



પરિપત્ર:

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટીની સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજોનાં આચાર્યશ્રીઓને સવિનય જણાવવાનું કે સાયન્સ વિદ્યાશાખા હેઠળનો લાઈફ સાયન્સ (ઝૂલોજી) વિષયનો (એમ.એસસી. ઝૂલોજી) પ્રોગ્રામનો સેમેસ્ટર-૩ અને સેમેસ્ટર-૪ નો અભ્યાસક્રમ આ સાથે સામેલ છે.

માનનીય કુલપતિશ્રીની મંજૂરી અનુસાર સદર અભ્યાસક્રમ શૈક્ષણિક વર્ષ જુન, ૨૦૨૪ થી અમલવારી કરવાની રહે છે. સાયન્સ વિદ્યાશાખાનાં લાઈફ સાયન્સ વિષયનાં પી.જી.નો અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજોનાં પી.જી.સેન્ટર ધ્વારા તેની અમલવારી કરવા જણાવવામાં આવે છે.



[Signature]
૦૫/૦૭/૨૦૨૪
ખાસ ફરજ પરના અધિકારી
(એકેડેમિક)

ક્રમાંક/બીકેએનએમયુ/એકેડેમિક/૮૯૨/૨૦૨૪

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી,

સરકારી પોલીટેકનિક કેમ્પસ,

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી રોડ,

ખડીયા, જૂનાગઢ-૩૬૨૨૬૩

તા.૦૪/૦૭/૨૦૨૪

પ્રતિ,

- ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી સંલગ્ન સાયન્સ વિદ્યાશાખાનાં પી.જી.(લાઈફ સાયન્સ)નાં અભ્યાસક્રમો ચલાવતી તમામ કોલેજોના આચાર્યશ્રીઓ તેમજ સંલગ્ન ભવનનોનાં અધ્યક્ષશ્રીઓ તરફ....

નકલ સાદર રવાના:-

- માન.કુલપતિશ્રી/કુલસચિવશ્રીનાં અંગત સચિવશ્રી.
- પરીક્ષા નિયામકશ્રી, ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી, જૂનાગઢ

નકલ રવાના જાણ તથા યોગ્ય કાર્યવાહી અર્થે:

- સીસ્ટમ મેનેજરશ્રી, આઈ.ટી.સેલ વિભાગ (વેબસાઇટ ઉપર પ્રસિદ્ધ થવા અર્થે.)



**BHAKTA KAVI NARSINH MEHTA UNIVERSITY
JUNAGADH**



**BOARD OF LIFE SCIENCE STUDIES
FACULTY OF SCIENCE
SYLLABUS FOR
M.Sc. (ZOOLOGY) PROGRAMME
(SEMESTER- III & IV)
EFFECTIVE FROM JUNE, 2024**

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Syllabus of M.Sc. ZOOLOGY
Faculty of SCIENCE
Effective from June 2024
SEMESTER-III & IV

1. The Course

- The course is full time course comprising of four semesters. There will be four theory papers (three core papers and one interdisciplinary / multidisciplinary paper) and one combined practicals in first two semesters. The last two semesters offer choice of courses to the students where two core courses and one elective (to be chosen from three available) courses will be taught. Any elective course will be taught only when prerequisite number of the student enrolls for that course. Students shall be required to submit at the time of practical examination at the end of each semester.
 - The laboratory Journal and diary of field work (Tour report) duly signed by the teachers concerned from time to time.
 - A set of assignments, submissions, preparations or materials illustrating the subject - matter as per syllabus for each semester.

2. Eligibility

- The candidate with B.Sc. degree in Zoology with minimum 45% is eligible for admission to M.Sc. Zoology course.
- Students, who have cleared B.Sc. with Zoology as the second subject in S.Y. B.Sc. will also be considered for admission, provided the seats are available. A total of 20 seats are available in the Zoology.
- Students will be admitted as per the reservation policy in effect from time to time, as directed by the University.

3. Educational tour

- The study/ educational tour is compulsory and part of Curriculum to study different ecosystems, botanical, zoological and microbiological places of interest anywhere in the country. Since the tour or tours are part of the curriculum, these can be conducted during any or all of the four semesters. However, in special cases, alternative of the educational tour will be decided and assigned to the student concerned, by the Staff Council of the Department.

