

SCHOOL OF ARCHITECTURE, SCIENCE AND TECHNOLOGY
YASHWANTRAO CHAVAN MAHARASHTRA OPEN UNIVERSITY

Detail Syllabus

V133: M. Sc. (Zoology) {2021 Pattern}

2021

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School of Architecture, Science and Technology

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V133 M Sc (ZOOLOGY) {2021 PATTERN}

PROGRAMME OBJECTIVE AND SCOPE

This programme is designed to achieve following objectives and scope.

The 'M.Sc. Zoology' program aims to develop understanding about significance of fauna and their biology from animals of single cell to multi-cellular systems. This Program trains the students to appreciate the diversity of Earth's fauna, with opportunities to specialize in areas such as animal evolution, behavior and ecology.

Objectives: The 'M.Sc. (Zoology)' program will

- Inculcate critical thinking and analytical skills to enable students to pursue higher studies and research in Life Sciences or related fields of Zoology.
- Provide a strong foundation for a better understanding of current advances in Zoology and its practical significance.
- Expose students to current trends in research about Zoology.

Scope of the programmes: After successful completion of this programme, students may get opportunities in various fields/sectors to work as

- Career opportunities in both private and government sector/ in India and abroad
- Job opportunities in sectors like Marine industries, NMCs, Pest Control, zoological parks, applied business like fisheries, apiculture, sericulture, pearl culture, etc
- Inculcation of research attitude
- Inculcation of entrepreneurship
- Perceive higher education and research in the same or allied fields like veterinary science

MODE OF EDUCATION

This Programme will be offered in Open and Distance Learning (ODL) Mode as defined in "UGC Open and Distance Learning Programmes and Online Programmes Regulations, 2020" published in the gazette notification by dated 4th Sept 2020 by the UGC as specified below.

"Open and Distance Learning Mode means a mode of providing flexible learning opportunities by overcoming separation of teacher and learner using a variety of media, including print, electronic, online and occasional interactive face-to-face meetings with the learners or Learner Support Services to deliver teaching-learning experiences, including practical or work experiences"

MODE OF EXAMINATION

Continuous Assessment is conducted at recognized learner support centres/ study centres and End Examination for all type of courses is conducted at recognized Exam Centres of the University under supervision.

BASIC INFORMATION

1. **Mode of Education:** Open and Distance Learning (ODL) Mode
2. **Minimum Programme Duration:** 2 years/ 4 semesters after Candidates with B.Sc. with Zoology at FY and SY/ B.Sc. (Agri) or Equivalent pass
3. **Learner Support Centers/ Study Centers:** University approved/ recognized Senior Science Colleges/ Institutes
4. **Medium of Instruction:** English
5. **Attendance:** Minimum 80% attendance for all type of courses.
6. **Minimum Programme Duration:** 2 years after Graduation
7. **Teaching-Learning:** 36 working weeks per year

8. **Total Teaching-Learning Support:** 960 Hours in each year
9. **Total Courses:** 16 courses (subjects) at year 01-02
10. **Total Credits:** 48 Credits. As per UGC norms 1 Credit means 30 hours of study efforts required to gain learning of particular content of each credit.
11. **Year Credits:** 24 Credits in each year (16 credits for Theory and 08 credits for Practical).
12. **Total Courses and Credit Points:**

Year	Theory	Practical	Credits
01	4	4	24
02	4	4	24
Total credits			48

13. **Passing:** Minimum 40% or better marks

14. **Credit Transfer:**

15. **Continuous Assessment:** Continuous Assessment conducted for Continuous evaluation during teaching-learning for 20% Weightage

16. **End Exam :**End Examination conducted for Summative evaluation of the student for 80% Weightage

17. **Degree Certification:** Aggregate performance and Class in the programme reported on the basis of performance.

18. **Curriculum Design:** Student centric curriculum is designed to enable professional ability, employability and skill enhancement.

19. **Approval/Equivalence Status:** UGC Approved. UGC-DEB Approval is available on UGC Website

ELIGIBILITY AND FEES

Admission Eligibility	Certification Eligibility	Fees and Deposit / Year UF is payable for a year to the university at the time of online admission	
Candidates with B.Sc. with B.Sc. with Zoology at FY and SY/ B.Sc. (Agri) or Equivalent pass	Min 40% or better marks, in all Theory type of courses, with total 48 credits at Year 01 to 02	Description	INR ₹
		University Fee (UF)	8000
		Study Center/ Learner Support Center Fee (LSCF)	12,000
		Total ≈	20000
		Refundable LD (Payable only when student choose to avail Library Facility at the SC)	1,500

