Re-Accredited by NAAC with 'A' Grade
VEER NARMAD SOUTH GUJARAT UNIVERSITY
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વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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–: પરિપત્ર :–

વિજ્ઞાન વિદ્યાશાખા હેઠળની સંલગ્ન પ્રાણીશાસ્ત્ર વિષયની તમામ અનુસ્નાતક કોલેજોનાં આચાર્યશ્રીઓ તથા ડિપાર્ટમેન્ટનાં વડાશ્રીને જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૨–૨૩ થી અમલમાં આવનાર M.Sc. Sem-1 પ્રાણીશાસ્ત્ર વિષયનો પ્રાણીશાસ્ત્ર વિષયની અભ્યાસ સમિતિનાં ચેરમેનશ્રીએ તૈયાર કરેલ અભ્યાસક્રમ બોર્ડ વતી ચેરમેનશ્રીએ અને વિજ્ઞાન વિદ્યાશાખાનાં ડીનશ્રીએ વિદ્યાશાખાની મંજૂરીની અપેક્ષાએ વિજ્ઞાન વિદ્યાશાખા વતી મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલ તા.૦૨/૦૬/૨૦૨૨ ની સભાનાં ઠરાવ ક્રમાંકઃ૦૫ થી સ્વીકારી મંજૂર કરેલ છે. જેની આથી જાણ કરવામાં આવે છે.

એકેડેમિક કાઉન્સિલની તા.૦૨/૦૬/૨૦૨૨ની ઠરાવ ક્રમાંકઃ ૦૫

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૨૨–૨૩ થી અમલમાં આવનાર M.Sc. Zoology વિષયનો સેમે. –૧ નો અભ્યાસક્રમ પ્રાણીશાસ્ત્ર વિષયની અભ્યાસ સમિતિનાં ચેરમેનશ્રીએ તૈયાર કરેલ અભ્યાસક્રમ બોર્ડ વતી ચેરમેનશ્રીએ અને વિજ્ઞાન વિદ્યાશાખાનાં ડીનશ્રીએ વિદ્યાશાખાની મંજૂરીની અપેક્ષાએ વિજ્ઞાન વિદ્યાશાખા વતી મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ સ્વીકારી M.Sc. Zoology વિષયનો સેમે. –૧ નો અભ્યાસક્રમ મંજુર કરવામાં આવે છે.

(બિડાણઃ ઉપર મુજબ)

ક્રમાંક : એસ./પ્રાણીશાસ્ત્ર/પરિપત્ર/૧૧૨૦૫/૨૦૨૨
તા.૦૪–૦૬–૨૦૨૨

ઈ.ચા. કુલસચિવ

પ્રતિ,
૧) વિજ્ઞાન વિદ્યાશાખા હેઠળની સંલગ્ન પ્રાણીશાસ્ત્ર વિષયની તમામ અનુસ્નાતક કોલેજોનાં આચાર્યશ્રીઓ. તથા ડિપાર્ટમેન્ટનાં વડાશ્રી.
.....આપશ્રીની કોલેજ/વિભાગના સંબંધિત શિક્ષકોને જાણ કરી અમલ કરવા સારૂ.

૨) અધ્યક્ષશ્રી, વિજ્ઞાન વિદ્યાશાખા.
૩) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.
.....તરફ જાણ તેમજ અમલ સારૂ.

VEER NARMAD SOUTH GUJARAT UNIVERSITY

NEP

M.Sc. Zoology Syllabus Semester I

Credit Based and Grading System

To be implemented from the Academic year 2022-2023

ZOO - 1001: BIOLOGY OF NON-CHORDATES 60 Hrs

Unit 1: **15 Hrs**

a) Non-chordata - classification with diagnostic features up to class level.

b) Origin of metazoa

c) Origin and Organization of Coelom: Acoelomates, pseudo coelomates and coelomates

Unit 2: **15 Hrs**

a) Locomotion: Amoeboid, Flageller and Ciliary movement in protozoa. Hydrostatic movements in Coelenterata. Mollusca and Echinodermata

b) Nutrition and Digestion: Patterns of Feeding and digestion in lower Metazoa, Mollusca, Echinodermata, Filter feeding in polychaeta, Mollusca and Echinodermata

Unit 3: **15 Hrs**

a) Respiration and Excretion: Organs of respiration: Gills, lungs and trachea. Respiratory pigments. Mechanism of respiration. Excretion in lower invertebrates. Excretion in higher invertebrates. Mechanism of Osmoregulation.