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4. Seminars / Assignments / Submission

- Regular seminars will be organized on I and II Semesters and it is compulsory. Presentation on relevant topics, mostly from syllabus (oral and / or poster), is mandatory for the enrolled student. For each seminar, a student will be given marks, which will be added in the III Semester marksheet.

5. Attendance

- Admitted students have to attend all the Lectures, Practicals and Seminars. A minimum prescribed attendance as per university rules is required to sanction a term grant. Students whose term is not granted will not be allowed to appear in the examination, and will have to join the same semester in the following year.

6. Semester wise distribution of marks

- SEMESTER-I: 4 Papers (100 Marks each*) : 400
1 Combined Practical 200
Total 600
- SEMESTER-II:
4 Papers (100 Marks each*) : 400
1 Combined Practical 200
Total 600
*** 70 external + 30 internal**
- SEMESTER-III:
4 Papers (100 Marks each*) : 400
1 Combined Practical 200
Total 600
- SEMESTER-IV:
Dissertation / Project : 500 (400+ 100 viva)
Seminar course
(Intermediate presentation) : 50
Submission
(Research proposal and review article) : 50 (25+25)

Total 600

7. The M.Sc. courses run by this Department are full time studies and as such, a student admitted to the Department is not allowed to join any other courses or study, or take up any paid service.
8. The candidate should bring all original mark sheets, certificates etc. At the time of the interview.

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Semester - III

Course code	Paper title	Hours / week	Credits	Marks		
				Int.	Ext.	Total
ZOO 313	Zoonotic Disease, Structure and Functions in Invertebrates & Vertebrates (Core)	04	04	30	70	100
ZOO 314	Mammalian Physiology (Core)	04	04	30	70	100
ZOO 315	Marine & Coastal Ecology and Aquaculture & Fisheries Technology (Core)	04	04	30	70	100
\$ZOO 316 A	Wildlife, Applied Ecology & Conservation Biology and Research Methodology (Elective)	04	04	30	70	100
\$ZOO 316 B	Developmental Biology and Research Methodology (Elective)					
ZOO PRAC 317	Combined Practicals	12	12	-	200	200
*ZOO 418	Dissertation / Project	09	00			
	Total	37	24			
				-		600

\$ Out of two elective papers 316 A and 316 B **any one is to be selected**

* **Dissertation / Project** commences in III Semester but evaluated and Grade Points are to be added in 4th Semester.

Semester - IV

Course code	Paper title	Hours / week	Credits	Marks		
				Int.	Ext.	Total
ZOO 418	*Dissertation / Project	20	20	-	500	500
ZOO 419	#Seminar course	04	04	50	-	50
ZOO 420	@Submission/ Assignments (Research Proposal & Review Article)			50	-	50
	Total	24	24			
				-		600

* **Dissertation / Project** commences in 3rd Semester but evaluated and Grade Points are to be added in 4th Semester.

Seminar Courses are to be carried out as intermediate evaluation of dissertation progress in the 4th Semester.

@ **Submission** of research proposal and review article are to be submitted and evaluated in the 4th Semester.

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Zoo 313: ZONOTIC DISEASE, STRUCTURE AND FUNCTIONS IN INVERTEBRATES & VERTEBRATES (CORE)
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Unit: 1

- 1.1 Introduction to Zoonotic Disease (Zoonoses).
- 1.2 Foodborne zoonoses, Animal Feed and Food Safety.
- 1.3 Mosquito biology, control and Mosquito-borne diseases.
- 1.4 Zoonotic disease outbreak, human pandemic.

Unit: 2

- 2.1 Classification organization and general characteristics of invertebrate phyla.
- 2.2 Classification and organization of lower vertebrates.
- 2.3 Classification, organization and general characteristics of vertebrate phyla. Strategies and evolutionary significance of larval forms.
- 2.4 Larval forms of free-living invertebrates (Crustacea and Echinodermata). Evaluation of Biodiversity indices with brief reference to Shannon-Weinner index.

