

M.Sc. ZOOLOGY

| SEM | COURSE CODE | COURSE | COURSE TITLE | INS. HRS / WEEK | CREDIT | MARKS | | TOTAL |
|--------------------|---------------|----------------------------|--|-----------------|-----------|-----------|-----|-------------|
| | | | | | | CIA | ESE | |
| I | 20PZO1CC1 | Core – I | Biology of Invertebrates & Chordates | 6 | 5 | 25 | 75 | 100 |
| | 20PZO1CC2 | Core – II | Developmental Biology | 6 | 5 | 25 | 75 | 100 |
| | 20PZO1CC3 | Core – III | Environmental Biology, Evolution and Paleontology | 6 | 4 | 25 | 75 | 100 |
| | 20PZO1CC4P | Core – IV | Biology of Invertebrates and Chordates, Developmental Biology, Environmental Biology, Evolution and Paleontology - Practical | 6 | 4 | 20 | 80 | 100 |
| | 20PZO1DE1A/B | DSE– I# | | 6 | 4 | 25 | 75 | 100 |
| | TOTAL | | | | 30 | 22 | | |
| II | 20PZO2CC5 | Core – V | Genetics | 6 | 5 | 25 | 75 | 100 |
| | 20PZO2CC6 | Core – VI | Cell and Molecular Biology | 6 | 5 | 25 | 75 | 100 |
| | 20PZO2CC7 | Core – VII | Animal Physiology | 6 | 4 | 25 | 75 | 100 |
| | 20PZO2CC8P | Core – VIII | Genetics, Cell and Molecular Biology and Animal Physiology - Practical | 6 | 4 | 20 | 80 | 100 |
| | 20PZO2DE2 A/B | DSE – II # | | 6 | 4 | 25 | 75 | 100 |
| | TOTAL | | | | 30 | 22 | | |
| III | 20PZO3CC9 | Core – IX | Biochemistry | 6 | 5 | 25 | 75 | 100 |
| | 20PZO3CC10 | Core – X | Immunology | 6 | 5 | 25 | 75 | 100 |
| | 20PZO3CC11 | Core – XI | Biostatistics and Bioinformatics | 6 | 4 | 25 | 75 | 100 |
| | 20PZO3CC12P | Core – XII | Biochemistry, Immunology, Biostatistics and Bioinformatics - Practical | 6 | 4 | 20 | 80 | 100 |
| | 20PZO3DE3 A/B | DSE – III # | | 6 | 4 | 25 | 75 | 100 |
| | 20PZO3EC1 | Extra Credit Course – I | Online Course (MOOC) | - | 1* | - | - | - |
| | TOTAL | | | | 30 | 22 | | |
| IV | 20PZO4CC13 | Core – XIII | General and Applied Entomology | 6 | 5 | 25 | 75 | 100 |
| | 20PZO4CC14R | Core – XIV | Microbiology | 6 | 5 | 25 | 75 | 100 |
| | 20PZO4CC15P | Core – XV | General and Applied Entomology and Microbiology - Practical | 6 | 5 | 20 | 80 | 100 |
| | 20PZO4DE4 A/B | DSE- IV # | | 6 | 4 | 25 | 75 | 100 |
| | 20PZO4PW | Project | | 6 | 4 | - | 100 | 100 |
| | 20PZO4EC2 | Extra Credit Course – II | Zoology for career examinations | - | 5* | - | 100 | 100* |
| | 20PCNOC | Online Course (Compulsory) | | - | 1 | - | - | - |
| TOTAL | | | | 30 | 24 | | | 500 |
| GRAND TOTAL | | | | | 90 | | | 2000 |

#DISCIPLINE SPECIFIC ELECTIVE

| SEM | COURSE CODE | COURSE TITLE |
|-----|-------------|--|
| I | 20PZO1DE1A | Biophysics, Radiation Biology and Nanotechnology |
| | 20PZO1DE1B | Occupational Health and Safety |
| II | 20PZO2DE2AR | Biotechnology |
| | 20PZO2DE2B | Endocrinology |
| III | 20PZO3DE3A | Animal Behavior and Biodiversity Conservation |
| | 20PZO3DE3B | Aquaculture and Farm Management |
| IV | 20PZO4DE4AR | Research Methodology & Bioinstrumentation |
| | 20PZO4DE4B | Clinical Lab Technology |

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|----------|-----------|----------|---|-------|---------|------------|----------------|----------------|
| I | 20PZO1CC1 | Core – I | BIOLOGY OF INVERTEBRATES & CHORDATES | 6 | 5 | 100 | 25 | 75 |

Course Outcomes:

On successful completion of the course, students will be able to:

1. Describe animal organization, locomotion and the process of nutrition in Invertebrates.
2. Acquire Knowledge and compare respiration, excretion and reproductive ability in Invertebrates.
3. Analyze the larval life of Invertebrates and biology of organisms of minor phyla.
4. Differentiate and relate the integumentary systems, digestive systems and circulatory systems among Vertebrates.
5. Appreciate the organization of respiratory systems, excretory systems, reproductive systems and structure of appendicular skeleton in Vertebrates.

BIOLOGY OF INVERTEBRATES

UNIT I

18 hours

Animal organization: Symmetry, Coelom and Metamerism; origin and significance - Body wall pattern in Invertebrates - Locomotion in Arthropods and Molluscs - Nutrition in Polychaetes, # Molluscs and Echinoderms #

UNIT II

18 hours

Respiration in Annelids, Arthropods and Molluscs – Excretory organs in Invertebrates – Nervous system in Arthropods and #Echinoderms # – Reproduction in Invertebrates.

UNIT III

18 hours

Larval life of Invertebrates: Larval forms, their existence, adaptation and transformation – Minor Phyla: Classification – Detailed study of Mesozoa, Rotifera, Ectoprocta, # Phoronida # and Chaetognatha.

BIOLOGY OF CHORDATES

UNIT IV

18 hours

Integumentary system in Vertebrates – Dermal and Epidermal derivatives of Vertebrates - Digestive system in Vertebrates – # Stomach in Mammals # – Circulatory system in vertebrates – Heart in Vertebrates.

UNIT V

18 hours

Respiration in Fishes – Pulmonary Respiration in Tetrapods – Types of Kidneys - Reproductive system in Vertebrates – Appendicular Skeleton in Vertebrates: Pectoral and Pelvic girdles of Vertebrates – Limbs of Vertebrates: Fishes, # Birds # and mammals.

Text Books

1. Barnes, R.D. Invertebrate Zoology, IV Edition, Holt Saunders, 1982.
2. Barrington, E.J.W. Invertebrate Structure and Function, II Ed., ELBS and Nelson. 1979.
3. Hyman, G.H., The Invertebrates, Vols. I to VII, McGraw Hill Book Co. Inc. New York.
4. Kent. G.C. Comparative Anatomy of the Vertebrates, McGraw Hill Book Co., Inc., New York. 1976.
5. Malcolm Jollie, Chordate Morphology, Reinhold Publishing Corporation, New York. 1962.

Books for Reference:

1. Kotpal, R.L., Minor Phyla., Rastogi Publication, Meerut. 2nd Edition, 2002.
2. Vasantika Kashyap., Life of Invertebrates, Vikas Publishing House Pvt. Ltd., New Delhi. 1997.
3. Waterman, A.J., Chordate Structure and Function, The Macmillan Company, 1971.

Web Reference

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>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | Title of the Paper | | | | | Hours | Credits | | | | |
|--|-----------------------------|--|-----|-----|-----|---------------------------------------|-------|---------|------|------|--|--|
| I | 20PZO1CC1 | BIOLOGY OF INVERTEBRATES & CHORDATES | | | | | 6 | 5 | | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | | |
| CO1 | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | - | ✓ | ✓ | | |
| CO2 | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | - | ✓ | ✓ | | |
| CO3 | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | - | ✓ | ✓ | | |
| CO4 | ✓ | ✓ | - | ✓ | ✓ | ✓ | ✓ | - | ✓ | ✓ | | |
| CO5 | ✓ | ✓ | - | ✓ | ✓ | ✓ | ✓ | - | ✓ | ✓ | | |
| Number of Matches= 37, Relationship : High | | | | | | | | | | | | |

Prepared By:

S. N. Sheik Umar Sahith

Checked by:

Dr. I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|----------|-----------|-----------|-----------------------|-------|---------|------------|----------------|----------------|
| I | 20PZO1CC2 | Core – II | DEVELOPMENTAL BIOLOGY | 6 | 5 | 100 | 25 | 75 |

Course outcomes:

On successful completion of the course, students will be able to:

1. Understand the key concepts, including mechanisms by which differential gene activity controls development, mechanisms that determine cell fate, and mechanisms that ensure consistency and reliability of development
2. Summarize the basic concepts of development and the role of genes in sex determination
3. Analyse and apply the concept of organizer and induction in the development of limb and metamorphosis
4. Relate and apply the concept of differentiation in gene knock out and abnormal differentiation
5. Apply the knowledge of understanding of basic concepts in Stem Cells and Assisted Reproductive Technologies (ART)

UNIT I: Phases of Development

18 hours

Developmental patterns among Metazoans – Gametogenesis: Structure of Mammalian gametes. Fertilization: Biochemical events. #Cleavage (patterns & types)#Gastrulation: Germ layer formation. Organogenesis. Growth and differentiation. Genetic regulations of early embryonic development – Gradient theory – Morphogenetic gradients – Cell fate and Cell lineage.

UNIT II: Embryonic Induction and Organiser

18 hours

Embryonic induction. Organizers - Spemann and Mangold experiments. Molecular biology of the Nieuwkoop center - Functions of organizer – Induction Regional specification types – Nuclear transplantation - Growth and Post embryonic development – Sex determination – Genomic equivalence and cytoplasmic determinants – Imprinting- Cell aggregation and differentiation in *Dictyostelium*.

Axes and pattern formation in *Drosophila*

UNIT III: Metamorphosis and Regeneration

18 hours

Influence of hormones on Growth and metamorphosis in Insects and Amphibians – Formation of limb bud in Amphibia – Specification of limb fields – Induction of early limb bud – Eye lens induction-Cell death and the formation of digits and joints. Regenerative ability of various Invertebrates and Vertebrates – Mechanism of regeneration – Blastema formation – Wolffian regeneration - #Factors affecting regeneration#.

UNIT IV: Differentiation and Aging

18 hours

Teratogenesis: Teratogenic agents. Embryonic induction and differentiation. Embryonic induction in vertebrates: Types – exogenous and endogenous. Theories of Organizer or Inductor. Morphology - Chemical basis of neural induction. Differentiation - Characteristics and types of Differentiation. Aging and Senescence – Apoptosis. # Selective action of genes in differentiation #

UNIT V: Advanced Techniques in Developmental Biology

18 hours

Cell differentiation and Stem cells - Applications of Stem cells – Control of transcription involving tissue specific transcription regulators – Assisted Reproductive Technology (ART) - Super ovulation, ICSI, GIFT- Artificial insemination – *In vitro* fertilization – Cloning - Human development – Placentation. # Birth control and its need #.

#.....# Self study

Text books:

1. Balinsky, B.L., An Introduction to Embryology, V Ed., Saunders Co., Philadelphia. 1981.
2. Strickberger, M.W., Evolution. Jones and Barlett Pub. Inc., London. 1996.

Books for Reference:

1. Gilbert, S.F., Developmental Biology, II Edn., Sinamer Associates Inc. Publishers, Saunderland, Massachusetts, USA. 1995.
2. Berrill, N.J., Developmental Biology, Tata McGraw Hill, New Delhi. 1986.
3. Browder, L.N., Developmental Biology, Saunders Co., Philadelphia. 1980.
4. Saunders, A.W., Developmental Biology, Patterns, Principles and Problems. Macmillan Publishing Co., New York. 1982.
5. Stevan, B. and Oppenheimer., Introduction to Embryonic Development, Alley and Bern. 1980.
6. Sharma, B.K. and Kaur, H. Environmental Chemistry, Goel Pub. House, Meerut. 1997.
7. Tacconi, L., Biodiversity and Ecological Economics - Participation, Values and Resource Management. Earthscan Pub. Ltd., London. 2000.
8. Castri, F.D. and Younes, T., Biodiversity: Science and Development, CABInt, Wallingford, U.K. 1996.

Web reference:

1. www.corning.com > worldwide > cls > documents > CLS-DL-CC-015
2. dev.biologists.org > content
3. www.reproductivefacts.org > documents > fact-sheets-and-info-booklets

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | Title of the Paper | | | | | Hours | Credits | | | | |
|--|--------------------------|-----------------------|-----|-----|-----|------------------------------------|-------|---------|------|------|--|--|
| I | 20PZO1CC2 | DEVELOPMENTAL BIOLOGY | | | | | 6 | 5 | | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | | |
| CO1 | √ | √ | √ | √ | | √ | √ | √ | | | | |
| CO2 | √ | √ | | √ | √ | √ | | √ | √ | | | |
| CO3 | √ | | √ | √ | √ | √ | | | √ | √ | | |
| CO4 | √ | √ | √ | | √ | √ | √ | √ | √ | | | |
| CO5 | | √ | √ | √ | √ | √ | | √ | √ | √ | | |
| Number of Matches= 37, Relationship : High | | | | | | | | | | | | |

Prepared By:

Dr. Mohamed Shamsudin

Checked by:

Dr. I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|----------|-----------|------------|---|-------|---------|------------|----------------|----------------|
| I | 20PZO1CC3 | Core – III | ENVIRONMENTAL BIOLOGY, EVOLUTION AND PALEONTOLOGY | 6 | 4 | 100 | 25 | 75 |

Outcomes

On successful completion of the course, students will be able to:

1. Understand the diversity of animals in various ecosystems and demographic analysis in their habitats
2. Analyse the characteristics of different kinds of resources and anthropogenic activities responsible for degradation of natural resources
3. Adopt measures to protect environment and maintain sustainability of natural resources
4. Acquire knowledge on modern theories and principles related to evolution of animal populations
5. Discuss Geological time scale of animal evolution and relate the major events leading to fossilization

UNIT I: Concepts in Ecology

18 hours

Ecosystem: Structure of ecosystem, Energy flow, Dynamics of ecosystem, Food chain, Food web, Tropic level and ecological pyramids. Biogeochemical Cycles: Nitrogen Cycle, Phosphorous Cycle, Sulphur Cycle, Carbon Cycle and Hydrologic Cycle – Nutrient Cycling in the Tropics.- Limiting and Regulatory Factors.