PROGRAMME STRUCTURE

V133:M.Sc.(Zoology){2021 Pattern}				
Course → year ↓	Course 01, 4 CR, T	Course 02, 4 CR, T	Course 03, 4 CR, T	Course 04, 4 CR, T
Year 1 Theory 16 CR	ZGY011 Animal Diversity and Ecology	ZGY012 Cell and Molecular Biology	ZGY013 Animal Physiology and Physiological Chemistry	ZGY014 Human Cytogenetic and Developmental Biology
Year 1 Practical 8 CR	Course 05, 2 CR, P	Course 06, 2 CR, P	Course 07, 2 CR, P	Course 08, 2 CR, P
	ZGY015 Animal Diversity and Ecology	ZGY016 Cell and Molecular Biology (Practical)	ZGY017 Animal Physiology and Physiological Chemistry	ZGY018 Human Cytogenetic and Developmental Biology

	(Practical)		(Practical)	(Practical)
Year 2 Theory 16 CR	Course 01, 4 CR, T	Course 02, 4 CR, T	Course 03, 4 CR, T	Course 04, 4 CR, T
	ZGY021 Immunology	ZGY022 Animal Biotechnology	ZGY023 Toxicology	ZGY024 Applied Entomology
Year 2 Practical 8 CR	Course 05, 2 CR, P	Course 06, 2 CR, P	Course 07, 2 CR, P	Course 08, 2 CR, P
	ZGY025 Immunology (Practical)	ZGY026 Animal Biotechnology (Practical)	ZGY027 Toxicology (Practical)	ZGY028 Applied Entomology (Practical)

TEACHING-LEARNING SCHEME:

Description	Total 8 (Twelve) Theory Courses in Programme Total 8 (Eight) Practical Courses in Programme
Face-to-face Counselling Sessions for interaction, problem solving and conduction of practical activities at Study Centre	12 hrs each of 01 clock hour duration for each Theory Course of 4 Credits, Study Hours – 60 12 hrs each of 02 clock hour duration for each Practical/ Activity Course of 2 Credits, Study Hours – 60
Delivery of Information	08 Books in SLM format: 30 Hours/ for each 08 WorkBooks in SLM format: 60 Hours/ for each
Self-Study, Learning Evaluation and Feedback	(1) Solving Problems, Self-Tests, SAQs and Exploring more Details on Text-Book: 30 Hours
Total Study Hours	(8 x 60 = 480 Hours + 8 x 60 = 480 Hours) = 960 Hours

YEARS AND COURSES

SN	Code	Name	CA	EE	TM	Type	CR	Min %
I Year:24 Credits								
01	ZGY011	Animal Diversity and Ecology	20	80	100	T	4	40%
02	ZGY012	Cell and Molecular Biology	20	80	100	T	4	40%
03	ZGY013	Animal Physiology and Physiological Chemistry	20	80	100	T	4	40%
04	ZGY014	Human Cytogenetic and Developmental Biology	20	80	100	T	4	40%
05	ZGY015	Animal Diversity and Ecology (Practical)	10	40	50	P	2	40%
06	ZGY016	Cell and Molecular Biology (Practical)	10	40	50	P	2	40%
07	ZGY017	Animal Physiology and Physiological Chemistry (Practical)	10	40	50	P	2	40%
08	ZGY018	Human Cytogenetic and Developmental Biology (Practical)	10	40	50	P	2	40%
II Year:24 Credits								
09	ZGY021	Immunology	20	80	100	T	4	40%
10	ZGY022	Animal Biotechnology	20	80	100	T	4	40%
11	ZGY023	Toxicology	20	80	100	T	4	40%
12	ZGY024	Applied Entomology	20	80	100	T	4	40%
13	ZGY025	Immunology (Practical)	10	40	50	P	2	40%
14	ZGY026	Animal Biotechnology (Practical)	10	40	50	P	2	40%
15	ZGY027	Toxicology (Practical)	10	40	50	P	2	40%
16	ZGY028	Applied Entomology (Practical)	10	40	50	P	2	40%

GRADING SYSTEM

1. **“Absolute Grading”**: the marks are converted to grades based on pre-determined class intervals.
2. **“Letter Grade”**: It is an index of the performance of students in a said programme. Grades are denoted by letters O, A+, A, B+, B, C, P and F.
3. **“Grade Point”**: It is a numerical weight allotted to each letter grade on a 10-point scale. Grade Point shall be “o (Zero)” for Letter Grade “Ab” and “F”. The marks scored by the examinee shall be converted into grade points by dividing the marks scored in the aggregate and dividing the resulting number by maximum marks, multiplying the result by ten, retaining the integer part (ignore the fractional part). Thus if a person has secured 56 marks out of 100 marks in aggregate for a course, we get $(56/100) \times 10$ which is 5.6. Ignoring the fraction, we get 5 as the grade point.