Unit: 3

- 3.1 Mouthparts and digestion in Invertebrates.
- 3.2 Excretion in Invertebrates.
- 3.3 Reproduction in Invertebrates.
- 3.4 Organisms of health and agricultural importance: Common parasites and pathogens of humans and domestic animals.

Unit: 4

- 4.1 Agricultural pests and their pathogenicity.
- 4.2 Pests of stored grains and their pathogenicity.
- 4.3 Insect pest management: Chemical, environmental and biological control.
- 4.4 Useful insects; Insect as food, Lac culture and Apiculture.

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Reference Books:

1. Principles of Insect Morphology, Snodgrass, R. E., Cornell Univ. Press, USA
2. Introduction to the study of insects, Borror, D. J., Triplehorn, C. A., and Johnson, N. F., M Saunders College Publication, USA
3. Ecology of insects, Speight, M. R., Hunter, M. D., & Watt, A. D., Wiley-Blackwell, UK
4. Entomology & Pest Management, Pedigo, L. P., Prentice Hall, New Jersey, USA
5. Invertebrate Zoology, Ruppert and Barnes, R.D. (2006). VIII Edition. Holt Saunders International Edition.
6. Invertebrates: A New Synthesis, Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The III Edition, Blackwell Science
7. An introduction to Embryology Balinsky, B.I. (2008)., International Thomson Computer Press.
8. The Principles of Insect Physiology Wigglesworth, V. B., ELBS and Chapman and Hall.
9. Modern text book of zoology: invertebrates, R.L. Kotpal
10. Modern text book of zoology: vertebrates, R.L. Kotpal
11. Principles of Zoology – Touching the Structure, Development, Distribution, and Natural Arrangement of the Races of Animals, Living and Extinct” by Louis Agassiz
12. Perspectives in animal phylogeny and evolution, alessandro minelli, Oxford university press
13. Principle of animal taxonomy, G.G. simpson, Oxford IBH publication company
14. Biomimicry: A tool for innovation. (2009). Retrieved September 4, 2010, from The Biomimicry Institute
website: <http://www.biomimicryinstitute.org/about-us/biomimicry-a-tool-for-innovation.html>
15. Vogel, Steven. Cats’ Paws and Catapults: Mechanical Worlds of Nature and People (2000). W. W. Norton & Company. ISBN: 9780393319903.
16. Spillover: Animal infections and the next human pandemic. Quammen, D. (2012). New York: W. W. Norton & Company

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Zoo 314: MAMMALIAN PHYSIOLOGY (CORE)

Unit 1: Digestive System, Endocrinology and reproduction

- 1.1 Physiology of digestion and absorption.
- 1.2 Energy balance, BMR.
- 1.3 Endocrinology and reproduction: Endocrine glands, basic mechanism of hormone action, hormones and diseases.
- 1.4 Reproductive processes, gametogenesis, ovulation neuroendocrine regulation.

Unit 2: Cardiovascular System

- 2.1 Comparative anatomy of heart structure, myogenic heart, specialized tissue.
- 2.2 ECG – its principle and significance, cardiac cycle, heart as a pump, neural and chemical regulation of all above.
- 2.3 Blood corpuscles, haemopoiesis and formed elements, plasma function.
- 2.4 Blood volume, blood pressure, blood volume regulation, blood groups, haemoglobin, Immunity, haemostasis.

Unit 3: Excretory system and Respiratory system

- 3.1 Comparative physiology of excretion, kidney, urine formation, urine concentration
- 3.2 Waste elimination, micturition, regulation of water balance
- 3.3 Comparison of respiration in different species, anatomical considerations
- 3.4 Transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration

Unit 4: Sense organs, Thermoregulation

- 4.1 Vision, hearing and tactile response.
- 4.2 Thermoregulation: Comfort zone, body temperature – physical, chemical, neural regulation acclimatization.
- 4.3 Stress and adaptation.
- 4.4 Introduction to Computer Oriented statistical techniques.