Population Ecology: Characteristics of a population; population growth curves; population regulation - concept of metapopulation. Community Ecology: Biological communities Community structure and regulation – #EcologicalSuccession#.

UNIT II: Natural Resources

18 hours

Forest and Water resources – Exploitation, decrease of forest cover, its impact on Urbanization, Impact of dams on forest - exploitation of ground water – surface water and sustainable use.

Energy resources and Food resources – Renewable and Non-renewable resources, energy sources, its impact on Nature - Mining and its environmental impacts.

Food resources, food material, #Agriculture and food production and its impacts on environment, GIS, remote sensing and Satellites - applications.

UNIT III: Social Issues & Environment

18 hours

Urban problems: Energy consumerism - waste products – rain water harvesting. Environmental ethics, issues – possible solutions. Global issues: Climate change – Global Warming - Global summits – Acid rain – Ozone depletion –Environmental protection Act –#Forest conservation Act# - Natural disasters – Floods, Droughts, Earthquakes, Cyclones and Landslides.

UNIT IV: Evolution

18 hours

Direct and Indirect evidences of evolution - Lamarckism - Darwinism – Germ Plasm theory – Mutation theory - Isolation and Isolating mechanisms – Speciation. Origin of basic biological molecules; Abiotic synthesis of organic monomers and polymers; Concepts of Oparin and Haldane; Experiment of Miller (1953) - Evolution of Prokaryotes and Eukaryotic cells. Phylogenetic tree – Evolutionary significance of animals.

UNIT V: Palaeontology

18 hours

Scope and development – Geological time scale -The evolutionary Time Scale; Eras, Periods and Epochs; Major events in the Evolutionary Time Scale- Fossils and fossilization; Collection of fossils – Dating of Rocks – Micropalaentology; Collection, sampling and storing – Vertebrate Palaentology - Mammalian Palaeontology; Development of Viviparity and Parental care – #Evolution of Horse#.

Self-study#.....#

Text books

1. Odum, Eugene P., Fundamentals of Ecology, W.B. Saunder's Co. Philadelphia. 5th Edition, 2010.
2. Sharma, P.D., Ecology and Environment, VII Edition, Rastogi Publications. 2005.
3. Asthana, D. K., Environment: Problems and Solutions, S. Chand & Company, 2007

Books for Reference:

1. Clarke, G.L. Elements of Ecology. John Wiley & Sons, New York. 1954.
2. Kendeigh, S.C., Animal Ecology. Prentice Hall. 1961.
3. N.Arumugam. Concepts of Ecology. Saras Publications. 114/35G. A.R.P.Camp Road. Periyevilar, Kottar(Post). Nagarkoil. 1983.
4. Odum, E.P. and Barrett, G.W. Fundamentals of Ecology. Thomson Brooks/ Cole (EWP) 5th Ed. 2005.
5. Rastogi, V.B. and M.S. Jayaraj Animal Ecology and distribution of animals, Kedarnath Ramnath. 1989,
6. Southwick, C.H., Ecology and the quality of Environment. D.Vas Nostrand Co. 1976.
7. Verma, P.S. and V.K. Agarwal, Principles of Ecology. S. Chand & Co. New Delhi. 1996.

Web reference:

1. <https://peda.net/kenya/css/subjects/biology/form-three/ecology2/concepts-of-ecology>
2. <http://www.yourarticlelibrary.com/environment/5-major-environmental-problems-discussed/31434>
3. <https://www.yourgenome.org/facts/what-is-evolution>
4. <https://www.nature.com/subjects/palaeontology>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | | Title of the Paper | | | Hours | Credits | | | |
|--|--------------------------|-----|---|-----|-----|------------------------------------|---------|------|------|------|
| I | 20PZO1CC3 | | ENVIRONMENTAL BIOLOGY, EVOLUTION AND PALEONTOLOGY | | | 6 | 4 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
| CO1 | √ | | √ | √ | √ | √ | √ | √ | √ | √ |
| CO2 | √ | | √ | √ | √ | √ | √ | | √ | √ |
| CO3 | | √ | √ | √ | √ | √ | | | √ | √ |
| CO4 | √ | √ | √ | √ | √ | √ | | | √ | √ |
| CO5 | | √ | √ | √ | √ | √ | √ | √ | | √ |
| Number of Matches= 36, Relationship : High | | | | | | | | | | |

Prepared by:

Dr. P.Rajasekar

Checked by:

Dr I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|----------|-----------|-----------|--|-------|---------|------------|----------------|----------------|
| I | 20PZO1CC4 | Core – IV | PRACTICAL I - BIOLOGY OF INVERTEBRATES & CHORDATES, DEVELOPMENTAL BIOLOGY, ENVIRONMENTAL BIOLOGY, EVOLUTION & PALEONTOLOGY | 6 | 4 | 100 | 20 | 80 |

Course Outcomes

On successful completion of the course, students will be able to:

1. Recognize Invertebrate species based on their general characters.
2. Practice and acquire knowledge on mounting and dissection of Invertebrates.
3. Describe estrous cycle and analyse bull sperm smear preparation; Investigate Induced ovulation in Fishes.
4. Appraise the concept of water quality analysis and plankton studies.
5. Justify the evidences supporting evolution.

BIOLOGY OF INVERTEBRATES & CHORDATES

a. TAXONOMY

30 Invertebrates – Identifying features upto Class level

Minor Phyla - Rotifera, Phoronida, Chaetognatha

20 Vertebrates – Identifying features upto Order level

b. MOUNTING

Scales of Teleost Fish (Ctenoid and Cycloid types), Feathers (structure), Soil Nematodes

c. SPOTTERS

Invertebrate Larval forms.

DEVELOPMENTAL BIOLOGY

Preparation of sperm suspension of bull and observation of spermatozoa.

Observation of live spermatozoa & study of motility rate of bull spermatozoa.

Chick blastoderm

Vaginal smear preparation of rat/mouse to study the stages of estrous cycle.

Induced ovulation in fish.

Group Project: Study of life cycle of silkworm (Egg, Larva, Pupa)

Spotters: Different developmental stages in chick development

ENVIRONMENTAL BIOLOGY & RESOURCE MANAGEMENT

Faunal adaptations of different Marine Habitats – Sandy, Muddy and Rocky shore characteristics.

Analysis of water samples for Chlorides, Silicates, Calcium, Total hardness, Phosphates, Nitrates, and Water Quality Index.

Qualitative and Quantitative estimation of Plankton (Marine sample).

A study on Pond ecosystem and Forest ecosystem – Report submission mandatory.

Spotters: Secchi disk, Electrical conductivity Meter, Turbidity Meter

EVOLUTION AND PALAENTOLOGY

Fossil study - Nautiloid, Ammonoid and Belemnites.

Colouration and Mimicry

Evolutionary significance - Limulus, Peripatus

Connecting Link –Archaeopteryx

Text books:

1. P.S.Verma , A Manual of Practical Zoology - Invertebrates, Fifteenth Edition S.Chand& Company Ltd, 2003
2. Manual of Zoology - Chordata. M. EkambaranathaAyyar, T.N. Ananthkrishnan , S. Viswanathan (Printers &Publishers)Pvt. Ltd. 2008.
3. P.S. Verma , V.K.Agarwal, Chordate Embryology - Developmental Biology, S.Chand& Company Ltd, 2003

Books for Reference:

1. Kotpal, R.L., Minor Phyla., 2nd Edition, Rastogi Publications, Meerut., 2002.
2. VasantikaKashyap., Life of Invertebrates, Vikas Publishing House Pvt., Ltd., New Delhi.1997.
3. EkambaranathaIyer and S. Viswanathan, Manual of Zoology - CHORDATA Vol. II (Printers & Publishers) Chennai. 1993.
4. Gilbert, F.S. Developmental Biology, 8th edition, Sinauer Associates, Inc. Publishers, Massachusetts 2006.
5. R.K.Trivedy&P.K.Goel, Environmental Publications, Karad, India 1984.

Web Reference

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. www.reproductivefacts.org › documents › fact-sheets-and-info-booklets

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | Title of the Paper | | | | | Hours | Credits | | | | |
|--|--------------------------|--|-----|-----|-----|------------------------------------|-------|---------|------|------|--|--|
| I | 20PZO1CC4 | PRACTICAL I - BIOLOGY OF INVERTEBRATES & CHORDATES, DEVELOPMENTAL BIOLOGY, ENVIRONMENTAL BIOLOGY, EVOLUTION & PALEONTOLOGY | | | | | 6 | 4 | | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | | |
| CO1 | | √ | √ | | √ | √ | √ | | √ | | | |
| CO2 | √ | | √ | √ | √ | √ | | √ | √ | | | |
| CO3 | | √ | | | | | √ | | | √ | | |
| CO4 | √ | | | √ | √ | | | √ | | | | |
| CO5 | | √ | √ | √ | √ | | | √ | √ | √ | | |
| Number of Matches= 27, Relationship : Moderate | | | | | | | | | | | | |

Prepared By:

Dr. A. Sadiq Bukhari

Checked by:

Dr. I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Sem | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal Marks | External marks |
|-----|------------|---------|---|-------|---------|------------|----------------|----------------|
| I | 20PZO1DE1A | DSE – I | BIOPHYSICS, RADIATION BIOLOGY AND NANOTECHNOLOGY | 6 | 4 | 100 | 25 | 75 |

Course Outcomes

On successful completion of the course, students will be able to:

1. Understand and apply Thermodynamic principles in biology; Acquire knowledge on the Principles and applications of microscopy
2. Apply the uses of various biological instruments by understanding their Biophysical principles
3. Understand and evaluate the impact of Natural Radiations
4. Apply Radio isotopes in Energy Production and Industry
5. Analyze the significance of nano-materials in biomedical science

BIOPHYSICS

UNIT I

18 hours

Thermodynamic principles in biology – Concept of free energy – Energy rich bonds – Biological energy transducers – Oxidation, Reduction and Redox potential. Microscopy - Principles and applications of microscopy –Phase contrast, Confocal, Fluorescence and Electron microscopes - Scanning and Transmission Electron Microscopy. Cytofluometry. #Laser- Principle and applications#.

UNIT II

18 hours

Absorption and Emission principles - Principle and application of UV-visible, Spectrofluometer, Flame photometer, Atomic Absorption and Emission spectrophotometers, Structure determination using X-ray diffraction, NMR and Mass spectrometer in Biology. Principles and Application of Chromatography: Thin layer, Column, Ion Exchange, Gel filtration, Gas Liquid, HPLC and Affinity. Principles and Application of Electrophoresis: Agarose, SDS-PAGE and #Iso-Electric Focusing#.

RADIATION BIOLOGY

UNIT III

18 hours

Natural Radiation - Man made radiations; Ionizing and non-ionizing radiation - Properties of Radiation – Radiation Units (Becquerel, RAD, Gray & Curie, Sievert). Measurement of Radiation – Geiger-Muller proportional counter- Skeletal Scintigraphy#Safety standards – safety measures#.

UNIT IV

18 hours

Biological effects of Radiation - Cellular level – Organ and system level – Genetic effects (aberrations) – Dosimetric study – Radiation Oncology, PET, Applications of Radio Isotopes in Agriculture, Industry and Food Preservation - Radioactive wastes - Sources and Management - #Nuclear Energy Programme in India#.

NANOTECHNOLOGY

UNIT V

18 hours

Fundamentals of Nanotechnology – Nanomaterials – Building blocks - Interaction and Topology – Microscopic environment of the Nanoworld. Metal and Semiconductor Nanomaterials, Quantum Dots, Wells, Fiber and Wires, Bucky balls and Carbon Nanotubes. Biomedical Nanotechnology – Diagnostics, Therapy and Applications; Nanotoxicology – Nano etymology – Sources of nanoparticles and their health effects; #Social and Ethical Implications#.

#.....# **Self study**

Text Books:

1. Narayanan,P. Essential of Biophysics. New Age International (P)Ltd.,Publishers, NewDelhi.2000
2. Sha, V.C., Elements of Radiation Biology, Todays & Tomorrows Printers & Publishers, New Delhi. 1985.
3. Siddhartha Shrivastava, Introductory Nanobiotechnology. New Central Book Agency (P) Ltd. Delhi. 2013.

Books for Reference:

1. Casey, E. J. Biophysics - Concepts and Mechanisms. East West Press Pvt. Ltd. New Delhi. 1962
2. N. Gurumani, Research Methodology for biological Sciences. MJP Publishers, 2007.
3. Daniel, M. Basic Biophysics for Biologist. Agro Botanical Publishers, Bikaner, India. 2005.
4. Narayanan, P. Essentials of Biophysics.New Age International (P) Ltd., Publishers. 2007.
5. Plummer, T.D.An introduction to Practical Biochemistry. Tata McGraw Hill Publishing Company Limited, New Delhi. 1978.
6. Rodney, C. Biophysics An Introduction. John Wiley & Sons Ltd. 2004
7. Skoog, A. D. and James, J. L. Principles of Instrumental Analysis. Saunders GoldenSunberst Series. 1992.
8. Vasanthan, P. and Gautham, N. Biophysics. Narosa Publishing House, New Delhi. 2002.
9. Sharma, B.K., Environmental Chemistry, Goel Publishing House, Meerut. 1990
10. Sood, D.D., Reddy, A.V.R. and Ramamoorthy, N. Fundamentals of Radiochemistry, Indian Association of Nuclear Chemists and Allied Scientists, Radiochemistry Division, Mumbai. 2000.
11. Arun, B. Arun, S., Bhongirwar, D.R., Food Preservation by Irradiation. Indian Association for Radiation Protection, BARC, Trombay, Mumbai. 2001.
12. M. Eisenbud and T. Gesell, Environmental Radio activity from Natural, Industrial, and Military Sources. Academic Press. 1997.
13. Shanmugam,S.Nanotechnology. MJP Pub. Chennai. 2010.
14. Breck,M.M., Nanotechnology, Vol.1 & 2. CBS Pub. & Distributors Pvt. Ltd., New Delhi. 2016.