Letter Grade	Grade Point	Class
O	10	Outstanding
A+	9	Excellent
A	8	Very Good
B+	7	Good
B	6	Above Average
C	5	Average
P	4	Pass
F	o	Fail
Ab	o	Absent

4. **“Credit Point”**: It is the product of grade point and number of credits for a course.
5. **“Semester Grade Point Average (SGPA)”**: It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.
6. **“Cumulative Grade Point Average (CGPA)”**: It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.
7. **“Transcript or Grade Card or Certificate”**: Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that year.

EVALUATION PATTERN

SN	Type of Course	Continuous Assessment	End Examination
1	Theory (T)	"Continuous Assessment (CA)" of total 20 marks and total 4 SAQs, each of 5 marks, 1 SAQ on each CR in a Single attempt only	"End Examination (EE)" of total 80 Marks and 16 "Short Answer Questions (SAQs)" each of 05 marks (4 out of 5 SAQs on each Credit), during 150 Minutes. (80%)

- Separate and independent passing @ 40% in EE and (CAT+EE) shall be essential for Theory and Practical component of each course.** "CA, EE and Total marks" shall be separately reported for **each** course in the transcript or mark-statement.
- Only 1 attempt** for EE for **each** course shall be allowed in **each** semester. **Maximum 2 attempts**, for CAT for **each** course, shall be allowed in **each** semester.
- Only best of past performance shall be reported in transcript or mark statement.**
- Total student evaluation for**
 - Each** semester shall be for **500** marks.
 - Each** year shall be for **1000** marks
 - Each** regular PG degree shall be for **2000** marks.

SUCCESSFUL COMPLETION OF COURSE OR PROGRAMME

- "Successful Completion of the Course" means - either course is exempted or student gets minimum specified or better grade, either in end examination of that course or by credit transfer. A student obtaining grade "F" shall be considered failed and will be required to reappear in the examination. The student obtained minimum "P" (Pass) letter grade required for successful completion of the each course.
- "Successful Completion of the Programme" means – all courses at all semesters are successfully completed and the student obtained "P" (Pass) letter grade for all courses at all semesters along with minimum specified SGPA and CGPA.

YEAR 01

ZGY011 ANIMAL DIVERSITY AND ECOLOGY

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	VXX: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY011	Animal Diversity and Ecology	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: <ul style="list-style-type: none"> B.Sc with Zoology or equivalent from a recognized University/Board. 	After successful completion of this course, student should be able to <ul style="list-style-type: none"> Name specialize structure, systems and functions presented for each specimen. Introduction between living and non living.

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3	Theories and concepts of Taxonomy Biological Classification Methodologies in Systematic	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4 2-5	Coelom Circulatory System Nervous System Excretory System Phylogenic Importance of Echinoderm Larvae	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
3-1 3-2 3-3 3-4	Integument Heart and Circulatory System Respiratory System Nervous System, Brain and Sensory Organs	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
4-1 4-2 4-3 4-4	Ecology and Animal Diversity Aquatic ecosystems and Animal Diversity Protected areas (sanctuaries and National Parks) Extinction and Biodiversity Conservation	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	Theories and Concepts of Taxonomy: Objectives, Introduction, Why Classification and Nomenclature, The Science of Classification / Taxonomy, Binomial Systems of Classification,	CR 01