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Reference Books:

1. Text book of Medical Physiology by A. C. Guyton and J. E. Harcourt.
2. Text book of Medical Physiology by Ganong.
3. Principles of anatomy and physiology by Gerard Tortora and Bryan Derrickson, 12th edition
4. Invertebrate Structure and function. 2nd ed. ELBS & Nelson.
5. Analysis of Vertebrate Structure. Hildebrand, M. (1995). John Wiley & Sons.
6. Vertebrates: Comparative anatomy, function evolution. Kardong, K. V. (2002). Tata McGraw Hill.
7. Comparative anatomy of the Vertebrates. Kent, G. C. & Carr, R. K. (2001). 9th ed. Mc Graw Hill.
8. Biology of the Invertebrates Pechenik, J. A. (1998). 4th Ed. McGraw Hill.
9. The vertebrate body. Weichert, C. K. & Presch, W. (1984). Elements of Chordate Anatomy. Tata-McGraw Hill Pub. Comp.
10. Comparative Vertebrate Endocrinology, Bentley, P. J., Cambridge University Press, UK
11. Vertebrate Endocrinology, Norris D. O., Elsevier Academic Press,
12. Hand Book of Physiology, American Physiological Society, Oxford University Press, Section 7: Multiple volumes set.

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Zoo 315: MARINE & COASTAL ECOLOGY AND AQUACULTURE & FISHERIES TECHNOLOGY (CORE)
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Unit 1:

- 1.1 The shore environment. Physico-chemical and biological factors of intertidal zone. Distribution of life on rocky shores, sandy shores and muddy shores. Field visit.
- 1.2 Zonation and adaptation of organisms in the intertidal habitats.
- 1.3 Benthos: Distribution of shallow water benthic organisms. Distribution and adaptation of deep-seabenthic organisms. Marine animal associations: commensalisms symbiosis and parasitism.
- 1.4 Marine protected areas of India, Eco-tourism and recreational tourism, marine Amusement parks and their impact on Tourism and marine life.

Unit 2:

- 2.1 Freshwater capture and culture fisheries status in India and Gujarat. Estuarine capture and culture fisheries status in Gujarat and India.
- 2.2 Marine capture fisheries (Pisces): Pomfret fishery, Bombay duck fishery.
- 2.3 Marine capture fisheries (Other than Pisces): Shrimps, Prawn fishery, Lobster, Crab, Molluscan, Pearl Oyster fisheries.
- 2.4 Culture practices: Indian major carps and exotic carps.

Unit 3:

- 3.1. Classification of Pisces, Crustacea and Molluscan with examples. Type study: Scoliodon. (External, Scales, Digestive, Circulatory, Urinogenital, Brain, etc.)
- 3.2. Aquaculture and its importance: Advantages, scope and status of aquaculture in India and Gujarat. Gujarat Fisheries Act, Coastal Aquaculture Authority Act, Biodiversity Act.
- 3.3. Different types of Fishing boats and gears used in Fisheries, Induced breeding.
- 3.4. Ornamental fishes and its maintenance of fresh water and marine aquarium.

Unit -4:

- 4.1 Fish Preservation: Need of preservation, methods of preservation and their advantages.
- 4.2 Fish Processing methods used in industries with their advantages and applications, Fish by-products and their uses. Visit to fish processing unit at Veraval.
- 4.3 Role of biopesticides in aquaculture, application of monoclonal antibodies; Vaccines and immunostimulants; Drug resistance Aquafeed: Nutrition, Feed formulation, Feed additives, Alternative feed ingredients.
- 4.4 Physical parameters of Water quality and their effect on fisheries. Global and local environmental water pollution and their effect on fisheries.

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Reference Books:

1. Aquaculture. Bardach, J. E. & Ryther, J. H. (1972). John Willey and Sons.
2. Fish Nutrition in Aquaculture. DE Silva, S. S. & Anderson, T. A. (1995). Chapman & Hall, London.
3. Nutrition and Feeding of Fish and Crustaceans. Guillaume, J., Kaushik, S., Bergot, P. & Metailler, R. (2001). Springer and Praxis, U. K.
4. Fish Nutrition. Halver, J. E. (1972). Academic Press, New York & London.
5. Fish and Fisheries of India. Jhingran, V. G. (1991). 3rd ed., Hindustan Pub. Corp.
6. Aquaculture. Pillay, T.V.R. (1993). Fishing News Books.
7. Fish Biology. Srivastava, C. B. L. (1999). Narendra Pub. House.
8. A Text Book of Fishery Science & Indian Fisheries. Srivastava, C. B. L. (2006). Kitab Mahal. Allahabad.
9. The fresh water fishes of India, Pakistan, Bangladesh, Burma and Sri Lanka. Jayaram K. C. 1981.
10. Prawns and Prawn fisheries of India. Kurian, C. V. and Sebastian, V. O. 1986.
11. Fish Migration. Jones, F. R. H. 1968.
12. India's water wealth. Rao, K. L. 1975.
13. A textbook of marine ecology. Balakrishnan, N. N. and Thampy, D. M. 1980.
14. Fisheries Biotechnology. Lakra W. S., Abidi SAH, Mukherjee SC and Ayyappan S. 2004.
15. Theory and practice of induced breeding in fishes. Harvey, B. J. and Hoar, W. S. 1979.
16. Aquaculture – Principles and Practices. Fishing News Book. T. V. R. Pillay. 1993.
17. Aquaculture. Bardach, J. E. & Ryther, J. H. (1972). John Willey and Sons.
18. Biotechnology & Genetics in Fisheries and Aquaculture. Beaumont, A. R. & Hoare, K. (2003). Blackwell Publishing.
19. Biology of Fishes. Bond, C. E. (1996). 2nd ed. Saunders Pub.
20. Chakrabarti, N. M. (1998).
21. Biology, Culture and Production of Indian Major Carps – A Review. Narendra Publishing House. New Delhi.
22. The Physiology of Fishes. Evans, D. H. (1998). CRC Press.
23. Aquaculture. Pillay, T. V. R. (1993).. Fishing News Books.
24. Textbook of Fish Genetics and Biotechnology. Reddy, P. V. G. K., Ayyappan, S., Thampy, D. M. & Krishna, G. (2005). ICAR, New Delhi.
25. Fish Biology. Srivastava, C. B. L. (1999). Narendra Pub. House.
26. Fishponds in Farming Systems, Zijpp, V. D., Verreth, J. A. J., Tri, L. Q., van Mensvoort, M. E. F., Bosma, R. H., and Beveridge, M. C. M., Wageningen Academic Publishers, Netherlands
27. Aquaculture Principles and Practices, Pillay, T. V. R., Blackwell Publishing, USA
28. Aquaculture and Fisheries Biotechnology Genetic Approaches, Dunham, R. A., CABI Publishing, USA.

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Zoo 316 A WILDLIFE, APPLIED ECOLOGY & CONSERVATION BIOLOGY, AND RESEARCH METHODOLOGY (ELECTIVE)
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Unit 1 Wildlife

- 1.1 Population genetics – populations, gene pool, gene frequency; Hardy-Weinberg law; concepts and rate of change in gene frequency through natural selection, migration and random genetic drift.
- 1.2 Methods in field biology: Methods of estimating population density of animals, ranging patterns through direct, indirect and remote observations, sampling methods in the study of behavior, habitat characterization-ground and remote sensing methods.
- 1.3 Adaptive radiation and modifications; isolating mechanisms; speciation; allopatricity and sympatricity; convergent evolution; sexual selection; co-evolution.
- 1.4 Ecological sub divisions of Indian wildlife (marine ecology). Biodiversity monitoring techniques: population & habitat estimation methods (Species diversity estimation, Mark-recapture, Distance sampling-line transect & point count, Occupancy modelling, SDM).

Unit 2 Conservation & Development

- 2.1 Causes of wildlife depletion & legislation.
- 2.2 Biosphere reserves, national park & sanctuaries of India.
- 2.3 Wildlife management, Instruments used in wildlife poaching and man-wildlife conflicts; Wildlife protection act, Projects, trades in wildlife.
- 2.4 Bio-resource and uses of biodiversity; Biosensors, Ecological census techniques, Economic and ecological values of biodiversity: Use and non-use values, Access Benefit sharing

Unit-3 Applied Ecology and Conservation Biology

- 3.1 Applied Ecology: Environmental pollution; global environmental change; biodiversity:status, monitoring and documentation;
- 3.2 Major drivers of biodiversity change; biodiversity management approaches.
- 3.3 Conservation Biology: Principles of conservation, major approaches to management,
- 3.4 Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves).