Web reference:

1. <https://nptel.ac.in/courses/103108100/>
2. www-pub.iaea.org > MTCD > Publications > PDF > TCS-42_webPDF
3. <https://en.wikipedia.org/wiki/Radiobiology>
4. <https://en.wikipedia.org/wiki/Nanotechnology>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | | Title of the Paper | | | Hours | Credits | | | |
|--|--------------------------|-----|--|-----|-----|------------------------------------|---------|------|------|------|
| I | 20PZO1DE1A | | BIOPHYSICS, RADIATION BIOLOGY AND NANOTECHNOLOGY | | | 6 | 4 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
| CO1 | √ | √ | √ | √ | √ | √ | √ | | √ | |
| CO2 | √ | √ | √ | √ | √ | √ | | √ | √ | |
| CO3 | √ | √ | √ | √ | √ | | √ | | | √ |
| CO4 | √ | | | √ | √ | √ | √ | √ | | √ |
| CO5 | | √ | √ | | √ | √ | | √ | √ | √ |
| Number of Matches= 37, Relationship : HIGH | | | | | | | | | | |

Prepared By:

Dr.H.E. Syed Mohamed

Checked by:

Dr. I.Jopesh A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Sem | Code | Course | Title of the course | Hours | Credits | Max. marks | Internal marks | External marks |
|-----|-------------|--------|--------------------------------|-------|---------|------------|----------------|----------------|
| I | 20PZO1DE1 B | DSE I | OCCUPATIONAL HEALTH AND SAFETY | 6 | 4 | 100 | 25 | 75 |

Course outcomes:

On successful completion of the course, students will be able to:

1. Understand the basic knowledge about occupational health and safety.
2. Analyse and apply the safety measures.
3. Understand the definition of hazards and risks, evolution of methodical analysis
4. Analyse good practices in industries.
5. Apply fire safety measures.

UNIT I: Introduction To Safety Philosophy

18 Hours

Sequence of Accident Occurrence, Occupational Injuries-Effects of Industrial Accidents, Analysis of Accidents, Injury Data, Accident Investigations & Reporting, #Accident Costing#.

UNIT II: Safety & Health Management

18 Hours

Employer & Employee Responsibilities, Record-keeping & Reporting Requirements, Safety Organization, Responsibilities of Safety Officer, Supervisors, #Safety committees#.

UNIT III: Risk Management

18 Hours

Definitions of Hazards, Risks, Evolution of Methodical Analysis, System safety Analysis techniques, Performance measurement, Operational Reviews – #Internal & External#.

UNIT IV: Work Practices In Industries

18 Hours

Hazards in Chemical Operations, Material Handling Hazards, Lifting Machinery & Pressure Vessels, Material Safety Data Sheets, Classification of Chemicals, Hazardous Chemicals, Storage Practices, Radiation Safety, Petroleum Storage Requirements, # Pesticide Safety#.

UNIT V: Fire Safety

18 Hours

Basic Elements, Causes, #Industrial Fires, Explosions, Effect on Environment, Property & Human Loss, Prevention Techniques, Building Design, Fire Protection Systems, Contingency Plan, Emergency Preparedness, #Evacuation#.

#...# Self-study portion

Text books:

1. David L. Gretsch,, Handbook of environmental health and safety, Industrial safety and health, Macmillan Publishing Company, 1993.

Books for reference:

1. Charles D. Reese, Occupational Health and Safety Management: A Practical Approach, Third Edition, CRC Press, Taylor and Francis Group.2003.

Web reference:

1. www.osha.gov
2. www.who.int
3. www.cchos.ca
4. www.ask-ehs.com

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | Title of the Paper | | | | | Hours | Credits | | | |
|--|--------------------------|---|-----|-----|-----|------------------------------------|-------|---------|------|------|--|
| I | 20PZO1DE1 B | OCCUPATIONAL HEALTH AND SAFETY | | | | | 6 | 4 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | √ | √ | √ | √ | √ | √ | √ | √ | | | |
| CO2 | √ | √ | | √ | √ | √ | √ | √ | √ | | |
| CO3 | √ | | √ | √ | √ | √ | | √ | √ | √ | |
| CO4 | √ | √ | √ | | | √ | | | √ | | |
| CO5 | | √ | √ | √ | √ | √ | √ | √ | √ | √ | |
| Number of Matches= 38, Relationship : High | | | | | | | | | | | |

Prepared by

Dr. M.I. Huassain Syed Bava

Checked By

Dr. I. Joseph Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal Marks | External marks |
|----------|-----------|----------|---------------------|-------|---------|------------|----------------|----------------|
| II | 20PZO2CC5 | Core – V | GENETICS | 6 | 5 | 100 | 25 | 75 |

Course Outcomes

On successful completion of the course, students will be able to:

1. Acquire knowledge on chromosome structure, chromatin organization and variation
2. Understand Mendelian inheritance and Gene regulation factors
3. Discuss the concepts of Gene and gene interactions, DNA transcription and translation process
4. Explore various kinds of mutations and genetic transfers in man
5. Explain and diagnose the diseases & disorders related to Genes and Metabolism; apply the uses of Genetics in human welfare

UNIT I: Mendelian Principles and Chromosomes

18 hours

Principles of segregation and independent assortment- Deviation from Mendel's findings-Incomplete dominance and co-dominance, lethal genes. Pleiotropism-The chromosome theory of inheritance. Chromatin-structure, heterochromatin and euchromatin, C value paradox, repetitive DNA, satellite DNA, overlapping genes, split genes, pseudo genes. #Genetic structure analysis of eukaryotic genomes#.

UNIT II: Gene interactions and Sex determination

18 hours

Gene interactions and types, multiple alleles, recombination and its molecular mechanism, linkage, crossing over, chromosome mapping, LOD score for linkage testing. # Hardy –Weinberg equilibrium# Extra chromosomal inheritance - Inheritance of Mitochondrial and chloroplast genes, maternal inheritance - Mitochondrial and chloroplast genome organization

Sex determination: Chromosome theory of sex determination, gynandromorphism. Hormonal Influence on sex determination and Environmental influence -Hermaphroditism.

UNIT III: Gene regulation

18 hours

Gene regulation in prokaryotes: Lac operon, Catabolite repression, Attenuation and tryptophan operon, Lytic and lysogeny regulation in lambda phage - Gene regulation in eukaryotes: Short term regulation and Long term regulation. Effect of temperature and light on gene expression.

Microbial genetics: Bacterial chromosome and # Plasmids# - Methods of gene transfer; transformation, conjugation, transduction and sexduction, mapping genes by interrupted mating -fine structure of gene - Transposons.

UNIT IV: Mutation

18 hours

Mutation; classification, DNA damage and repair, role in genetic analysis and evolution. types, causes and detection, Mutation detecting systems AME's test – fluctuation test, SCE (sister chromatid exchange). Mutant type's lethal, conditional, biochemical, loss of function, gain of function, germinal versus somatic mutation, insertional mutagenesis. Chromosomal mutation- # Numerical changes in chromosomes # and structural changes in chromosomes.

UNIT V: Inborn errors of metabolism and Genetic diseases

18 hours

Inborn errors of metabolism: Phenylketonuria, Alkaptonuria, Albinism, Lesch-Nyhan syndrome, ADA deficiency, Galactosemia, G6PD deficiency, TaySach's disease, and Gaucher's disease. Human karyotype: preparation and analysis - # chromosomal syndromes in man#. Detecting genetic diseases – Genetic counselling -prenatal diagnosis, pedigree analysis, Genetic diseases - Treating genetic diseases - Altering genetic traits Human Genome Project – Features, methods and future prospects.

Self-study#.....#

Text Books:

- 1.M.W. Strickberger, Genetics, Third Edition, Prentice-Hall of India Private Limited, 2004.
2. P.S. Verma and V.K. Agarwal, Genetics, Ninth Revised edition, S.Chand& Company Ltd. Publishers, 2009.
3. Alice Marcus, Genetics, MJP Publication, 1st Edition 2009

Books for Reference:

1. Benjamin Levin. Genes VIII, Oxford University Press, New York. 2005.
2. Daniel L. Hartl. Genetics, III Ed., Jones Bartlett Publishers. Boston. 1996.
3. David Friefelder. Microbial Genetics, Narosa Publishing House, New Delhi. 1998.
4. Elaine Johansen Mange and Arthur P. Mange., Basic Human Genetics, Sinour Associates, Inc., Sunderland, Massachusetts. 1994.
5. Jenkins, J. B. Human Genetics, The Benjamin Cummings Publishing Co. 1983.
6. John D. Hawkins. Gene Structure and Expression, III Ed., Cambridge University Press. 1996.
7. Robert H. Tamarin. Principles of Genetics, WCB Publishers. 1996.

Web reference:

1. <https://www.khanacademy.org/science/biology/dna-as-the-genetic-material/structure-of-dna/a/nucleic-acids?modal=1>
2. https://link.springer.com/referenceworkentry/10.1007%2F978-1-4419-1005-9_690
3. https://link.springer.com/referenceworkentry/10.1007%2F978-1-4419-1005-9_690

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | Title of the Paper | | | | | Hours | Credits | | | |
|--|--------------------------|--------------------|-----|-----|-----|------------------------------------|-------|---------|------|------|--|
| II | 20PZO2CC5 | GENETICS | | | | | 6 | 5 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | √ | | √ | √ | √ | √ | √ | √ | √ | √ | |
| CO2 | √ | | √ | √ | √ | √ | √ | | √ | √ | |
| CO3 | | √ | √ | √ | √ | √ | | | √ | √ | |
| CO4 | √ | √ | √ | | | √ | | | √ | √ | |
| CO5 | | √ | √ | √ | √ | √ | √ | √ | | √ | |
| Number of Matches= 38, Relationship : HIGH | | | | | | | | | | | |

Prepared by:

Dr P.Rajasekar

Checked by:

Dr I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal Marks | External marks |
|----------|-----------|-----------|----------------------------|-------|---------|------------|----------------|----------------|
| II | 20PZO2CC6 | Core – VI | CELL AND MOLECULAR BIOLOGY | 6 | 5 | 100 | 25 | 75 |

Course Outcomes

On successful completion of the course, students will be able to:

1. Understand the basic Structural organization of Prokaryotic, Eukaryotic and Intracellular organelles
2. Analyse the methods of Cell communication and signaling
3. Apply and acquire knowledge on DNA replication, damage, mutation and repair mechanisms
4. Describe transcription in Prokaryotes & Eukaryotes; Regulation of Protein Synthesis and RNA processing
5. Explain Cell cycle; acquire knowledge on oncogenes and cancer cells

UNIT I: Cell Organization

15 hours

Structure and functions of Plasma membrane, Mitochondria, Golgi bodies, Lysosomes, Ribosome, Endoplasmic Reticulum - # Membrane models # (Fluid mosaic and Unit membrane) - Mechanism of protein sorting and Regulation of intracellular transport- Electrical properties of membranes.

UNIT II: Cell Signalling and Communication

15 hours

Cell signalling hormones and their receptors- Cell surface receptors– signaling through G-protein coupled receptors– Signal transduction pathways: MAP kinase pathway – Tyrosine kinase - #Signaling from plasma membrane to nucleus#. Cellular communication: General principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, neurotransmission and its regulation.

UNIT III: DNA replication and repair mechanisms

15 hours

Structure and functions of Nucleus, Nuclear envelope, Nuclear pore complex and Nucleolus- DNA replication: Semi conservative and rolling circle replication, genes, enzymology of replication, replication origin and replication fork, fidelity of replication - #DNA damage, mutation and repair mechanisms#, homologous and site-specific recombination- structure of chromatin and chromosomes.

UNIT IV: Regulation and Transcription

15 hours

Regulation of transcription in Prokaryotes and Eukaryotes. Transcription factors and machinery, formation of initiation complex, transcription activator and repressor, RNA polymerases, capping- Regulation of Protein Synthesis: initiation, elongation and termination, RNA processing, splicing, polyadenylation, introns, exons, and #RNA transport#.

UNIT V: Cell Cycle & Cancer Biology

15 hours

Cell cycle: Mitosis and Meiosis – Cell division control in mammalian cells – Oncogenes - Types – Characteristics of cancer cells – Control & prevention -#Tumor suppressor genes# - Tumor viruses - Role of Apoptosis in Cancer - Molecular diagnosis, prevention, early detection and treatment of cancer, Therapeutic interventions of uncontrolled cell growth.

#..... # Self study

Text Book:

- 1). De Robertis, E.D.P., and De Robertis, E.M.F., Cell and Molecular Biology, VIII Ed., 2014, Lippincott Williams & Wilkins, A Wolters Kluwer India Pvt., Ltd.
- 2). Verma, P.S. and Agarwal, V.K., Cytology, 3rd Edition, Chand & Co., Ltd. Delhi. 2009.
- 3). Ajoy Paul, Text Book of Cell and Molecular Biology. II Edition, Books and Allied (P)Ltd. 2009.

Books for Reference:

- 1) Geoffrey, M. Cooper and Robert E. Hausman., The Cell – A Molecular Approach. 5th Edition. Asm Press, Sinauer, Washington D.C. USA. 2007.
- 2) Alberts *et al.*, Molecular Biology of the Cell. 4th Edition, Garland Science, A Member of the Taylor and Francis group, New York, USA.2002.
- 3.) Cooper, G. M. “The Cell – A Molecular Biological Approaches”. ASM Press, Washington,2013.
- 4.) David Freifelder. “Molecular Biology” Narosa Publishing House, 2000.
- 5.) Gupta PK, Cell and Molecular Biology. Rastogi Publications, Meerut, 2013.

Web Reference:

1. [https://en.wikipedia.org/wiki/Cell_\(biology\)](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

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | | Title of the Paper | | | Hours | Credits | | | |
|--|--------------------------|-----|-----------------------------------|-----|-----|------------------------------------|----------|------|------|------|
| II | 20PZO2CC6 | | CELL AND MOLECULAR BIOLOGY | | | 6 | 5 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
| CO1 | √ | √ | √ | | √ | √ | √ | | √ | |
| CO2 | √ | | √ | √ | √ | √ | | √ | √ | |
| CO3 | √ | √ | √ | | √ | | √ | | √ | √ |
| CO4 | √ | √ | √ | | √ | | √ | √ | | √ |
| CO5 | | √ | √ | | √ | √ | | √ | | √ |
| Number of Matches= 37, Relationship : HIGH | | | | | | | | | | |

Prepared by:

Dr. K. Prabakar

Edited By

Dr. I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal Marks | External marks |
|----------|-----------|------------|---------------------|-------|---------|------------|----------------|----------------|
| II | 20PZO2CC7 | Core – VII | ANIMAL PHYSIOLOGY | 6 | 4 | 100 | 25 | 75 |

Course Outcomes

On successful completion of the course, students will be able to:

1. Record the importance of nutrients and digestion in animal wellbeing
2. Understand and evaluate the physiology of circulation and cardiovascular system in animals
3. Acquire knowledge on physiology of effectors, neural conduction and receptors
4. Discuss homeostatic mechanisms, osmoregulation and excretion.
5. Analyse and apply the biology of endocrine glands to human reproductive physiology.