b) Nervous System: Primitive Nervous systems:-Coelentrata and Echinodermata. Advanced nervous system - Annelida, Arthropoda (Crustacea and Insecta) and Mollusca (Cephalopoda). Sense organs and their importance

Unit 4: **15 Hrs**

a) Invertebrate larvae: Invertebrate larval forms and their evolutionary significance. Trematoda and Cestoda. Larval forms of Crustacea, Mollusca and Echinodermata.

b) Minor Phyla: Structure affinities and life history of the following minor Phyla-Rotifera, Entoprocta, Phoronida and Ectoprocta

Bibliography

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6. Russel-Hunter, W.D. A biology of higher invertbrates, the Macmillan Co. Ltd., London.
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9. Parker, T.J., Haswell W.A. Text book of Zoology, Macmillan Co., London.

ZOO - 1002: BIOCHEMISTRY AND IMMUNOLOGY 60 Hrs

Unit 1: pH and Buffers: **15 Hrs**

a) Properties of water, law of mass of action, pH, dissociation of water and its ion product

b) Buffers- formulation and significance of buffers, biological buffers.

Unit 2: Biomolecules and Metabolism: **15 Hrs**

a) Carbohydrates: Classification, properties and significance. Derived sugars Metabolism of carbohydrates: Glycolysis, TCA cycle, HMP shunt and their energetic pathways. Glyoxylate cycle, uronic acid pathway. mitochondrial ATP synthesis.

Glycogen metabolism - Gluconeogenesis, Glycogenesis, Glycogenolysis, and regulation of glycogen metabolism.

b) Lipids: Classification, properties and significance, phospholipids, sphingolipids, glycolipids, steroids & Oxidation of fatty acids & energetic, ketogenesis & its implications

c) Proteins: Amino acids - Classification, properties and significance, Proteins- Classification, structure, properties and significance Transamination, deamination and decarboxylation.

Unit 3: Immunbiology: **15 Hrs**

a) Introduction to immune system- organs, tissue and cells of immune system
b) Types of Immunity (Innate and Acquired)
c) Antigens, haptens physical chemical characteristics.

Unit 4: Immunoglobulin: **15 Hrs**

a) Non-specific Host resistance and Chemical mediators
b) Antigen-antibody structure, isotypes and biological function interaction and
c) Immunodiagnostics, hypersensitivity- types of hypersensitivity and Autoimmune diseases- mechanism of auto immunity.

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ZOO - 1003: CELL AND MOLECULAR BIOLOGY 60 Hrs

Unit I: **15 Hrs**

Molecular Architecture of Eukaryotic cell and their environment:

a) Biomemebranes – Composition, Structure, Fluid mosaic model b) Basic functions – Permiability, Osmotic principles, Carrier protein, Channel proteins, Passive transport, Active transport, Na+/K+ Pump, Pinocytosis, Phagocytosis.

Cells and their environment :

a) Cell- matrix adhesion – Collagen, Proteoglycan, Fibronectin, Laminins, Integrins, Extra cellular matrix b) Cell-cell adhesion - Cadherins, Desmosomes, Gap junction.

Unit II:

Molecular mechanisms of cell division and Special chromosomes: **15 Hrs**

a) Ultrastructure and organization of – Centrosome, centromere and Kinetochore b)Microtubule and their dynamic instability c) Microtubule associated proteins, d)Metaphase and Anaphase movements e) Cytokinesis.

Special Chromosomes :

(a) Polytene chromosome- Structural organization and significance b) Lampbrush chromosomes- Structural organization and significance c) Supernumerary chromosomes

Sex determination: a) Sex chromosomes b) Chromosomal basis of sex determination.

Heterochromatin:a)Types and Function.

Unit III: **15 Hrs**

Recombinant DNA Technology: a) Tools of Recombinant DNA Technology- Restriction enzymes, cloning vectors, Plasmids, Phages, Viruses b) Methods of Introduction - Tranformation, Transduction, Transfection, Electroporation, Biolistics, microinjection, liposome fusion b) Applications of Recombinant DNA Technology and Transgenic animals.

Unit IV: **15 Hrs**

Molecular cytogenetic techniques: a) Banding – C, G, R and Fluorescence b) Autoradiography c) *Insitu* hybridization – FISH, Chromosome painting.

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E. G. – ZOO – 1004 - INDUSTRIAL FISHERY

OR

E. G. – ZOO – 1004 – MICROBIOME

'Industrial Fishery' the main focus is given on the applied aspects of fishery. This may develop a platform to produce successful fishery entrepreneurs. Keeping this in the mind, so that the learners develop skills and gain relevant knowledge to prepare various fishery products. Visit to fish processing industry, export unit and marketing surveys can be conducted to get first-hand information on packaging and marketing aspects of fish products and by-products. Assignment based on case studies of fish entrepreneurs, various agribusiness models and feasibility report can be given to develop entrepreneurial skills of the learners.