Unit 4- Research Methodology: Scientific writing

- 4.1 Thesis, report, paper writing, Review writing and submission, Research Paper presentation. (on topics in that is directly related to the Dissertation thesis work opted.)
- 4.2 Basics of Data collection and analysis, Research scheme and research proposal writing.
- 4.3 National and international Funding agency and its role and Plagiarism.
- 4.4 Mentoring and mentor-mentee responsibility, Skills in Scientific communications, Use of computer/PPT in research presentation.

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Reference Books

1. Field Sampling: Principles and Practices in Environmental Analysis, Conklin, A.R. Jr., (2004), CRC Press.
2. Principles and Standards for Measuring Primary Production, Fahey, T.J. and Knapp, A.K., (2007), Oxford University Press, UK
3. Ecological Modeling, Grant, W.E. and Swannack, T.M., (2008), Blackwell.
4. Fundamental Processes in Ecology: An Earth system Approach, Wilkinson, D.M., (2007), Oxford University Press, UK
5. Mechanism of Animal Behaviour, Peter Marler and J. Hamilton; John Wiley & Sons, USA
6. Perspective on Animal Behaviour, Goodenough, McGuire and Wallace, John Wiley & Sons, USA
7. Exploring Animal Behaviour, Paul W. Sherman & John Alcock, Sinauer Associate Inc., Massachusetts, USA
8. An Introduction to Animal Behaviour, A. Manning and M.S Dawkins, Cambridge University Press, UK
9. Field Guide to the Indian mammals, Vivek menon
10. Life of birds, welty
11. Biodiversity concepts and conservation, B.B. Hosetti
12. Forest ecology, Barnes
13. The book of Indian reptiles and amphibians, Daniel J C
14. Ecology and tropical biology, Jan Deshmukh, Blackwell scientific publications
15. Man and ecosystem, L Loyd, JR Macmillan edu. Ltd.
16. Marine biodiversity, Ormond, Cambridge Uni
17. The theory of Evolution- J. Maynard Smith
18. Molecular Evolution and Origin of Life- Widney W. Fox and Klous Dose
19. Animal species and their evolution- A.J. Cain
20. Evidences for Macroevolution- Douglas Theobald (<http://www.talkorigins.org/faqs/comdesc/>)
21. Textbook for Environmental Studies- Erach Bharucha, UGC, New Delhi (2004)
22. Environmental Biology- K.C. Agrawal
23. Ecology & Environment- P.D.Sharma
24. Cite Right: A Quick Guide to Citation Styles--MLA, APA, Chicago, the Sciences, Professions, and More, Lipson, C., University of Chicago Press
25. Microsoft Office for Beginners, Humphrey M. L., (published by M. L. Humphrey)
26. Predatory Journals: What They Are and How to Avoid Them, Elmore, S. A., and Weston, E. H., Toxicologic Pathology, Sage Journals (<https://doi.org/10.1177/0192623320920209>)
27. Presentation Skills for Scientist, Zanders, E., and Macleod, L., Cambridge University Press
28. The craft of scientific writing by Michael Alley
29. Writing Science by Joshua Schimel
30. The Scientist's guide to writing by Stephen B. Heard.

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Zoo 316 B: DEVELOPMENTAL BIOLOGY AND RESEARCH METHODOLOGY (ELECTIVE)

Unit 1:

- 1.1 Basic concepts of development: Potency, commitment, specification.
- 1.2 Basic concepts of development: induction, competence, determination and differentiation.
- 1.3 Morphogenetic gradients; cell fate and cell lineages; stem cells.
- 1.4 Genomic equivalence.

Unit 2:

- 2.1 The cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development.
- 2.2 Gametogenesis, fertilization and early development.
- 2.3 Production of gametes, cell surface molecules in sperm-egg recognition in animals.
- 2.4 Embryo sac development; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals.