	Systems of Classification, Current Theories on Taxonomy, Traditional Evolutionary Taxonomy, Phylogenetics / Climactic Taxonomy, Current Status of Taxonomy, Summery, Model Examination Questions..	
1-2	Biological Classification: Objectives, Introduction, Systems of Classification, Major Division of Kingdom Animal, Subkingdom: Protozoa- General characters and classification, Kingdom: Animalia- General characters and classification, Summary, Model Examination Questions.	
1-3	Methodologist in Systematic: Objectives, Introduction, Types and Methodologies in Taxonomy, Numerical (Phonetics) Taxonomy, Cytological Taxonomy, Biochemical and Molecular Taxonomy, Summary, Model Examination Questions.	
2-1	Coelom: Objectives, Introduction, Advantages and Function of Coelom, Origin of Coelom, Classification of Animals based on the types of Coelom, Comparative study of Coelom in Coelomates, Summary, Model Examination Questions.	
2-2	Circulatory System: Objectives, Introduction, Function of circulating fluid or blood, Types of Circulation, Circulatory system and its status in Non- chordates, Circulatory system in Annelida, Circulatory system in Arthropod, Circulatory system in Mollusca, Circulatory system in Echinodermata, Summary, Model Examination Questions.	
2-3	Nervous System: Objectives, Introduction, The Neuron: Structure and Function, Types of Neurons, Synapses: Junction Points between Nerves, Nerve Impulse, Evolution of Nervous System in Invertebrates, Nervous system in Various Phyla of Invertebrates, Summary, Model Examination Questions..	CR 02
2-4	Excretory System: Objectives, Introduction, Excretory Organs in Annelid, Excretory Organs in Arthropod, Excretory Organs in Mollusk, Excretory Organs in Echinodermata, Summary, Model Examination Questions.	
2-5	Phylogenetic Importance of Echinoderm Larvae: Objectives, Introduction, Broad Classification of Echinoderm, Larval Form in Echinodermata, Phylogenetics importance of Echinoderm Larvae, Summary, Model Examination Questions.	
3-1	Integument: Objectives, Introduction, Structure and Function, Derivatives of Integument, Summary, Model Examination Questions, Recommended Reference Book.	
3-2	Heart and Circulatory system: Objectives, Introduction, Origin Evolution of Heart, Evolution of aortic arches, Lymphatic system, Structure of Blood vessels, Summary, Model Examination Questions.	
3-3	Respiratory system: Objectives, Introduction, Respiratory system in Vertebrates, Respiratory organs, Gills, Lungs, Accessory Respiratory organs, Comparative account of Respiratory system of Vertebrate types Summary, Model Examination Questions.	CR 03
3-4	Nervous system, Brain and Sensory Organs: Objectives, Introduction, Generalized Nervous system of Vertebrates, Brain in different classes of Vertebrates, Sense organs in Vertebrates, Photorespiration in vertebrates: Vision, Statoacoustic organs in vertebrates: Ear, Summary, Model Examination Questions.	
4-1	Ecology and Animal Diversity: Objectives, Introduction, Ecology, Communities, Ecosystems and Organization, Environment and Diversity, Terrestrial Ecosystem and Diversity, Brief account on major Geographical Realms/Biomes, The tundra Biome, Environment and diversity, Taiga Biome, Environment and Biodiversity, The temperate Deciduous forest Biome environment and diversity, Evergreen subtropical and tropical forest biome environment and diversity, Grassland biome environment and diversity, Chapparral biome and diversity, Desert biome environment and diversity, Summary, Model Examination Questions	CR 04
4-2	Aquatic Ecosystem and Animal Diversity: Objectives, Introduction, Marine life zones, life styles and diversity, Zonation in marine water and diversity inter tidal zone and animal diversity, Diversity of animals of sandy shore in an Indian Coast, Coral reef animal Diversity, Subtidal zone and diversity, Oceanic region and diversity, fresh water life zones and diversity, Animal diversity in lentic water lotic water lakes and ponds, Estuarine biodiversity in India, Summary, Model	

	Examination Questions..	
4-3	Protected Areas (Sanctuaries and National parks) Extinction and Biodiversity Conservation: Objectives, Introduction, Types of biodiversity, Status of biodiversity in India and Value of biodiversity, Global status of Biodiversity threatened species and project in India, Causes of Extinction of Wild life, Importance Sanctuaries National parks and Biodiversity, Summary, Model Examination Questions.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY011	Animal Diversity and Ecology,		
Text-Books			
ZGY011	Animal Diversity and Ecology, Dr. K.V. Rama Rao, Dr. P. Nagaraja Rao, Dr. Pramila Devi, Dr. P. Neeraja, Prof. N.V. Nanda Kumar.	Reprint 2013	Dr. B.R.Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY011-RB1	wild life in india V.B, Saharia	1980	Rastogi publication Dehradun
ZGY011-RB2	Ecology and Environment P.D. Sharma	1999	
ZGY011-RB3	Word Bank Project Technical report on Jerdons Course.Dept. of forest. Govt. of AP. N.V. Nanda Kumar	WL25216/96	World Bank Project
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY011- -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY011--WL1			

ZGY012: CELL AND MOLECULAR BIOLOGY

PROGRAMME INFORMATION

SN	Description	Details
1	University	YashwantraoChavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	VXX: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY012	Cell And Molecular Biology	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully complete:</p> <ul style="list-style-type: none"> B.Sc with Zoology or equivalent from a recognized University/Board. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> Students will understand how this cellular components are used to generate to utilized energy in cell Student will understand nucleic acid & proteins and how this molecules interact within cell to promote growth, division & development