E. G. – ZOO – 1004
INDUSTRIAL FISHERY

Unit 1: Value added Products **15 Hrs**

Objective

To familiarize the learners about the entrepreneur of value added products from the fin fish and shell fish.

Desired Outcome

- The learners will get knowledge of value added preparation and will start its own Business.

- ✓ Dry, salted and smoked products
- ✓ Fish / Prawn Pickle
- ✓ Fish Chakli and Wafers
- ✓ Artificial products / Crabs streaks
- ✓ RTE products
- ✓ Fish Kabab
- ✓ Fish cuttlet
- ✓ Fish Amoti
- ✓ Fish Rumani
- ✓ Fish fillets

Unit 2: Fish, Shell fish and Seaweed Products and By-products **15 Hrs**

Objective

To provide information on various fish products and by-products, utilization of fishery wastes and their nutritional value.

Desired Outcome

The learner will develop the competence for making fish by products leading to Self - employment.

2.1 By-products

- ✓ Fish meal
- ✓ Fish oil
- ✓ Fish protein concentrate
- ✓ Functional fish protein concentrates
- ✓ Isinglass
- ✓ Shark leather
- ✓ Fish glue
- ✓ Fish gelatin
- ✓ Pearl essence
- ✓ Shark fin soup

2.2 Fermented fish products

- ✓ Fish-Shrimp sauces and pastes
- ✓ Philippine Bagoong
- ✓ Malaysian Budu
- ✓ Fish silage
- ✓ Fish Protein Hydrolysate

2.3 Products from marine invertebrates shell waste

- ✓ Chitin
- ✓ Chitosan
- ✓ Glucosamine hydrochloride
- ✓ Astaxanthine
- ✓ Calcium Supplements from shell

2.4 Seaweed products

- ✓ Alginates
- ✓ Agar agar
- ✓ Agarose
- ✓ Carageenan

Unit 3: Packaging Methods for Fish Products and By-products 15 Hrs

Objective

- To impart comprehensive overview of the scientific and technical aspects of food packaging.

Desired Outcome

- The learner will be equipped with the knowledge on packaging machinery, systems, testing and regulations of packaging, thus helping in job placement in fish processing / export unit.

3.1 Food packaging

- ✓ Purposes of food packaging
- ✓ Technological aspects of packaging of fishery products
- ✓ Packing of fresh and frozen fish for consumers
- ✓ Packaging for transport, shipping and institutional supplies
- ✓ Packaging standards for domestic and international trade

3.2 Packaging materials

- ✓ Basic films and laminates, their manufacture and identification
- ✓ Resistance of packaging materials
- ✓ Development of protective packaging for fishery products

3.3 Modified atmosphere packaging

- ✓ Controlled packaging and aseptic packaging
- ✓ Flexible packing, retort pouch processing of fish and fishery products principles and techniques

3.4 Labelling and printing of packaging materials.

- ✓ Labeling requirements – national and international, legislation on labeling
- ✓ Labeling for product traceability
- ✓ Type of labeling for organic foods, specific foods like organic foods, GM foods, irradiated foods, vegetarian and non-vegetarian foods. Label design specification – size, colour

3.5 Biodegradable plastics, Edible packaging and Bio-composites

3.6 Environmental Concerns: Recycling and Disposal of Plastic waste

3.7 Paper and Paper-based materials, Corrugated Fiber Board box (CFB)

Unit 4: Entrepreneurship and Marketing **15 Hrs**

Objective

To familiarize the students with the basic concepts of Entrepreneurship and marketing as applied to fishery industries.

Desired Outcome

The learner will understand and apply the entrepreneurship and marketing skills and become a successful entrepreneur.

4.1 Role of Government and other organizations in promoting entrepreneurship

- ✓ Government schemes and incentives for Small and Medium enterprises (SMEs)
- ✓ Small Scale Industries (SSIs), START Ups, Women entrepreneurs

4.2 Projects:

- ✓ Science and Technology in Entrepreneurship Development (STED project of NSTEDB)
- ✓ Agribusiness Incubation Centre (ICAR), National Fisheries Development Board (NFDB)
- ✓ National Bank for Agriculture and Rural Development (NABARD)

- ✓ Entrepreneurship Development Institute of India (EDII)
- ✓ National Co-operative Development Corporation (NCDC)
- ✓ Small Industry Development Organization (SIDO)
- ✓ National Institute for Entrepreneurship and Small Business Development (NIESBUD), National Alliance Young Entrepreneur (NAYE)
- ✓ Self Employed Women Association (SEWA)
- ✓ Self Help Groups (SHGs)