Unit 3:

- 3.1 Embryogenesis, establishment of symmetry.
- 3.2 Morphogenesis and organogenesis in animals: Cell aggregation and differentiation in Dictyostelium.
- 3.3 Axes and pattern formation in Drosophila, amphibia and chick.
- 3.4 Organogenesis – vulva formation in Caenorhabditis elegans; eye lens induction, limb development and regeneration in vertebrates.

Unit 4- Research Methodology: Scientific writing

- 4.1 Thesis, report, paper writing, Review writing and submission, Research Paper presentation. (on topics in that is directly related to the Dissertation thesis work opted.)
- 4.2 Basics of Data collection and analysis, Research scheme and research proposal writing.
- 4.3 National and international Funding agency and its role and Plagiarism.
- 4.4 Mentoring and mentor-mentee responsibility, Skills in Scientific communications, Use of computer/PPT in research presentation.

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Reference Books:

1. Developmental biology by Gibert
2. Reproduction I animals by Austen and short
3. Molecular Biology of Development by Scott. F. Gilbert
4. Human Reproduction by R. G. Edwards
5. Introduction to Embryology by Balinsky
6. Molecular Biology of Fertilization by Schatten and Schatten.
7. A Book on Indian Patenting System and Patent Agent Examination, Sheetal Chopra, Notion Press
8. Fundamentals of Intellectual Property Rights: For Students, Industrialist and Patent Lawyers, Anil Kumar, Ramakrishna, Notion Press
9. Intellectual Property Rights (IPRs): TRIPS Agreement & Indian Laws, E. T. Lokganathan, New Century Publications
10. How to Patent an Idea in India, Prasad Karhad
11. Building Biotechnology: Biotechnology Business, Regulations, Patents, Law, Policy and Science Paperback, Yali Friedman, Logos Press
12. Bioethics and Biosafety M.K. Sateesh, I K International Publishing House
13. Biosafety and Regulation for Genetically Modified Organisms, Xue, Ipha Science International Ltd
14. Kothari, Research Methodology, Methods and Techniques
15. Gurumani, An Introduction to Biostatistics

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PAPER ZooPRAC – 317:

Practicals Based on Theory Papers ZOO 313, 314, 315 and 316 A / B

Semester – IV

ZOO 418: Dissertation/Project

- Selection of the dissertation topic should be new and not repeated amongst the class students.
- Any reported case study will not be considered as a dissertation report.
- Dissertation carried out from other than the affiliated university/college will be liable to produce the attendance and work carried out certificate from the respected university/institute/industries. The original certificate should be attached to the dissertation report.

ZOO 419: Seminar Course (Presentation)

- Seminar course includes the topic selected for dissertation.
- Seminar course covers the presentation of selected topic and intermediate evaluation of dissertation.

ZOO 420: Submission (Research Proposal & Review Article)

- Preparation of research proposal prescribe format of state and nation funding agency such as GUJCOST, DST-SERB, DBT, ICMR etc. download from portal.
- Research paper and review article writing from the national and international publisher such as Current Sciences, Elsevier, Springer, Taylor and Francis, Wiley etc. download the instruction from selected journal.

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Semester wise Paper Style of Master of Science (M. Sc.) For
C.B.C.S. Examination for Semesters 1 to 4
(Revised, w.e.f. JUNE – 2024)

- | | | |
|-------------|--|-----------|
| Q 1. | Answer the following:
(Any <u>Seven</u> out of Eight questions from whole syllabus – 02 marks each) | 14 |
| Q 2. | Answer the following:
(Any <u>Two</u> out of Three questions – 07 marks each for two questions)
2.1
2.2
2.3 | 14 |
| Q 3. | Answer the following:
(Any <u>Two</u> out of Three questions – 07 marks each for two questions)
3.1
3.2
3.3 | 14 |
| Q 4. | Answer the following:
(Any <u>Two</u> out of Three questions – 07 marks each for two questions)
4.1
4.2
4.3 | 14 |
| Q 5. | Answer the following:
(Any <u>Two</u> out of Three questions – 07 marks each for two questions)
5.1
5.2
5.3 | 14 |

Note:

Q.1 From all units

Q.2/Q.3/Q.4/Q.5 From Unit 1, 2, 3 and 4 *in any order* but a single question must cover a single unit.