UNIT I: Nutrition, Digestion, Respiration

18 hours

Nutritive types in animal kingdom, Role of vitamins and minerals in nutrition – Deficiency diseases – Caloric value of foods – BMR. Digestion and absorption of proteins, carbohydrates and lipids – Role of enzymes in digestion. Comparison of respiration in different vertebrate; anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration.

Digestive glands

UNIT II: Blood, Cardiovascular system

18 hours

Blood and circulation - Blood corpuscles, haemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, blood groups, haemoglobin, immunity, haemostasis.

Cardiovascular System: Anatomy of heart , myogenic heart, ECG – its principle and significance, cardiac cycle, heart as a pump, blood pressure, neural and chemical regulation of all above.

Respiratory organs and pigments

UNIT III: Nervous, Muscle, Receptor

18 hours

Nervous system - Neurons, Nerve Impulse genesis conduction and transmission across synaptic junction, action potential, gross neuroanatomy of the brain and spinal cord, central and peripheral nervous system. Types of muscles – Ultra structure of skeletal muscle – Mechanism of muscle contraction. Receptor: Chemoreception - Chemical senses, taste and smell Mechanoreception - Pressure receptor ,Gravity receptor – Phonoreception, Physiology of hearing Photoreception – Photochemistry of vision.

#Neural control of muscle tone and posture#

UNIT IV: Homeostatic, Osmoregulation, Excretion

18 hours

Homeostatic mechanisms: Thermoregulation in Poikilotherms&Homeotherms - Tolerance to high temperature, cold and freezing - Acclimatization and acclimation –Physiology of hibernation and aestivation - Osmotic and ionic regulation in crustaceans, fishes, birds and mammals. Comparative physiology of excretion, kidney, urine formation, urine concentration, waste elimination, micturition, regulation of water balance, electrolyte balance, acid-base balance.

#Adaptation to Pressure, High altitude – Buoyancy#.

UNIT V: Endocrinology and Reproduction

18 hours

Endocrine glands: Structure, Secretion and functions of endocrine glands – Pituitary – Thyroid – Pancreas – Adrenal. Hormones: Chemical nature – functions –deficiency diseases – Mechanism of hormone action.Reproductive processes, gametogenesis, ovulation, endocrine glands in relation to human reproduction.

#Hormonal regulation, Menopause, Pregnancy and Parturition#

#.....#self study

Text books:

1. Singh, H. R. Animal Physiology and Related Biochemistry. SHOBAN Lal Nagin Chand and co., Educational Publishers, New Delhi.
2. P.S.Verma , B.S.Tyagi and V.K. Agrawal, Animal Physiology,S.Chand&Company Pvt.Ltd. 2013

Books for Reference:

1. Rastogi, S. C. Essentials of Animal Physiology. Wiley Eastern Limited. New Delhi.1979.
2. Berry A. K., A Text book of Animal Physiology. Emkay Publications.1st Edition, 1998.
3. Hoar, S. Williams. General and Comparative Physiology. Prentice Hall.1987.
4. Parameswaran, R., Anantha Krishnan, T. N. Anantha Subramanian. Outlines of Animal Physiology, K. S. ViswanathanPvt. Ltd. Chennai.

Web Reference

1. <https://books.google.co.in/books?id=8ARZjwEACAAJ&dq=hill+wyse+anderson+animal+physiology&hl=en&sa=X&ved=0ahUKEwir0Mz1zIXoAhWUA3IKHWkDAsQQ6wEIKzAA>
2. https://books.google.co.in/books?id=Ba_wAAAAMAAJ&q=animal+physiology&dq=animal+physiology&hl=en&sa=X&ved=0ahUKEwiJmePIzoXoAhVkzTgGHeilAJQQ6AEIKDAA

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | | Title of the Paper | | | Hours | Credits | | | |
|--|--------------------------|-----|--------------------|-----|-----|------------------------------------|---------|------|------|------|
| II | 20PZO2CC7 | | ANIMAL PHYSIOLOGY | | | 6 | 4 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
| CO1 | | √ | √ | | √ | √ | √ | | √ | |
| CO2 | √ | | √ | √ | √ | √ | | √ | √ | |
| CO3 | √ | √ | | | | | √ | | | √ |
| CO4 | √ | √ | | √ | √ | | √ | √ | | √ |
| CO5 | | √ | √ | √ | √ | √ | | √ | √ | √ |
| Number of Matches= 32, Relationship : Moderate | | | | | | | | | | |

Prepared By:

Prof. Sheik Umar Sahith

Checked by:

Dr. I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal Marks | External marks |
|----------|------------|-------------|--|-------|---------|------------|----------------|----------------|
| II | 20PZO2CC8P | Core – VIII | PRACTICAL II - GENETICS, CELL AND MOLECULAR BIOLOGY, AND ANIMAL PHYSIOLOGY | 6 | 4 | 100 | 20 | 80 |

Course Outcomes

On successful completion of the course, students will be able to:

1. Acquire skill on Drosophila genetics, Chromosome and staining techniques and Calculation of gene Frequency.
2. Identify tissue types; Isolate cells and sub cellular organelles & acquire knowledge on DNA and Plasmids
3. Estimate amylase activity, ammonia, urea and blood chlorides
4. Understand and design microtechnique; apply histochemical staining of tissues
5. Visit to Research Institutes and acquire knowledge on natural environment and ecosystems

Genetics

Drosophila culture technique.

Identification of mutants and sexes in Drosophila

ABO Blood groups & Rh - Genetic significance.

Staining of chromosomes and G- banding.

Human Karyotyping

Human Pedigree analysis

Calculation of gene frequency for Dominant, recessive, and multiple alleles.

Cell and Molecular Biology

Human Buccal Smear

Cockroach Haemolymph smear

Mounting of Sarcomere, Columnar epithelial cells, ciliated epithelial cell

Isolation of nuclei from Animal cells.

Isolation of subcellular organelles from cells (Mitochondria, Lysosomes)

Isolation of DNA from animal tissue

Isolation of plasmid from bacteria (demo)

Agarose gel electrophoresis of DNA samples (demo)

Animal Physiology

Quantitative estimation of Amylase activity

Quantitative estimation of Ammonia and Urea

Rate of Salt loss and Salt gain in fish using different experimental media

Estimation of Blood Chlorides

Rate of oxygen consumption in experimental fish

Microtechnique

Preparation of permanent serial sections of tissues Liver, spleen, lungs of Sheep / Goat (10 slides). Tissue sections and histochemical staining for identification of cell structure, protein, carbohydrate and lipids.

Educational Tour

Visit to R & D labs and different natural habitats related to the above subjects and submission of report is compulsory.

Record work

A record of laboratory work shall be submitted at the time of Practical examination.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | Title of the Paper | | | | | Hours | Credits | | | |
|--|--------------------------|--|-----|-----|-----|------------------------------------|-------|---------|------|------|--|
| II | 20PZO2CC8 | PRACTICAL II - GENETICS, CELL AND MOLECULAR BIOLOGY, AND ANIMAL PHYSIOLOGY | | | | | 6 | 4 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO2 | ✓ | ✓ | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO3 | ✓ | ✓ | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO4 | ✓ | ✓ | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO5 | ✓ | - | ✓ | ✓ | ✓ | ✓ | - | - | - | ✓ | |
| Number of Matches= 43, Relationship : Moderate | | | | | | | | | | | |

Prepared By:

Prof. Sheik Umar Sahith

Checked by:

Dr. I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal Marks | External marks |
|----------|-------------|----------|---------------------|-------|---------|------------|----------------|----------------|
| II | 20PZO2DE2AR | DSE – II | BIOTECHNOLOGY | 6 | 4 | 100 | 25 | 75 |

(for the students admitted in the academic year 2022-23 and onwards)

Course Outcomes

On successful completion of the course, students will be able to:

1. Acquire knowledge on recombinant DNA technology
2. Apply the concepts of molecular techniques involved in Biotechnology
3. Acquire knowledge on Animal and Medical Biotechnology
4. Evaluate and apply knowledge on Industrial biotechnology
5. Discuss Bioremediation; Apply Biological Treatment Systems and acquire knowledge on IPR

UNIT- I: Recombinant DNA Technology

18 hours

Molecular Tools of Genetic Engineering - Restriction endonucleases - DNA ligases- Alkaline Phosphatase – Nucleases - Polymerases. Vectors: Plasmids- Bacteriophages, Cosmids, # Shuttle vectors #. Artificial chromosomes (YACs, BACs, PACs, MACs and HACs). Methods of Gene Transfer.

UNIT – II:Molecular Techniques

18 hours

Gene Synthesis –Chemical Synthesis (Phosphoramidite method).*DNA Sequencing* –Maxam& Gilbert method and Sangar Coulson method. *Gene Amplification*- PCR Technique, Types and Applications – Automated DNA sequencing, Cycle sequencing and Next generation sequencing. #*Gene Libraries* – cDNA Library# - Blotting techniques – Southern, Northern and Western blotting.

UNIT- III:Animal and Medical Biotechnology

18 hours

Animal cell culture technology: Primary culture- secondary culture - cell lines- Organ culture - whole embryo culture. Methods involved and applications– Stem cell culture and preservation.

DNA in Disease Diagnosis– DNA Probes, chip & Microarray.

Gene Therapy–*Ex vivo* and *in vivo* therapy- Vector delivery system #Vectors used for gene therapy# *DNA Fingerprinting and DNA Markers*- RFLP, RAPD, Satellite, cell finishing, VNTR, STR, SNP.

UNIT- IV:Industrial Biotechnology

18 hours

Fermentation– Types– Fermenter designs – Scale up microbial process - Upstream and Downstream processing– Production of hormones, vaccines, Enzymes and Vaccines – Recombinant Vaccines and its types. Immobilization of enzymes and its applications. Production and application of monoclonal and polyclonal antibody #Vitamins and Single Cell Proteins#.

UNIT- V:Environmental Biotechnology

18 hours

Bioremediation: Bioreduction, Biofiltration, Biosensor, eDNA, Biosorption, Bioleaching of Heavy Metals and Ores: Copper and Gold. Wastewater Treatment: Biological Treatment System – Aerobic and Anaerobic Treatment. Sewage Treatment Plant- Distilleries, Tannery effluent. #Risks in Biotechnology #Biosafety, Bioethics and patenting- IPR.

#.....# **Self study**

Text Book:

1. Satyanarayana, U, Biotechnology, Books and Allied (P) Ltd., Kolkata. 2009.

Books for Reference:

1. Gupta, P. K., Biotechnology and Genetics. Rastogi Publications, Meerut. 2004.

- Brown, C.M., Campbell, I. and Priest, F.G. Introduction to Biotechnology. Blackwell Scientific Publications, U.K(1988).
- Old, R. W and Primrose, S B., Principles of Gene Manipulation, An Introduction to Genetic Engineering, Oxford Blackwell Scientific Publications. 1989.
- Primrose, S. B. Modern Biotechnology. Blackwell Scientific Publications, Oxford, London. 1989.
- Prentis, S. Biotechnology New Industrial Revolution, Orbis, London. 1985.
- Smith John, E. Biotechnology. Edward Arnold, London. 1988.

Web reference:

- ebookpdf.com/recombinant-dna-technology
- www.khanacademy.org > tag > pcr
- www.khanacademy.org > science > biology > biotech-dna-technology
- www.vanderbilt.edu > viibre > CellCultureBasicsEU

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | Title of the Paper | | | | | Hours | Credits | | | |
|--|--------------------------|----------------------|-----|-----|-----|------------------------------------|----------|----------|------|------|--|
| II | 20PZO2DE2AR | BIOTECHNOLOGY | | | | | 6 | 4 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | √ | √ | | √ | √ | √ | √ | | √ | | |
| CO2 | √ | √ | √ | √ | | √ | | √ | √ | | |
| CO3 | √ | √ | √ | √ | √ | √ | | √ | | √ | |
| CO4 | √ | √ | √ | | √ | √ | √ | √ | √ | | |
| CO5 | | √ | √ | √ | √ | √ | | √ | √ | √ | |
| Number of Matches= 38, Relationship : Moderate | | | | | | | | | | | |

Prepared By:

Dr. S. Mohamed Hussain

Checked by:

Dr. I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Sem | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|-----|----------------|----------|---------------------|-------|---------|------------|----------------|----------------|
| II | 20PZO2DE2 B | DSE – II | ENDOCRINOLOGY | 6 | 4 | 100 | 25 | 75 |

COURSE OUTCOMES

On successful completion of the course, students will be able to:

1. Understand the general principles and scope.
2. Explain the integrated function of endocrine glands in regulation of body functions.
3. Relate the role of hormones in reproduction.
4. Substantiate the intrinsic relationship existing between hormones and metabolism.
5. Evaluate and apply the impact of hormones in response to internal and external environmental changes.

Unit I: Scope of Endocrinology

18 Hours

Scope of Endocrinology – Hormones – Life history – Chemical structure – Synthesis – classification – Characteristic features of hormones – General and principles of hormone action, Cell signaling and hormonal action – #Cyclic AMP#.

Unit II: Endocrine glands

18 Hours

Functional organization of hormones of Endocrine glands – pituitary (hypophysis): Adenohypophysial and Neurohypophysial hormones – Thyroid – Pancreas – Adrenal – #Pineal gland (Epiphysis)# – Tissue hormones.

Unit III: Endocrine Hormones

18 Hours

Hormones and reproduction : Ovary and Testis – Hormonal control of mammary glands, ovarian cycles, pregnancy and Lactation – #Placenta and its endocrine function#.

Unit IV: Endocrine metabolism

18 Hours

Gastrointestinal hormones and its function – regulation of hormone metabolism and mineral metabolism – carbohydrate– nitrogen – lipid. Metabolism . Influence of hormones on growth and development – Hormones and calcium – #phosphate homeostasis#.