4.3 Fish Market

- ✓ Structure, Functions and Types
- ✓ Marketing channels & supply chains
- ✓ Consumer behaviour
- ✓ Marketing research

4.4 Fish markets & marketing in India:

- ✓ Problems of fish marketing in India
- ✓ Cold storage & other marketing infrastructure in India
- ✓ Marketing organization and improvement
- ✓ E-marketing
- ✓ Role of Government and Co-operatives in fish marketing, Export and import of fish & fishery products, Role of MPEDA

Learners' Space:

1. Food Packaging Laws and Regulations
2. Packaging Machine

References

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E. G. – ZOO – 1004

MICROBIOME

Course Objectives:

The course will provide knowledge about different microbes living in specific niche, their interaction with each other and other living organisms

Course content:

Unit no.	Topics	Hours
Unit 1.	**Microbes:** (bacteria, virus, fungi and protozoa which colonize human and animal body): ✓ Role of Microbiome in health of Human ✓ Development of Microbiome in human from mother to old age ✓ Role of Genome ✓ Environment and lifestyle in development of microbiome	**15**
Unit 2.	**Biodiversity and their function**: ✓ Importance of the communities of microorganisms that inhabit the human body ✓ Human Pathogens and their mechanism of disease establishment ✓ Micobiome and Immunity and their role in protection from pathogens ✓ Cross-Talk Between Gut Microbiome ✓ Host Metabolism Under Normal Physiological Condition	**15**
Unit 3.	**HUMAN MICROBIOME:** ✓ Gut Microbiome and their role in digestion and nutrition ✓ Skin and Oral Microbiome ✓ Microbiome in other human tissues ✓ Microbiome and Diseases ✓ Virome in Health and Diseases ✓ Mycrobiome in Health and Diseases ✓ Application of Microbiome in treatment of disease	**15**
Unit 4.	**Pioneering projects in metagenomics:** ✓ The acid mine drainage project ✓ the Sargasso sea metagenomics survey and community profiling ✓ The antibiotic resistor project ✓ Viral metagenomics ✓ Metagenomics of insects	**15**

Suggested Literature:

1. The course will be taught from papers published in "Nature, Science, Cell, Microbiome, Gut" and other journals

P – ZOO - 1005 - Practicals

(A). Based on P - ZOO 1001: BIOLOGY OF NON-CHORDATES

PRACTICALS: **60 Hrs**

1 **Protozoa:** *Trypanosoma, Plasmodium, Radiolaria, Balantidium, Monocystis, Noctiluca, Paramecium*

2 **Porifera:** *Leucosolenia, Euplectella* (Venus flower basket), *Hyalonema*

3 **Cnidaria:** *Hydra, Carrybdea* (Cubozoan medusa), *Tubipora*, Alcyonarian coral, *Physalia* (Portuguese man of war), *Pennaria, Velella, Porpita, Aurelia, Obelia,* Sea Anemone

4 **Platyhelminthes & Nemathelminthes:** *Microstomum, Gyrodactylus, Schistosoma haematobium* (Blood worm), *Echinococcus granulosus* (Dog tapeworm), *Ancylostoma duodenale* (Hook worm), *Trichinella spiralis* (Pin worm)

5 **Annelida:** *Nereis, Aphrodite, Tubifex, Placobdella, Hirudinaria* (Leech), *Arenicola, Sabella,*Earthworm, *Chaetopterus*

6 **Arthropoda:** Black widow spider, *Cyclops, Calanus, Lepas, Balanus* (Acorn barnacle), Centipede, Millipede, *Xiphosura limulus* (King crab)

7 **Mollusca:** *Neopalina, Cardium, Sepia, Loligo, Patella, Chiton, Dentalium, Murex xanchus*

8 **Echinodermata:** *Ophiothrix,* Sea urchin, Heart urchin, Starfish, Sea cucumber, Echinoderm larvae

9 **Dissections:** C**ockroach :**

1) Digestive system
2) Reproductive system of male & female
3) Nervous system.

