jodpur 2002.

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credits
VI	**14U6ZOCP6**	**Core – PL – ANIMAL PHYSIOLOGY, ENVIRONMENTAL BIOLOGY, MOLECULAR BIOLOGY AND r-DNA TECHNOLOGY**	**6**	**4**

Objectives:

1. To learn the estimation of O_2 consumption by fish, Enumeration of RBC and WBC and qualitative tests for nitrogenous excretory products.
2. To know about determination of Urine sugar in Man, demonstration of blood pressure in Man.
3. To study about the dissolved O_2, CO_2, salinity, pH in water samples, identification of plankton and animal relationship with suitable examples.
4. To learn the techniques of isolation of DNA, RNA and plasmid, southern blotting and separation of proteins by PAGE Electrophoresis.

Animal Physiology

1. Estimation of O_2 consumption in fresh water fish.
2. Total and differential counts of blood cells.
3. Qualitative tests for ammonia, urea and uric acid.
4. Demonstration of blood pressure in Man.
5. Determination of Urine sugar in Man.

Environmental Biology

1. Measurement of Physico – Chemical parameters in aquatic environment.

a. Dissolved Oxygen
b. Salinity
c. pH (Using pH paper (or) pH meter or Lovidbond Comparator).
d. Free Carbon –di-oxide, carbonates and bicarbonates.

2. Study of examples illustrating animal associations.
3. Study tour and report .

Molecular Biology and r-DNA Technology

1. Plasmid extraction
2. DNA Isolation

Mark Details

Methodology = 20
Execution = 30
Result = 10
Total = 60

Reference

1. Okotore, R.O. – Basic Separation technique in Biochemistry.
2. Sareen – Instrumental methods in Environmental Analysis.
3. S.C. Rastogi – Experimental Physiology

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credits
VI	**14U6ZOEL3A**	**Major Elective - III BIOINFORMATICS**	**5**	**4**

Objectives:

1. To study about the scope of Bioinformatics and usage of www.
2. To study about the various databases in related with protein and nucleic acid sequences.
3. To know about the gene sequencing studies.

Unit I **Hrs15**

Scope of Bioinformatics, Application of Bioinformatics-Computer–Types of computers, Browsers used in Biology; Internet – Email.

Unit II **Hrs15**

Biological databases – Objectives of Biological databases, properties of databases, Symbols used in databases – Single letter codes for nucleotides, single letter codes for Amino-acids, Standard genetic code. Classification of biological database – Generalized databases, specialized databases.

Unit III **Hrs15**

Bioinformatics tool: Uses of bioinformatics tool – classification of bioinformatics tools – Homology and similarity tools – BLAST, FASTA clustral W – protein functional analysis tools : PFAM, SCANPS – Sequence analysis tools – structural analysis tools : PROTPARAM, GOR – Molecular modelling and visualizing tools – MMTK – visualizing tool – Rasmol – phylogenetic analysis tools - PHYLIP.

Unit IV

Sequence alignment: Criteria for sequence alignment – sequence alignment techniques – optimal alignment – Global alignment and local alignment. Multiple sequence alignment. Structural alignment.

Unit V **Hrs15**

Usage of protein sequence database–SWISSPROT–one letter code and three letter code for amino acids–signal region. Cross reference to EMBL and DDBJ. Genome and its significance. Human genome project–Potential benefits of Human Genome Project.

References

1.Information Theory and Living system – L.I. Garfield (1992), Columbia University.
2.Nucleic acid and Protein Sequence Analysis – M.J. Bishop and C.J. Ramalinga (1987),IRL Press.
3.Text Book of Bioinformatics – Sundharalingam and Kumaresan, Suras Publication.

Semester	Subject Code	Title of the Paper	Hours of Teaching/ Week	No. of Credits
VI	**14U6ZOEL3B**	**Major Elective – III BIO-STATISTICS AND COMPUTER APPLICATIONS IN BIOLOGY**	**5**	**4**

Objectives:

1. To know about the basic statistical concepts and their applications in Biology.
2. To know the basic idea about computer and their role in learning process and biology.

Unit I **Hrs15**

Biostatistics – Definition and Scope – Collection of Data – Census and Sampling methods – Variable: Discrete and continuous, Presentation of Data : Classification and tabulation, Diagrams and graphs: Bar, pie, Histogram, Line graph – Concept of Statistical population and sample characteristics of frequent distribution.

Unit II **Hrs15**

Measures of Central tendency: Mean, Median, Mode – Measures of Dispersion: Range, Standard deviation – Correlation Analysis.

Unit III **Hrs15**

Basic components of computer – Input devices and output devices – CPU – Flow chart – Importance of Computer in Biology.

Unit IV **Hrs15**

The computer system–BASIC: Character sets in BASIC language–Constants and variables–System commands–Types of Statements–Basic Programme for Measures of Central Tendency.