Unit V: Hormonal regulation

18 Hours

Hormonal regulation of osmoregulation – Thermoregulation – Hormones and behavior – Hormones regulation on migration – Regeneration – Metamorphosis – #Environmental endocrinology#.

#....# **Self-study portion.**

Text Books:

1. Chandra, S. Negi, Introduction to Endocrinology, PHI Learning Pvt. Ltd., New Delhi. 2009.

Reference Books:

1. Bently, P. J., Comparative Vertebrate Endocrinology, Cambridge University Press. 1998.
2. Wiliam, R. H., Textbook of Endocrinology, W. B. Saunders.2011.
3. Gorbman et al., Comparative Endocrinology, John Wiley & Sons,2013.
4. Yadav, B. N., Mammalian Endocrinology, Vishal Publishing Co., Jalandhar,2000.
5. Martin, C. R., Endocrine Physiology, Oxford University Press.1985.

Web Reference

1. www.endocrinology.org
2. www.hormone.org
3. www.academic.oup.com ›

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | Title of the Paper | | | | | Hours | Credits | | | |
|--|--------------------------|----------------------|-----|-----|-----|------------------------------------|----------|----------|------|------|--|
| II | 20PZO2DE2 B | ENDOCRINOLOGY | | | | | 6 | 4 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | - | - | ✓ | ✓ | |
| CO2 | ✓ | ✓ | - | ✓ | ✓ | - | - | ✓ | ✓ | ✓ | |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | - | ✓ | ✓ | |
| CO4 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | - | ✓ | ✓ | ✓ | |
| CO5 | ✓ | ✓ | ✓ | ✓ | ✓ | - | - | ✓ | ✓ | ✓ | |
| Number of Matches= 41, Relationship : HIGH | | | | | | | | | | | |

Prepared By:

Dr. Mohamed Shamsudin

Checked by:

Dr. I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Sem | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|-----|-----------|-------------|---------------------|-------|---------|------------|----------------|----------------|
| III | 20PZO3CC9 | Course – IX | BIOCHEMISTRY | 6 | 5 | 100 | 25 | 75 |

Course Outcomes:

On successful completion of the course, students will be able to:

1. Differentiate biomolecules and macromolecules; review protein configuration.
2. Discuss the nucleic acids: chemical structure and biosynthesis.
3. Describe the role of vitamins and hormones: their deficiency diseases.
4. Examine cellular respiration and report carbohydrate metabolism.
5. Evaluate and apply protein and lipid metabolism at optimal health.

UNIT I: Carbohydrates, Proteins, Lipids

18 hours

Structure, Properties, Analytical tests and Functional Significance of: Carbohydrates (mono, di and poly saccharides) – Lipids (fatty acids, triglycerids and steroids) – Proteins (amino acid classification) #Protein configuration# .

UNIT II: Nucleic Acid and Enzymes

18 hours

Nucleic acid : Molecular structure, Chemistry, Types and Properties of DNA and RNA- Biosynthesis of Purines and Pyrimidine. Metabolism: DNA – RNA.

Enzymes : Types, Kinetics and Mechanism of Action – Enzyme inhibition – #Coenzymes (NAD, FAD) # and Cofactors.

UNIT III: Vitamins and Hormones

18 hours

Vitamins: Types, Occurrence, Classification, Structure, Properties, Functions and Deficiency symptoms.

Animal hormones: Synthesis, Secretion and Mechanism of action metabolic action and functions: Pituitary, Thyroid, Parathyroid, Adrenal, Pancreas, Reproductive, Placental, Thymus, Pineal and Gastrointestinal - # Prostaglandins #

UNIT IV: Cell Respiration and Carbohydrate Metabolism

18 hours

Cell Respiration and Biological Oxidations : Bioenergetics – High energy compounds – Biological oxidation – Electron Transport chain – Oxidative Phosphorylation – Enzymes involved in Biological oxidation – #Free radicals and Antioxidants#.

Carbohydrate Metabolism: Glycolysis - Kreb's cycle – Gluconeogenesis – Glycogenesis – Glycogenolysis - HMP Shunt – Electron Transport System.

UNIT V: Protein and Lipid Metabolism

18 hours

Protein Metabolism: Metabolism of Amino acid – Ammonia and Urea cycle – Disorders of Amino acid metabolism – #Phenylketoneuria# - Albinism.

Lipid Metabolism: Metabolism of Tryglycerols, Fatty acid oxidation – Ketone bodies – Metabolism of Phospholipids – Glycolipids – Cholesterol - HDL – Fatty liver – Obesity – Atherosclerosis.

Self-study portion.

Text Books

6. Michael M. Cox, David L. Nelson., Lehninger Principles of Biochemistry, W.H. Freeman & Company, New York. 2010

Books for Reference:

1. Jeremy M. Berg ,Lubert Stryer, John L. Tymoczko , Gregory J. Gatto , W.H. Freeman & Company, New York. 2019.
2. Narayanan,L.M., Nallasingam, K, Arumugam, N, Fathima, D., Pillai,R.P.M.,Kumar,S.P. Biochemistry- Saras publication. Nagercoil. 2003.
3. Frankton J.S. & S. Simmonds, G.General and R.H.Dol. Outlines of Biochemistry John Wiley & Sons. 1987.
4. Baldwin, E. An introduction to comparative Biochemistry, CUP, London. 1964.

Web Reference

1. <https://www.pdfdrive.com/textbook-of-biochemistry-e14983388.html>
2. <https://www.pdfdrive.com/textbook-of-biochemistry-for-medical-students-6th-edition-e56002358.html>
3. <https://www.google.com/url?sa=t&source=web&rct=j&url=https://labalbaha.files.wordpress.com/2014/04/fundamentals-of-biochemistry.pdf&ved=2ahUKEwjK- jsAhUGzTgGHTTPBdwQFjAlegQICRAB&usq=AOvVaw2NKyE0rUKlfhobMe8JTixa>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | Title of the Paper | | | | | Hours | Credits | | | | |
|--|--------------------------|--------------------|-----|-----|-----|------------------------------------|-------|---------|------|------|--|--|
| III | 20PZO3CC9 | BIOCHEMISTRY | | | | | 6 | 5 | | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | | |
| CO1 | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | - | ✓ | ✓ | | |
| CO2 | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | ✓ | ✓ | ✓ | | |
| CO3 | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | - | ✓ | ✓ | | |
| CO4 | ✓ | ✓ | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| CO5 | ✓ | ✓ | - | ✓ | ✓ | ✓ | ✓ | - | ✓ | ✓ | | |
| Number of Matches= 39, Relationship : High | | | | | | | | | | | | |

Prepared By:

Dr. M. Meeramaideen

Checked by:

Dr. I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Sem | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|-----|------------|----------|---------------------|-------|---------|------------|----------------|----------------|
| III | 20PZO3CC10 | Core – X | IMMUNOLOGY | 6 | 5 | 100 | 25 | 75 |

Course Outcomes

On successful completion of the course, students will be able to:

- Acquire knowledge on the functional organization of the immune system
- Understand and identify the cellular and molecular basis of immune responsiveness
- Explain the complement and their essential functions, and effects on the immune system.
- Evaluate the roles of the immune system in both maintaining health and contributing to disease including Allergy, hypersensitivity and autoimmunity
- Apply the role of antibodies in immunological techniques and to familiarize the modern laboratory techniques

UNIT I: Introduction to Immune System

18 hours

An overview - Scope of Immunology – concept of external and internal defence system – First line (innate) and second line (acquired) of defense – Immune organs – Types, anatomical location, structure and function- #Role of cells in immune response#.

UNIT II: Antigen and Antibody

18 hours

Antigen: Definition, Types Characteristic features and classification – Adjuvants – Definition types and applications

Antibodies: primary structure – classification – variants – functional characteristics of various antibody classes – generation of diversity – #antibody engineering and its applications# – Vaccines- types preparations and efficacies

UNIT III: Complement and Effector Mechanism

18 hours

COMPLEMENT – definition – salient features – major activation pathways - Immune response: Hormonal immune response - Cell mediated immune response.

Cytokines: Properties – General structure and functions – #Interleukins – types(Lymphokines and monokines)# and functions - interferon – origin – types and functions -

UNIT IV: Diseases and Immune Response

18 hours

Hypersensitivity – Definition – Types I to IV and Immune Manifestations – Auto Immune Diseases – types – onset and spectrum of diseases - Immuno deficiency diseases – types – congenital and acquired - Tumor immunology – Immune response to tumor – #Transplantation immunology# – Allograft rejection – types and mechanism -Major Histocompatibility Complex (MHC)

UNIT V: Immunological Test

18 hours

Precipitation tests - Immunodiffusion - Immuno electrophoresis – VDRL Agglutination test - Widal test - Immunoflorescence - ELISA – Hybirydoma technology – #Radio Immuno Assay (RIA)# – Western Blotting technique

#...# Self - Study portion

Text Book:

- Roitt, Immunology, (3rd Edition), Crover Medical Publishing Company, London.2011.

Books for Reference:

- Chakravarthy, A.K., Immunology, Tata McGraw Hill Publishing Company, New Delhi. 1993.
- Barret, J. T. Text Book of Immunology, (5th Edition).The C.V. Mosly, Company, 1983.
- Richard, H.M., Immunology(2nd Edition), Williams and Wilkins, Baltimore Maryland. 1992.
- Hidemann, W.H. Essentials of Immunology, Elsevier Science Publishing, Co. Inc. 1980.
- Weinn. D.M. and Steward, L. Immunology, Singapore Publishers Private Limited.1993.

Web Reference

1. <https://www.ncbi.nlm.nih.gov/books/NBK279395/>
2. <https://www.sciencedirect.com/topics/medicine-and-dentistry/organs-of-the-immune-system>
3. <https://www.immunology.org/public-information/bitesized-immunology/systems-and-processes/complement-system>
4. <https://www.immunopaedia.org.za/immunology/archive/type-i-iv-hypersensitivity-reactions/immune-complex-formation/hypersensitivity-reactions/>
5. <https://courses.lumenlearning.com/boundless-microbiology/chapter/the-major-histocompatibility-complex-mhc/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | Title of the Paper | | | | | Hours | Credits | | | | |
|--|--------------------------|--------------------|-----|-----|-----|------------------------------------|-------|---------|------|------|--|--|
| III | 20PZO3CC10 | IMMUNOLOGY | | | | | 6 | 5 | | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | | |
| CO1 | √ | | √ | √ | √ | √ | √ | √ | √ | √ | | |
| CO2 | √ | √ | √ | √ | √ | √ | √ | | √ | √ | | |
| CO3 | | √ | √ | √ | √ | √ | | √ | √ | √ | | |
| CO4 | √ | √ | √ | √ | √ | √ | | | √ | √ | | |
| CO5 | | √ | √ | √ | √ | √ | √ | √ | | √ | | |
| Number of Matches= 38, Relationship : High | | | | | | | | | | | | |

Prepared By:

Dr. M. Aneez Mohamed

Checked by:

Dr. I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Sem | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|-----|------------|---------|--|-------|---------|------------|----------------|----------------|
| III | 20PZO3CC11 | Core XI | BIostatistics AND Bioinformatics | 6 | 4 | 100 | 25 | 75 |

Course Outcomes

On successful completion of the course, students will be able to:

1. Understand and apply practical knowledge of theoretical distribution and correlation in Biological Sciences.
2. Acquire knowledge on Regression, Hypothesis testing and ANOVA.
3. Apply statistical knowledge such as making graphs, index numbers and interpolation.
4. Estimate and Evaluate biological databases.
5. Generate sequence alignment and prepare Molecular phylogenetic analysis and construction of phylogenetic tree.

BIostatistics

UNIT I: Theoretical Distribution and Correlation

18 hours

Binomial, Poisson and Normal distribution and Confidence limits - Correlation: - simple correlation, Carl Pearson coefficient - correlation for grouped data - multiple correlation and # rank correlation #.

UNIT II: Regression and Test of Significance

18 hours

Regression equation – Line of Regression, Regression X on Y and Y on X– Ratio of variation - Hypothesis testing; Student ‘t’ test, # Chi-square test #, F – test and Z test. ANOVA: One way and two way analysis, F values and Critical values.

UNIT III: Time Series and Index Number

18 hours

Analysis of time series: Average method, least square method - Association of attributes and coefficient of association – # Sampling of attributes # – Index numbers and construction methods – Interpolation and extrapolation - Statistical packages in Biostatistics – SPSS

Bioinformatics

UNIT IV: Biological Databases

18 hours

Biological Databases: Nucleotide sequence Databases; GenBank and DDBJ - Protein Sequence Databases; Prosite and PIR - Protein structure Database; PDB SCOP, – Gene Expression Database; ArrayExpress, Ensembl – Metabolic pathway Database MetaCyc, ExPASy, WIT, – # Specialized Database; dbEST # - Genome data bases; GDB, Entrez Genome.

UNIT V: Tools of Bioinformatics

18 hours

Sequence Alignments: Global and Local Sequence Alignments – Multiple Sequence Alignments and structural alignment - Bioinformatics tools –# FASTA, BLAST #, SRS, LocusLink Clustal W, RasMol and Swiss-Pdb viewer, MMTK - Molecular phylogenetic analysis and construction of phylogenetic tree.

#---# Self study portion.

Text Books

1. Arora, P.N. Biostatistics .Himalaya Publishing House. 2018.
2. Subramanian, C. A Text book of Bioinformatics, Dominant Publishers and Distributors. New Delhi, India. 2015.