Mountings:

1) Gizzard
2) Compound Eye
3) Mouth parts

(B). Based on P - ZOO 1002: BIOCHEMISTRY AND IMMUNOLOGY

PRACTICALS: **60 Hrs**

1. Determination of isoelectric point of casein.
2. Quantitative method for estimation of total amino acids
3. Determination of urine creatinine content

4. Quantitative method for estimation of total proteins

5. To study various cell types from human body (Immune Cell).

6. Study of various slides: T.S. of Spleen, Thymus, Lymphnodes and bone.

(C). Based on P - ZOO 1003: CELL AND MOLECULAR BIOLOGY PRACTICALS: 60 Hrs

1. Vital staining of mitochondrial using buccal cell.
2. Preparation of salivary gland chromosomes of *Drosophila melanogaster*.
3. Study of Meiotic chromosomes- *Cockroach*.
4. Study of Barr body in human using buccal smear
5. Isolation of cellular DNA by using liver.
6. Demonstration of Agarose gel electrophoresis.

ZOO – 1006 (Skill Based Elective Paper)
INSTRUMENTATION AND PRESENTATION OF SCIENTIFIC DATA

Unit 1: Instrumentation **15 Hrs**

Objective

To learn how to design and build instruments for laboratory measurement.
To understand fundamental principles of operation.

Desired Outcome

The learner will understand methods for operation of instruments and data analysis.
The learner will understand how instrumentation can advance scientific research.

1.1 Centrifugation:

- ✓ Principle and applications of Centrifugation
- ✓ Differential and density gradient Centrifugation

1.2 Electrophoresis:

- ✓ Principle
- ✓ Structural components
- ✓ Applications

1.3 Chromatography:

- ✓ Principle and applications
- ✓ Adsorption
- ✓ Ion exchange
- ✓ Gel permeation
- ✓ Affinity

1.4 Spectrophotometer:

- ✓ Principle
- ✓ Applications

1.5 PH meter:

- ✓ Principle
- ✓ Applications

1.6 Microscopy:

- ✓ Binocular
- ✓ Trinocular

Unit 2: Presentation of Scientific data **15 Hrs**

Objective

- ✓ To aware the students for good practice in data presentation.
- ✓ To aware the students to use different data presentation formats

Desired Outcome

The students will familiarize to explain their research data by using different techniques for presenting their scientific data.

2.1 Types of presentation:

- ✓ Oral
- ✓ Poster
- ✓ Written
- ✓ Audio-visual

Aids for presentation

2.2 Preparing the manuscript

- ✓ Guidelines for authors
- ✓ The IMRAD format

2.3 Title, Byline, Abstract and Summary, Keywords

2.4 Introduction:

- ✓ Defining the problem
- ✓ Literature survey
- ✓ Justification of study

2.5 Materials and Methods:

- ✓ Contents
- ✓ Sources
- ✓ Procedures
- ✓ Techniques
- ✓ Reproducibility
- ✓ Significance

2.6 Results:

- ✓ Text
- ✓ How to present data
- ✓ Tables and illustrations
- ✓ Writing captions
- ✓ Labels and legends

2.7 Discussion:

- ✓ Components and Sequence
- ✓ Analysis, Comparison and Integration of Data
- ✓ Likely Sources of Errors in Results

2.8 Conclusions and significance

Bibliography

1 Sharma V.K. (1991) - Techniques in microscopy and cell biology, Tata-McGrawHill.
2 Bisen & Mathew - Tools and Techniques in Life Sciences – CBS Publishers & distributors.
3 Robert Braun - Introduction to Instrumental Analysis. McGraw Hill International Editions
4 Wilson and Walker – Principles and Techniques of Practical Biochemistry. Cambridge Univ. Press.
5 C. R. Kothari – Research Methodology, Methods and Techniques. Wiley Eastern Ltd. Mumbai

THEORY PAPERS AND PRACTICALS	TEACHING SCHEDULE HOURS/WEEK	EXAM SCHEDULE			TOTAL MARKS	CREDIT
		DURATION (HOURS)	EXTERNAL MARKS	INTERNAL MARKS		
THEORY PAPERS:	---	---	---	---	---	---
ZOO - 1001: BIOLOGY OF NON-CHORDATES	04	03	70	30	100	04
ZOO - 1002: BIOCHEMISTRY AND IMMUNOLOGY	04	03	70	30	100	04
ZOO - 1003: CELL AND MOLECULAR BIOLOGY	04	03	70	30	100	04
ELECTIVE PAPER: E. G. – ZOO – 1004 – INDUSTRIAL FISHERY OR E. G. – ZOO – 1004 – MICROBIOME	04	03	70	30	100	04
PRACTICALS: BASED ON ZOO – 1001 + ZOO – 1002 + ZOO – 1003	12	12	210	90	300	06
SKILL BASED ELECTIVE PAPER: ZOO – 1006 – INSTRUMENTATION AND PRESENTATION OF SCIENTIFIC DATA	02	02	50	20	50	02
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TOTAL →	30	24	540	230	770	24
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