Unit V **Hrs15**

MS Word: File Operations: New, Open, Save and Print–Editing: Cut, Copy, Paste, Find and Replace–Insert: Page numbers and Pictures–Format: Font, Bullet and Numbering, Paragraph and Background–Tools:Spelling and Grammar–Data: Sort–MS; EXCEL: Presentation of Biostatistical data using Excel: Autosum, Paste function, Chart Wizard, Sort function and Drawing–Use of Internet, Messenger and e-mail–Basic knowledge of Medical, transcription.

Reference

1. Balagurusamy, E., Programming in BASIC (3rd ed.), Tata McGraw Hill Publishing Co. Ltd.
2. Narasimhan, M., Learning with BASIC (Book I, II, III),Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1996.
3. Practical Statistics – S.P. Gupta.
4. Jerold, H. Zar, Biostatistical Analysis (2nd Edition), Prentice Hall of International edition, 1984 (Relevant portions).
5. Rangaswamy, R., A Text book of Agriculture Statistics, New Age International Publishers, 1995.
6. Gowtham Roy, Introduction to Computing and Computing lab and Cad (2002), Books and Allied (Pvt.) Ltd., Kolkatta.
7. Introduction of Computing Science and Programming in BASIC – Dr. S.K. Nag – Books and Allied (P) Ltd.

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credits
VI	**14U6ZOEL4A**	**Major Elective – IV ANIMAL AND ENVIRONMENTAL BIOTECHNOLOGY**	**5**	**3**

Objectives:

1. To study about techniques of animal tissue cultures, cryopreservation of sperms and embryo transformation.
2. To study about the role of microbes in Bio-gas production, Ethanol production and conventional fuels, Bioleaching, Biomining and Biofertilizers.
3. To study about the sewage treatment methods.

Unit I **Hrs 15**

Animal cell culture–Techniques – Culture media for animal cells – Natural media – Artificial media–Complete culture media – Serum as culture medium – Serum free media – Disaggregation methods – Proliferation – differentiation – Stem cell cultures.

Unit II **Hrs 15**

Cryopreservation of sperms – Embryo transfer technique – IPR – Bioethics – Transgenic animals.

Unit III **Hrs 15**

Microbial quality of food and drinking water – conventional fuel (coal, natural gas and fire wood) and their impact on degradation of environment, Production of Biogas and ethanol.

Unit IV **Hrs 15**

Treatment of sewage by microbes – Treatment of industrial effluents and oil slick, oil spills by microbes – Degradation of chemical pesticides by microbes – Bioleaching and Biomining.

Unit V **Hrs 15**

Biofertilizers – N_2 fixing microbes (Azolla, Azatobacter, Azospirillum) for use in Agriculture – *A. fumifasciens* for crop improvement – Biocontrol agents – Biopesticides.

References:

1. Purohit, S.S. – Biotechnology
2. Agarwal, K.C. – Fundamentals of Molecular Biology and Biotechnology.
3. Jagdand, S.N. – Environmental Biotechnology.
4. Rang, M. – Animal Biotechnology.
5. Trevan, M.D., Boofey, S. – Biotechnology.
6. Sathyanarayana, U. – Biotechnology.

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credits
VI	**14U6ZOEL4B**	**Major Elective – IV POULTRY SCIENCE**	**5**	**3**

Unit I **Hrs15**

Poultry production in Tropics and India, Economics of Poultry production, Egg production trends in India, demand and supply pattern.

Unit II **Hrs15**

Common breeds of poultry – American class, English class, Medieterranean class, Asiatic class - Indian class. Important characters of modern breeds of poultry.

Unit III **Hrs15**

Incubation and hatchery management: Selection and care of eggs for incubation, Hatchery hygiene and prevention of hatchery borne diseases. Management of young birds, brooding conditions; farm operations during brooding period. Lighting, vaccination, debeaking, coccidiosis control.

Unit IV **Hrs15**

Management of growers: Culling, optimal-crowding, feeding.

Management of layers: Light, culling by distinction of non-layers, Deep Littre Management, Housing and equipments, floor space, feeders and waters.

Feed composition and nutrients: Grower and layer feeds.

Unit V **Hrs15**

Prevention and control of diseases: Common bacterial, fungal, viral and protozoan diseases.

Parasites: Nematode.

Arthropod pests: Ticks, mites and their control. Marketing problems: quality of eggs, grading of eggs and meat.

References:

1. Harbansingh and Moore (1982) – Livestock and Poultry Production, Prentice Hall of India Private Ltd., New Delhi 110 001.
2. N.S.R. Sastry, C.K. Thomas and R.A. Singh – Farm animal management and poultry production, Vikas Publishing House Private Ltd., Delhi.