Books for Reference:

1. Sokal, R.J. and Rohlf, S.J. Introduction to Biostatistics, W.H. Freeman, London. 1981.
2. Ramakrishnan, P. Biostatistics, Saras Publications, Nagercoil. 1996.
3. Irfan Ali Khan and AtiyaKhanum. Fundamentals of Bioinformatics. Ukaaz Publications Hyderabad, AP, India. 2003.
4. Arthur M Lesk Introduction to bioinformatics. Oxford University Press. Oxford, United Kingdom 2014.
5. Murthy, C.S.V. Bioinformatics. Himalaya Publishing House. Mumbai, Delhi, Nagpur, Bangalore, Hyderabad, India. 2003.
6. Mittal, C. Fundamentals of Information Technology, Praghati Prakasam, Meerut. 2003
7. Xiong J. Essential Bioinformatics. Texas A & M University. Cambridge University Press 2006
8. ZAR, J. H. Biostatistical Analysis. Pearson Education Pvt. Ltd. Singapore. 2007.
9. Kapur, S. Elements of practical statistics. Oxford&IBH Publishing Company 2008

Web Source

1. https://web2.ph.utexas.edu/~mwguthrie/t.theory_of_distributions.pdf
2. <https://sites.calvin.edu/scofield/courses/m143/materials/handouts/anova1And2.pdf>
3. <https://www.sjsu.edu/faculty/gerstman/StatPrimer/regression.pdf>
4. <https://www.ncbi.nlm.nih.gov/>
5. <https://pubmed.ncbi.nlm.nih.gov/>
6. <https://blast.ncbi.nlm.nih.gov/Blast.cgi>
7. <https://www.embl.org/>
8. <https://www.ddbj.nig.ac.jp/index-e.html>
9. <https://prosite.expasy.org/>
10. <http://www.wwpdb.org/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | | Title of the Paper | | | Hours | Credits | | | | |
|--|--------------------------|-----|----------------------------------|-----|-----|------------------------------------|---------|------|------|------|--|
| III | 20PZO3CC11 | | BIOSTATISTICS AND BIOINFORMATICS | | | 6 | 4 | | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| CO2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| CO4 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO5 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Number of Matches= 31, Relationship : Moderate | | | | | | | | | | | |

Prepared by:
S N Sheik Umar Sahith

Checked by:
Dr I Joseph Antony Gerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Sem | Code | Course | Title of the course | Hours | Credits | Max. marks | Internal marks | External marks |
|-----|-----------------|----------|---|-------|---------|------------|----------------|----------------|
| III | 20PZO3CC12 P | Core XII | PRACTICAL III - BIOCHEMISTRY, IMMUNOLOGY, BIostatISTICS & BIOinformatics | 6 | 4 | 100 | 20 | 80 |

Course Outcome

On successful completion of the course, students will be able to:

1. Acquire knowledge on the preparation of solutions, buffers; estimate the quantum of protein, amino acids and lipids.
2. Learn and relate the techniques of immunodiffusion, immunoelectrophoresis and blotting.
3. Analyze biological data using biostatistical tools.
4. Understand and apply basic knowledge on bioinformatics.
5. Exposure to R&D labs and planning career.

Biochemistry

Preparation of solutions: Percentage, Molarity, Normality.

Buffer preparation: phosphate buffer, Acetate buffer– Determination of pH using pH meter.

Quantitative estimation of: Proteins, Amino acids, Carbohydrates and Lipids in tissue samples.

Immunology

Lymphoid organs- Primary and Secondary.

Immunodiffusion - Immunoelectrophoresis (Demo) – ELISA.

Blotting techniques. Blood group matching (Compatibility test for ABO Blood Grouping).

Biostatistics:

Statistics using excel: Production of bar diagrams and pie charts from statistical data. Correlation, ANOVA - One way and Two way analysis.

Bioinformatics:

Similarity search for Nucleotide Sequences and protein sequences using BLAST and FASTA. Protein structure determination (prediction) using SWISS-MODEL.

Educational Tour:

Visit to R & D labs and submission of tour report.

Observation Record.

A record of lab work shall be maintained and submitted at the time of Practical Examination for valuation.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | Title of the Paper | Hours | Credits | | | | | | |
|--|--------------------------|---|-------|---------|-----|------------------------------------|------|------|------|------|
| III | 20PZO3CC12P | PRACTICAL III - BIOCHEMISTRY, IMMUNOLOGY, BIOSTATISTICS & BIOINFORMATICS | 6 | 4 | | | | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO2 | ✓ | ✓ | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO3 | ✓ | ✓ | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO4 | ✓ | ✓ | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO5 | ✓ | - | ✓ | ✓ | ✓ | ✓ | - | - | - | ✓ |
| Number of Matches= 39, Relationship : High | | | | | | | | | | |

Prepared by

Dr. M. I. Husaain Syed Bava

Checked by

Dr. I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Sem | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|-----|------------|---------|--|-------|---------|------------|----------------|----------------|
| III | 20PZO3DE3A | DSE III | ANIMAL BEHAVIOUR AND BIODIVERSITY CONSERVATION | 6 | 4 | 100 | 25 | 75 |

Course Outcomes

On successful completion of the course, students will be able to:

1. Understand the concepts of behavioural patterns of various organisms and their lifestyle.
2. Describe visual and chemical mode of communication among insects and birds.
3. Investigate the role of biodiversity on maintenance of ecosystem.
4. Visualise threats and values of biodiversity and conservations.
5. Educate and apply the Laws on protection of wildlife and biodiversity.

Unit I: Ethology

18 hours

Animal behavior : Classification, instinct, imprinting, learning, foraging and feeding behaviour. Adaptive value of behavior - Habituation and conditioning - Instinct versus learning - Circadian and circannual rhythms. Social behavior in insects. #Kin selection concept, Altruism#.

Unit II: Communication Behaviour

18 hours

Visual communication – Dance language of honey bee; mating dance of birds. Chemical communication – Pheromones of insects and mammals. #Migration of fishes# and birds. **Human behaviour** – Neuronal control; Mania; Excitement and Depression; Schizophrenia; Alzheimer's disease.

Unit III: Biodiversity and Species concepts

18 hours

Components of Biodiversity (Ecosystem, Genetic and Species diversity) - Assigning values to biodiversity - #Inventory Survey methods in Animal diversity# - Biodiversity Hotspots (Western Ghats, Indo - Burma region).

Unit IV: Threats to animal diversity and conservation tools

18 hours

Extinctions: Past rates of Extinction - Threats to animal diversity in India - Status of species: Rare, endemic, threatened and endangered species - IUCN Red list - Status of Indian animals. In situ and Ex situ conservation of Indian animals - #Project Tiger and Elephant#.

Unit V: Animal Laws and Policies in India

18 hours

Wildlife (Protection) Act of India (1972) - Protected Area Network - Zoo policy - Laws and their applications in Zoological parks, Wildlife sanctuaries and Biosphere reserves. Global Conservation Organizations - Role of NGO's and Government organizations in Wildlife Conservation – #Wildlife trade# - Wildlife documentation.

#...# Self - Study portion

Text Book:

1. P.D.Sharma., Ecology and Environment, Rastogi Publication, Meerut. 2012.

Books for Reference:

1. Lee Alan Dugatkin., Principles of Animal Behavior, 4th Edition, University of Chicago Press, 2020.
2. Mohan P. Arora., Animal Behavior, Himalaya Publishing House, 1995.
3. Reena mathur., Animal Behaviour, Rastogi Publication, Meerut. 2010.
4. Michael Begon, John L. Harper Colin R. Townsend., Ecology (Individuals, population and Communities), Wiley, 2005.
5. Hoshang S. Gunderia and Hare Govind Singh., The Text Book of Animal behaviour, S. Chand & Co, 2005.

Web Reference:

1. <https://www.khanacademy.org/science/biology/behavioral-biology/animal-behavior/a/intro-to-animal-behavior>
2. <https://www.nature.com/scitable/knowledge/library/an-introduction-to-animal-communication-23648715/>
3. <https://www.greenfacts.org/en/biodiversity/1-3/1-define-biodiversity.htm>
4. <https://www.bioexplorer.net/threats-to-biodiversity.html/>
5. <https://peepalfarm.org/animalrights>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | Title of the Paper | | | | | Hours | Credits | | | | |
|-------------------------|--------------------------|--|-----|-----|-----|------------------------------------|-------|---------|------|------|--|--|
| III | 20PZO3DE3A | ANIMAL BEHAVIOUR AND BIODIVERSITY CONSERVATION | | | | | 6 | 4 | | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | | |
| CO1 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | | | |
| CO2 | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | |
| CO3 | ✓ | ✓ | | ✓ | | ✓ | | ✓ | ✓ | ✓ | | |
| CO4 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ | | |
| CO5 | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | |
| Number of Matches = 38, | | | | | | Relationship : High | | | | | | |

Prepared By:

Dr. M. Salahudeen

Checked by:

Dr. I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Sem | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|-----|----------------|-----------|---------------------------------------|-------|---------|------------|----------------|----------------|
| III | 20PZO3DE3 B | DSE – III | AQUACULTURE AND FARM MANAGEMENT | 6 | 4 | 100 | 25 | 75 |

COURSE OUTCOMES

On successful completion of the course, students will be able to:

6. Understand the concepts of fish farming and their associated conditioning factors and how they can be manipulated.
7. Describe basic culture methodologies, problems and solutions in aquaculture practice and farm management.
8. Design and apply improved seed production techniques.
9. Understand and validate the therapeutic and nutritional importance in fish health management.
10. Formulate and derive genetic improvement of fish stock.

Unit I: Aquaculture Basics & Farm Management

18 Hours

Aquaculture – Blue Revolution in India – Coastal & Freshwater Aquaculture – Site selection – Farm layout & Construction – Farm Engineering and equipments – Role of Aeration in culture system – Management of Culture ponds – Fertilization – #Predator & weed management# – Water and soil quality management.

Unit II: Aquaculture for Sustainability

18 Hours

Sewage fed fish culture – Sewage treatment – Sewage cum Fish culture in India – Monoculture, Polyculture, Monosex culture. Recent developments in Integrated fish farming – Animal husbandry cum Fish culture – Paddy cum Pisciculture- Fish culture in cages & pens – Race-way fish culture – #Culture of Air breathing fishes#.

Unit III: Seed Production Techniques

18 Hours

Brooder care management – Bund breeding- Hypophysation – In-vitro fertilization – Application of Synthetic Hormone- Transport of fish seed and brooders – Hatchery operations of Fin and Shell Fishes - Edible and Pearl Oysters – #Ornamental fish culture#.

Unit IV: Nutrition and Fish Health Management

18 Hours

Culture of fish feed organisms: Diatoms - Cladocerans – Rotifers – Artemia – Copepod. Artificial feed formulation and management- #Probiotics in formulated feed#.

Bacterial Gill Rot & Furunculosis ; EUS & Erythrocytic Necrosis (Viral) & Saprolegniasis & Erythroderma (Fungal diseases) - Nutritional deficiency diseases - Ectoparasites and Endoparasites - Principles of Fish Health Management- Fish vaccines and Antibiotics.

Unit V: Aquaculture Biotechnology and Economics

18 Hours

Genetic improvement of stock – Selective and diversified breeding – Hybridization – Transgenic fishes (Antifreeze & Green fluorescent proteins). Chromosomal manipulation- Ploidy in Fishes- Gynogenesis and Androgenesis in Fishes- Production of Monosex and Sterile fishes- #Cryopreservation of gametes#.

Aquaculture Economics – Fish Marketing and Preservation – Cold storage - Governmental involvement in enhancing fish production and marketing – Role of MPEDA, NIOT, CMFRI, CIBA, and NABARD.

#...# Self - Study portion

Text books:

1. Agarwal, S.C. A Hand Book of Fish Farming . Narendra Publishing House, New Delhi. 3rd Edition, 1994.
2. Chakrabarthy, M.N., Biology, Culture and Production of Indian major carps, Narendra Publishing House, New Delhi. 2nd Edition, 1998.

Books for Reference

1. Hall, C.B. Ponds and fish culture . Agrobotanical Publishers India. 1999.
2. Jhingran, V.G. Fish and fisheries of India, Hindustan Publishing Co., New Delhi. 1997.
3. Santhanam, R., Fisheries Science, Daya Publication House. New Delhi. 1990.
4. S.K. Gupta., P.K. Gupta., General and Applied Ichthyology (Fish and Fisheries). S. Chand & company LTD, Ram Nagar, New Delhi, 2006.
5. Aquaculture, N. Arumugam., Saras Publication, 114/35 G, A.R.P Camp road, Periyakavilai, Kottar P.O. Nagercoil, Kanyakumari Dist. Second edition- 2010.
6. Fish and Fisheries. Santosh Kumar and Manju Tembhare., New Central book Agency (P) LTD, London, 2010.

Web References

1. www.fishfarming.com › services › aquaculture-farm-m...
2. www.fao.org › FAO_Training › FAO_Training › Genera
3. www.en.wikipedia.org › wiki › Aquaculture
4. www.mpeda.gov.in

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Sem | Code | Title of the Paper | | | | | Hours | Credits | | | | |
|--|--------------------------|---------------------------------|-----|-----|-----|------------------------------------|-------|---------|------|------|--|--|
| III | 20PZO3DE3 B | AQUACULTURE AND FARM MANAGEMENT | | | | | 6 | 4 | | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | | |
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| CO2 | ✓ | ✓ | ✓ | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| CO4 | ✓ | ✓ | - | ✓ | ✓ | ✓ | ✓ | - | ✓ | ✓ | | |
| CO5 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| Number of Matches= 47, Relationship : HIGH | | | | | | | | | | | | |

Prepared By:

Dr. H.E. Syed Mohamed

Checked by:

Dr. I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Sem | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|-----|------------|-------------|--------------------------------|-------|---------|------------|----------------|----------------|
| IV | 20PZO4CC13 | CORE - XIII | GENERAL AND APPLIED ENTOMOLOGY | 6 | 5 | 100 | 25 | 75 |

Course Outcomes

On successful completion of the course, students will be able to:

1. Classify insects using morphological information.
2. Relate the structure and physiology of insect systems, including their functional mechanisms.
3. Discuss and evaluate the damages caused by insect pests on agriculture; report disease causing vectors and their control measures.
4. Analyse and apply the significance of insects in economy; examine the culture techniques.
5. Validate the various control methods employed in the successful management of insect pests.

Unit I: Insect Taxonomy and Morphology

18 Hours

Taxonomy: Basics of Insect classification. Salient features of the insect orders with common south Indian examples.

Morphology: General structure of the insect head, thorax and abdomen.

Head – segmentation, sutures and types of antennae. Wings – Venation; Legs – types and modifications. # Genitalia#.

Unit II: Insect Physiology

18 Hours

Structure and physiology of Integumentary, digestive, circulatory, excretory, respiratory, nervous, reproductive and endocrine systems.

Physiology: Integument – structure and chemistry – physiology of moulting.

Digestive system: Structure of alimentary canal and physiology of digestion.

Respiratory System: Aerial respiration – aquatic respiration – respiration in endoparasites.

Circulatory system: Structure of heart – Haemolymph – composition and mechanism of haemolymph circulation. #Haemocytes and their functions#.

Excretory system: Malpighian tubules – functions – Salt and Water balance – Detoxification.

Nervous system: Structure – neurotransmitters – Structure and function of Compound eyes – Stridulatory organ.

Reproductive system: Male and female reproductive systems – types of ovarioles – vitellogenesis – mating – oviposition – viviparity. #Accessory reproductive glands, their secretions and functions#.

Endocrine system: Endocrine control of moulting and metamorphosis – role of hormones in male and female reproduction. Neuroendocrine system of insects.

Unit III: Insects – Agricultural and Medical Entomology

18 Hours

Biology, damage caused and control methods of any FIVE insect pests of Paddy, Sugarcane, Cotton, Coconut, Ground nut and Brinjal. #Stored product pests and their control#

Arthropods as vectors - of human diseases - Biology, diseases caused and control methods of House fly, Mosquito, Flea and Louse. #Role of WHO in vector control#

UNIT IV: Economic Importance of Insects

18 Hours

Sericulture: Biology and culture methods – types of silkworm – silkworm diseases – economics and marketing.

Apiculture: Biology and types of honey bees – culture and rearing – bee colony – bee keeping accessories and their by products – Natural enemies and diseases and their management – Economics. #Uses of Honey#

Lac culture: Biology and rearing methods of Lac insect - Uses of Lac.

Unit V: Insect Pest Management

18 Hours

Pests – types – impacts on crops and human beings – Insect host plant relationship – mechanisms and genetic nature of resistance - Sampling methods – symptoms – remote sensing – trapping - Economic Injury Level (EIL) Management decision.

Natural and Artificial control of insect pests – Cultural, Mechanical, Physical and Legal methods. Biological control – Parasites, Predators and Microbial agents – Baculo virus, Bt cotton. Chemical methods – Pesticides – classification – types of formulations – mode of action – Non-conventional methods - Insect Growth Regulators (IGR), Repellents, Antifeedants, Pheromones and Chemosterilants - Integrated Pest Management (IPM) – Need for IPM and uses. #Goals and Strategies of IPM in Cotton – Biointensive IPM#.

#...# Self - Study portion

Text books:

1. Chapman, R.F. The Insects: Structure and Function, Hodder and Broughton Ltd., Kent, U.S.A., 2015.
2. Nalina Sundari, M.S., and R. Santhi, Entomology, MJP Publishers, Chennai. 2006.

Books for Reference:

1. Mani, M.S., General Entomology, Oxford and IBH publishing Co., New Delhi. 1982.
2. Snodgrass, R.E., Principles of Insect Morphology, McGraw Hill and Co., New York. 1985.
3. Nayar, K.K., Ananthakrishnan, T.N., and David., M., General and Applied Entomology, Tata McGraw Hill Pub. Co., Ltd., New York. 1995.
4. Vasantharaj David, B., Elements of Economic Entomology, Popular Book Depot., Chennai – 15. 2001.
5. Nayar, K.K. et al., Economic Entomology and Applied Entomology, Oxford and IBH Publishing Co., New Delhi. 1983.
6. Rathinaswamy, T.K., Medical Entomology, S. Viswanathan and Co., Madras, 1986.

Web Reference:

1. www.mheducation.co.in › ... › entomology
2. www.pdfdrive.com › general-and-applied-entomolog
3. www.pdfdrive.com › general-and-applied-entomology-.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Sem | Code | Title of the Paper | | | | | Hours | Credits | | | |
|--|--------------------------|--------------------------------|-----|-----|-----|------------------------------------|-------|---------|------|------|--|
| IV | 20PZO4CC13 | GENERAL AND APPLIED ENTOMOLOGY | | | | | 6 | 5 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | - | ✓ | - | ✓ | ✓ | ✓ | ✓ | - | ✓ | - | |
| CO2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | - | - | ✓ | - | |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | - | ✓ | |
| CO4 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO5 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Number of Matches= 42, Relationship : HIGH | | | | | | | | | | | |

Prepared By:

Dr. Mohamed Shamsudin

Checked by:

Dr. I. Jopesh A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|----------|-------------|-----------|---------------------|-------|---------|------------|----------------|----------------|
| IV | 20PZO4CC14R | CORE -XIV | MICROBIOLOGY | 6 | 5 | 75 | 25 | 100 |

(for the students admitted in the academic year 2021-22 and onwards)

Course Outcomes

At the end of the course, Students will be able to,

1. Understand the basic microbial structure of bacteria and Virus, Demonstrate theoretical skills in Culture media, sterilization, Bacterial Culture and staining techniques.
2. Analyse the role of microorganisms in fermented foods and know the spoilage mechanisms in foods, thus identify methods to control deterioration and basis of food safety regulations.
3. Evaluate microbiological role in the manufacture of industrial products; understand the designing of bioreactors.
4. Examine the basic principles of environment microbiology to solve environmental problems.
5. Apply the basic principles, mechanism of transmission, diagnose and control of infectious diseases.

UNIT I: Introduction to Microbes

18 hours

History and Scope of Microbiology – Classification of Microorganisms - Morphological shapes of bacteria. and viruses, Bacterial growth: Growth curve, Factors affecting bacterial growth, Measurement of bacterial growth- Microbial culture – Types of Culture media – Method of Culturing Bacteria- Isolation and Purification Techniques - sterilization techniques – Safe Disposal in Microbial cultures waste- Safety precautions of Microbiology laboratory.# Differentiation of Gram positive and Gram negative bacterial cell walls# - Classification of Viruses – Morphology and structure.

UNIT II: Food Microbiology

18 hours

Normal Microbial flora of common food– food infection - food poisoning– food preservation – Microbiology of fermented food Milk and Egg- Bakery Products– Detection of food borne pathogens – Food Sanitation –Food control agencies and their regulations - Enumeration of bacteria in water- ISI and BIS Regulations for packaged drinking water.# Food spoilage#

UNIT III: Industrial Microbiology

18 hours

Microorganisms for Industrial Microbiology - Major products of Industrial Microbiology: Ethanol, Antibiotics - Vitamin-B12 – Industrial Applications of Microbial Enzymes – Bioreactors and Types -Biopolymers – Biosurfactants –Types of Biofuels - Biodiesel Production and Spirulina as Single Cell Protein.#Organic acids (Citric acid and Glutamic acid)#

UNIT IV: Agriculture and Environmental Microbiology

18 hours

Interaction between soil microbes and Plant - Biofertilizers: symbiotic and asymbiotic bacteria – Inoculum Preparation & Formulation of Biopesticides - Phytopathology - Bioleaching of metals - Biodegradation using microbial communities — Xenobiotics and Heavy metals degradation in water and soil - Biodeterioration - Microbiology of air - risks and control - Waste as a resource – Biocomposting - Sewage Treatment – Biogas Production #organic compost#.

UNIT V: Medical Microbiology

18 hours

Microbial diseases - Causative agents, Mode of transmission, Symptoms, Prevention & Control - Protozoan diseases: Plasmodium, Entamoeba. Fungal diseases: Mycosis - Mycotoxicosis. Bacterial diseases: Tuberculosis (TB) – Leprosy – Tetanus – Typhoid - Gonorrhoea and Syphilis. Viral diseases: Polio – Chicken pox - Hepatitis B – AIDS, Corona, Chikungunya, Dengue, Nipah, Ebola, Swine flu #Rabies# - Vaccination.

#....# Self-Study portion

Text Books:

1. Pelczar, Chan and Krieg. Microbiology, Tata McGraw Hill Pub.Co. Ltd. 1993.

Books for Reference:

1. Sulia, S.B & Santhanam, S. General Microbiology, Oxford and IBH. 2001.
2. Thomas, C.G.A. Medical Microbiology, ELBS Publications. 1988.
3. Powar, C.B. and Diginawala. H. F. General Microbiology - Vol. I & II. Himalaya Publishing House, Bombay. 1987.
4. Sharma, P.D. Microbiology - Rastogi Publications, Meerut. 1993.
5. Ananthanarayanan, R and Jayaram Panicker, C.K. Text Book of Microbiology, Orient Longman, Chennai and Hyderabad. 2000.
6. Dubey R.C and Maheswari D.K. Text book of Microbiology, S.Chand and Company Ltd, New Delhi. 2009.

Web reference:

1. <https://www.moscomm.org/pdf/Ananthanarayan%20microbio.pdf>
2. http://www.grsmu.by/files/file/university/cafedry/microbiologii-virysologii-immunologii/files/essential_microbiology.pdf
3. <https://open.oregonstate.edu/education/microbiology/>
4. http://textbookofbacteriology.net/kt_toc.html
5. http://www.freebookcentre.net/medical_text_books_journals/microbiology_ebooks_online_text_download.html
7. [https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_\(Kaiser\)](https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_(Kaiser))
8. <https://www.pdfdrive.com/medical-microbiology-d18737002.html>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

| Semester | Code | Title of the Paper | | | | | Hours | Credits | | | |
|--|--------------------------|--------------------|-----|-----|-----|------------------------------------|-------|---------|------|------|--|
| IV | 20PZO4CC14R | MICROBIOLOGY | | | | | 6 | 5 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | √ | √ | √ | √ | √ | √ | √ | | √ | √ | |
| CO2 | √ | √ | √ | √ | √ | √ | | √ | √ | | |
| CO3 | √ | √ | √ | √ | √ | | √ | | √ | √ | |
| CO4 | √ | | √ | √ | √ | √ | √ | √ | | √ | |
| CO5 | | √ | √ | | √ | √ | √ | √ | √ | √ | |
| Number of Matches= 41, Relationship : High | | | | | | | | | | | |

Prepared by:

Dr. R. Krishnamoorthy

Checked by:

Dr. I. Antony Joseph Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Sem | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|-----|-------------|-------------|--|-------|---------|------------|----------------|----------------|
| IV | 20PZO4CC15P | Course – XV | Practical- IV General and Applied Entomology and Microbiology- | 6 | 5 | 100 | 20 | 80 |

COURSE OUTCOMES

On successful completion of the course, students will be able to:

1. Understand the classification and identification of insects based on morphology.
2. Analyse the behaviour, importance and physiology of insects.
3. Acquire knowledge on the impact of pests and the damages caused. Evaluate the importance of beneficial insects.
4. Describe and demonstrate the different techniques in microbiology.
5. Apply the knowledge on preparation of microbial media and bacterial staining; determine the motility, antibiotic sensitivity of Bacteria.

GENERAL AND APPLIED ENTOMOLOGY

I. Collection and Identification of Insects, their parts and stages

1. Collection and preservation of insects.
2. Identification of insects belonging to important orders and super families using Dichotomous key.
3. Identification of beneficial insects, predators and parasites (relevant to biological Control).
4. Identification of harmful insects (two examples for each of the plants mentioned in theory).
5. Identification of household pests and Vectors
6. Study of types of larvae and pupae.
7. Study of types of antennae, legs, wing, mouth parts and external genitalia.

II. Mounting and Dissections

1. Mounting of mouth parts of bedbug, mosquito, honey bee and house fly
2. Dissections of digestive system, nervous system and reproductive systems of Grasshopper, Chrysocoris, Mylabris, House fly, Silk worm moth and Honey bee.
3. Dissection of Neuroendocrine system of cockroach.
4. Dissection of silk gland of silk worm.

III. Experiments

1. Estimation of Insects respiratory rate using respirometer.
2. Experiment on the role of cuticular lipids in preventing transpiration.
3. Experiment on the functioning of Malpighian tubules (in vitro study)
4. Insect haemolymph – Total and Differential counts of haemocytes.

MICROBIOLOGY

I. Culture Techniques

- Sterilization techniques
- Preparation of culture media
- Observation of Bacterial Motility – Hanging Drop Preparation
- Pure culture techniques
- Staining methods: Simple, Negative, acid fast, Gram staining, spore staining.
- Antibiotic Sensitivity Test - Kirby Bauer Diffusion Method
- Most Probable Number Test (MPN)

II. Equipments in Microbiology

- Inoculation loop
- Autoclave
- Laminar flow hood
- Bacteriological Incubator
- Hot Air Oven
- Colony Counter

Field visits

Visits to Sericulture units, Crop research stations, Farms and IPM Centers to have a first hand knowledge on culture techniques and problems.

Record work

A record of laboratory work and submission of photograph of insects (including insects of economic importance) shall be made for the practical examination.

Text book:

1. Dunston P. Ambrose. The Insects: Beneficial and Harmful aspects, Kalyani Publishers. New Delhi. 2007.
2. Dubey, R.C. and D.K. Maheshwari. Practical Microbiology. S. Chand & Company Ltd. New Delhi. 2010.

Books for Reference:

2. Chapman, R.F. The insects: Structure and Function, Hodder and Broughton Ltd., Kent, U.S.A., 2015.
3. Nalina Sundari, M.S., and R. Santhi, Entomology, MJP Publishers, Chennai. 2006.
4. Sulaiman Alnaimat, . Saqer AbuShattal, Laboratory Manual in General Microbiology, 2012.

Web reference:

1. https://wiki.bugwood.org/Collecting_insects
2. www.biologydiscussion.com > culture-organism > obtain
3. <https://bio.libretext.org/microbiology>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | Title of the Paper | | | | | Hours | Credits | | | |
|--|--------------------------|--|-----|-----|-----|------------------------------------|-------|---------|------|------|--|
| IV | 20PZO4CC15P | Practical-IV General and Applied Entomology and Microbiology | | | | | 6 | 5 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | √ | √ | √ | √ | √ | √ | √ | √ | | √ | |
| CO2 | | √ | | √ | √ | √ | | √ | √ | | |
| CO3 | √ | | √ | √ | √ | | | | √ | √ | |
| CO4 | √ | √ | √ | | | √ | √ | √ | √ | | |
| CO5 | √ | √ | √ | √ | √ | √ | | √ | √ | √ | |
| Number of Matches= 37, Relationship : High | | | | | | | | | | | |

Prepared By:
Dr. S. Mohamed Hussain

Checked by:
Dr. I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|----------|-------------|----------|---|-------|---------|------------|----------------|----------------|
| IV | 20PZ04DE4AR | DSE - IV | RESEARCH METHODOLOGY AND BIOINSTRUMENTATION | 6 | 4 | 100 | 25 | 75 |

(for the students admitted in the academic year 2021-22 and onwards)

Course Outcomes

On successful completion of the course, students will be able to:

1. Take up research program independently, design the experiment and execute
2. Document the thesis for evaluation and publish it as research communication
3. Rear and culture experimental tool organisms as model organisms for research work
4. Decide and separate the subcellular component and proceed further with analytical work
5. Apply and execute histochemical and histological methods

UNIT I: Research and Designing

18 hours

Research – Objectives – Types, Importance and Processes – Literature search relevant articles - Use of Internet in Literature search - Identification and selection of Research Problem – Experimental design – #Planning and Execution of research# – Indoor and outdoor experiments – Interpretation of research results by statistical test.

UNIT II: Thesis writing and journal publication

18 hours

Components of thesis and Writing of thesis - Preparation of scientific research papers - Publication of research documents – Journal types - Abstracts, Research articles, Review articles , short communications, Patent journals – Patents and patent publication – Drafting of patent documents – #Seminars , Conference and Symposia#.

UNIT III: Rearing and Culture of Model Organisms:

18 hours

Experiment Model organism - selection of model Animals and microorganisms – Rearing in animals in animal house, labs or outdoor units – Food and feeds - #culture and maintenance#. Exposure to experimental conditions (Physical and Chemical) - CPCSEA regulations.

UNIT IV: Separation Techniques and bioinstrumentation.

18 hours

Separation of sub cellular components, protein molecules, Enzymes, Lipid molecules, Nucleic acids, polysaccharides, Vitamins, Aminoacids and Antibiotics. #Spectrophotometers#, Chromatographic instruments, Electrophoretic instruments, Centrifuges, Radiation counter (Gamma),

UNIT V: Microtechnique and Microscopy

18 hours

Microtechnique: Preparation of organism or tissue samples - Permanent mounting – fixing – washing – Tissue processing – Staining – mounting – Labeling. Histochemistry – Carbohydrate, Protein, Lipid and Nucleic acids. Microscopy: #Light microscopes# and Electron microscopes (SEM and TEM) – Histological preparation of tissues for SEM and TEM.
#...# Self - Study portion

Text Books:

1. Palanichamy, S. and M. Shunmugavelu,. Research Methodology in Biological sciences. Palani Paramount publications, Palani. 1997.
2. Grumani, N. Research Methodology for Biological Sciences. MJP Publishers, Chennai.. 2006.

Books for Reference:

1. Anderson, D. P. Thesis and Assignment Writing, Wiley Eastern Limited 1970.
3. Pelczar, M.J. and R.D. Reid.. Microbiology. Tata Mc GrawHill, NewDelhi. 1996
4. De Robertis, E.D.P. and De Robertis, E.M.F. Cell and Molecular Biology. 8th Edition, B.I. Waverly Pvt. Lid., New Delhi. 1995.
5. Das, H.K (Editor). Text book of Biotechnology. Wiley dreamtech India Pvt Ltd., New Delhi, 2005.
6. Daniel, W.W. Biostatistics – A foundation for analysis in the Health sciences. John Wiley and Sons, NewYork, 2000.
7. Gupta, P.K. Biotechnology and Genomics (I Edition) Rastogi Publications, Meerut, 2004.
8. Dubey, R.C and Maheshwari, D.K. A text book of microbiology. S.Chand & Co Ltd., New Delhi. 1999.

Web Reference:

1. <https://gradcoach.com/what-is-research-methodology/>
2. <https://www.sciencedirect.com/topics/engineering/bioinstrumentation>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | Title of the Paper | | | | | Hours | Credits | | | | |
|--|--------------------------|---|-----|-----|-----|------------------------------------|-------|---------|------|------|--|--|
| IV | 20PZ04DE4AR | RESEARCH METHODOLOGY AND BIOINSTRUMENTATION | | | | | 6 | 4 | | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | | |
| CO1 | √ | | √ | √ | √ | √ | √ | √ | √ | √ | | |
| CO2 | √ | √ | √ | √ | √ | √ | √ | | √ | √ | | |
| CO3 | | √ | √ | √ | √ | √ | | √ | √ | √ | | |
| CO4 | √ | √ | | √ | √ | √ | | | √ | √ | | |
| CO5 | √ | √ | √ | √ | √ | √ | √ | √ | | √ | | |
| Number of Matches= 38 ,Relationship : High | | | | | | | | | | | | |

Prepared By:

Dr. I. Joseph A. Jerald

Checked by:

Prof. S.N. Shaik Umar Sahith

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Sem | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|-----|-------------|----------|-------------------------|-------|---------|------------|----------------|----------------|
| IV | 20PZO4DE4 B | DSE – IV | CLINICAL LAB TECHNOLOGY | 6 | 4 | 100 | 25 | 75 |

Course outcomes:

On successful completion of the course, students will be able to:

1. Examine the essential pre-requisites of clinical laboratory; describe safe disposal of medical wastes.
2. Describe the principle and working mechanism of laboratory instruments.
3. Demonstrate staining procedure, media preparation for bacterial culture; understand diagnostic techniques of pathogens.
4. Evaluate clinical assay and estimate blood and urine parameters.
5. Analyse Sputum & CSF; report microscopic examination of sperm; verify pregnancy; demonstrate & schedule histopathology.

UNIT I: Essential Pre-Requisites of a Clinical Laboratory 18 Hours

Introduction – scope of the subject CLT – collection of specimens and preservation - records and report preparation and maintenance – cleaning, maintenance and care of glassware – sterilizations - physical and chemical methods – Disposal of specimen and infected materials – safety precautions in the laboratory – #First aid treatments#.

UNIT II: Laboratory Instruments 18 Hours

Light microscope: parts and working – Centrifuge – Weighing balance – Colorimeter – Spectrometer, Incubator -. Haemocytometer – #Albuminometer# – Urinometer – Sahlis Haemoglobinometer

UNIT III: Clinical Microbiology 18 Hours

Bacteria – structure and types – staining procedures – culture media and antibiotic sensitivity test. Sexually transmitted diseases: Syphilis, Gonorrhoea, chancroid or soft sore, Donovanosis, Genital candidiasis, Non-gonococcal urethritis, Corynebacterium vaginale and herpes genitalis, #Lymphogranuloma venereum#, Trichomoniasis.

UNIT IV: Haematological and Urine analysis 18 Hours

BLOOD: Collection of blood (Venous and Capillary) – Plasma and serum for analysis – Total RBC count – Total leucocytes count - differential count – Haemoglobin estimation (Sahlis methods) ESR (Wintrobe and Westgren methods) – Bleeding and clotting time – Estimation of packed cell volume – Blood grouping and cross matching (Slide and Tube methods) - Anti – D (Rho) test (slide, rapid tube and Du test).

URINE : Collection, preservation, routine examinations – protein – glucose – acetone – bile salts – bile pigments – urobilin – urobilinogen – microscopical examination of urine FAECES: Microscopical examination – #intestinal parasites# – helminthes, nematodes, cestodes, trematodes, protozoa.

UNIT V: Sputum & CSF analysis and Histopathology**18 Hours**

SPUTUM: Collection – microscopical and naked eye inspection – clinical examination.
 CEREBROSPINAL FLUID: Composition – CSF cells total and differential count - estimation of protein – sugar chloride. SPERM: collection of semen – microscopic examination – smear and count.
 PREGNANCY TESTS - #Male frog test – Gravindex test# HISTOPATHOLOGY – Microtechnique – tissue preparation – fixation – dehydration – embedding , sectioning, staining and mounting

#...# Self-study portion

Reference book:

1. Samuel, K.M. (1992) Notes on Clinical Lab Techniques (IV Edition). Publishers: M.K.G. Iyyer & Sons, Madras

Web Reference:

1. www.en.wikipedia.org › wiki › Medical_laboratory
2. www.who.int › publications › manual_health_lab_tech
3. www.naco.gov.in › sites › default › files › Lab Tech Fa...

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | | Title of the Paper | | | Hours | Credits | | | |
|--|--------------------------|-----|-------------------------|-----|-----|------------------------------------|---------|------|------|------|
| IV | 20PZO4DE4 B | | CLINICAL LAB TECHNOLOGY | | | 6 | 4 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
| CO1 | √ | | √ | √ | √ | √ | √ | √ | √ | √ |
| CO2 | √ | √ | √ | √ | √ | √ | √ | | √ | √ |
| CO3 | √ | √ | | √ | √ | √ | √ | √ | √ | |
| CO4 | √ | √ | √ | √ | √ | √ | | | √ | √ |
| CO5 | | √ | √ | √ | √ | √ | √ | √ | | √ |
| Number of Matches= 38, Relationship : High | | | | | | | | | | |

Prepared By:

Dr. M. Aneez Mohamed

Checked by:

Dr. I. Joseph A. Jerald

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |

| Sem | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|-----|-----------|------------------------|--------------------------------|-------|---------|------------|----------------|----------------|
| IV | 20PZO4EC2 | EXTRA CREDIT COURSE II | ZOOLOGY FOR CAREER EXAMINATION | - | 5 | 100 | 0 | 100 |

Course Outcomes

On successful completion of the course, students will be able to:

1. Acquire knowledge on classification of Invertebrata upto phyla with the salient features and examples. Identify the general characters of chordate and classify vertebrata upto classes with examples. Examine the different systems in cockroach and frog.
2. Record the physiology of digestion, absorption, respiration and excretion. Discuss the composition and functions of blood. Explain the types of muscles, nerve impulse conduction and physiology of vision. Record the functions of pituitary and reproductive system.
3. Appraise the concepts of gene, gene regulation and genetic code. Detect the use of stem cells in human welfare. Illustrate Mendalian laws, Linkage, Pedigree and Mutations. Distinguish the Theories of Evolution and Speciation.
4. Observe and explain the structure and function of Cells and its inclusions. Investigate cell division and Chromosome types. Create and design nucleic acid topology, DNA replication, transcription and translation.
5. Validate the use of Apiculture, Sericulture, Carp, Prawn and Vermiculture. Investigate and Examine the major infections and communicable diseases. Record the pests of sugarcane, rice and oil seeds. Define Transgenesis.

UNIT I : Invertebrates and Chordates

Classification of Invertebrate up to phyla with diagnostic features and examples. Cockroach : External morphology, mouth parts, digestive system, respiratory system, circulatory system, nervous system and reproductive system.

General characters of Chordates - Classification of vertebrata upto classes with suitable examples. Frog: External features, digestive system, respiratory system, circulatory system, nervous system and urino-genital system.

UNIT II: Animal Physiology

Physiology of digestion and absorption, respiration, transport of oxygen and carbon-dioxide, structure of kidney and nephron, urine formation in man. Composition and functions of blood of man - Types of muscle - Structure of neuron - Nerve impulse conduction. Physiology of vision in man. Functions of Pituitary and Islets of Langerhans. Human Reproductive Systems – Menstrual cycle.

UNIT III: Genetics

Stem cells: Sources, types and their use in human welfare. Modern concept of gene, split gene, genetic regulation, genetic code. Mendel's laws of inheritance, recombination, linkage, multiple alleles, genetics of

blood groups, pedigree analysis, hereditary diseases in man. Mutations and mutagenesis. Theories of evolution; Natural selection, role of mutation in evolution, evolutionary patterns; molecular drive, mimicry, variation, isolation and speciation.

UNIT IV: Cell Biology

Structure and function of cell and its organelles (Nucleus, Plasma membrane, Mitochondria, Golgi bodies, Endoplasmic reticulum, Ribosomes and Lysosomes). Cell division (mitosis and meiosis), mitotic spindle and mitotic apparatus, Chromosome movement, Chromosome type: polytene and lampbrush, organization of chromatin, heterochromatin, cell cycle regulation.

Nucleic acid topology, DNA motif, DNA replication, transcription, RNA processing, translation, protein foldings and transport.

UNIT V: Applied Zoology

Apiculture, sericulture, lac culture, carp culture, pearl culture, prawn culture, vermiculture. Major infectious and communicable diseases (malaria, filaria, tuberculosis, cholera and AIDS) their vectors, pathogens and prevention. Pests of sugar cane (two each), oil seed and rice .Transgenesis.

Text Books:

1. Tomer & Bhatnager, Text books of Applied Zoology. Emkay publication, Delhi. 2000.
2. Kent. G.C. Comparative Anatomy of the Vertebrates, McGraw Hill Book Co., Inc., New York. 1976.

Books for Reference:

1. Barrington, E.J.W. Invertebrate Structure and Function, II Ed., ELBS and Nelson. 1979.
2. R. Nagabhushanam, M.S. Kodarkar, R. Sarojini, Textbook of Animal Physiology. Second Edition, Oxford & IBH Publishing CO. PVT. LTD. 2002
3. M.W. Strickberger, Genetics, Third Edition, Third Edition, Prentice-Hall of India Private Limited, 2004.
4. De Robertis, E.D. P. and De Robertis, E.M.F. Cell and Molecular Biology, VIII Ed. Lea and Febiger, Philadelphia. 1987.

Web Reference:

1. <https://www.ck12.org/biology/invertebrate-classification/lesson/Invertebrate-Classification-Advanced-BIO-ADV/>
2. <https://www.innerbody.com/image/digeov.html>
3. <https://www.britannica.com/science/biology/The-theory-of-evolution>
4. <https://microbenotes.com/cell-organelles/>
5. https://www.who.int/topics/infectious_diseases/en/

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

| Sem | Code | Title of the Paper | | | | | Hours | Credits | | | |
|--|--------------------------|--------------------------------|-----|-----|-----|------------------------------------|-------|---------|------|------|--|
| IV | 20PZ04EC2 | ZOOLOGY FOR CAREER EXAMINATION | | | | | -- | 5 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | √ | | √ | √ | √ | √ | √ | √ | √ | √ | |
| CO2 | √ | √ | √ | √ | √ | √ | √ | | √ | √ | |
| CO3 | | √ | √ | | √ | √ | | √ | √ | √ | |
| CO4 | √ | √ | | √ | √ | √ | | | √ | √ | |
| CO5 | | √ | √ | √ | √ | √ | √ | √ | | √ | |
| Number of Matches= 36, Relationship : High | | | | | | | | | | | |

Prepared By:

Dr. I. Joseph A. Jerald

Checked by:

Dr. M. Aneez Mohamed

Note:

| | | | | | |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very poor | Poor | Moderate | High | Very high |