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4	An overview of the Cell, Cell shapes and types Method in Cell Biology Structure and function of the Cell Membrane Functional aspects of cell Organelles	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4	The Cell Organelles Nucleus Cell Division Cell Communication and Signaling	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
3-1 3-2 3-3 3-4	Nucleic Acid DNA Replication Transcription Genetic code and Protein Synthesis	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
4-1 4-2 4-3 4-4	Gene Regulation Gene Transfer method in Prokaryotes Mobile Genetic Elements Cancer	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
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1-1	An Over view of the Cell, Cell shapes and Types: Introduction, objective, History of development of event leading to the establishment of the cell theory, Development in cell biology, Model Organism, Tools used in cell biology, Culturing, shape of the cell, size of the cell, summary, Check your progress, Model Question	CR 01
1-2	Method in cell biology: Objectives, Introduction, Microscopy, Fractionation of cell – isolation of cell organelles, Tracer Technique, Audiography, Summary, Check your progress- Model Answer, Model Examination Question	
1-3	Structure and Functions of The Cell Membrane: Objectives, Introduction, Structure and Composition, Functions-Transport of large molecules, Summary, Check Your progress- model answers, Model Examination Questions.	
1-4	Functional Aspects Of Cell Organelles: Objectives, Introduction, Structure of Mitochondrion, Endoplasmic reticulum, Summary, Model Examination Questions.	
2-1	The Cell Organelles: Objectives, The Golgi Complex-Structure, Golgi Complex and Protein sorting, Lysosomes - Structure and Function, Summary, Model Examination Questions.	CR 02
2-2	Nucleus: Objectives, Introduction, Historical Background, Characteristics of components of the nucleus, Organization of chromatin, Nucleolus, Summary, Model Examination Questions.	
2-3	Cell Division: Objectives, Introduction, Mitosis, Meiosis, Cell Cycle, Endomitosis, Cytoskeleton, Summary, Model Examination Questions.	
2-4	Cell Communication and Signaling: Objectives, Introduction, Strategies of chemical signaling, Intracellular and Cell Surface receptor, Signaling mediated by cell surface receptor, Second And third Messenger, C-AMP Inositol phosphate prostaglandins, Summary, Check Your Progress Model Examination Questions.	
3-1	Nucleic Acid: Objectives, Introduction, DNA, Structure of DNA, Types of DNA, DNA Polymorphism, RNA, Structure of RNA, Types of RNA, Summary, Check your progress, Model Examination Questions, Books for further reference	CR 03
3-2	Transcription: Objectives, Introduction, Transcription in Prokaryotes, Eukaryotic transcription, Split genes- introns and axons, Post – transcriptional processing of RNA, Summary, Check Your Progress, Model Examination Questions, Book For further reference.	
3-3	DNA Replication : Objectives, Introduction, Types of replication , Enzymology of DNA replication, Mechanism of DNA replication, Summary, Check Your Progress, Model Examination Questions, Book For further reference.	
3-4	Genetic Code and Protein Synthesis: Objectives, Introduction, Historical Developments, Properties of codon- codon assignment – Ribosome binding technique, Genetic Code, Components of Protein synthesis, Translation Initiation Elongation and Termination with reference to Prokaryotes and Eukaryotes, Check Your Progress, Model Questions.	
4-1	Gene Regulation: Objectives, Introduction, Basic terminology, Gene regulation in Prokaryotes, Gene regulation in Eukaryotes, Summary, Check your progress, Model Examination question, Book for further reference.	CR 04
4-2	Gene transfer method in prokaryotes: Objectives, Introduction, Basic test for transformation, conjugation and transduction, Summary, Test Your Process, and Model Questions.	
4-3	Mobile Genetic Element : Objectives, Introduction, Definition significance, Types of Mobile Genetic element, Transposes, Transposon families, Retrotransposon, Mechanism of transposition, Av-bv controlling elements, Ty element in yeast, Transposable element in Drosophila, Application of transposons, Summary, Check your progress, Model Examination Questions, Books for further reference	
4-4	Cancer : Objectives. Introduction. Molecular basis of Cancer. (Cell Differentiation. Mutations	

	effecting cellular process, Accumulation of mutation, Cell proliferation, Genomic instability, Familial cancers, proto oncogenes, Tumor Suppressor genes, Summary, Model Examination Questions.	
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LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY012	Cell And Molecular Biology		
Text-Books			
ZGY012	Cell And Molecular Biology Dr. V. Manga, DR. G. Gnanamani, DR.G.M.V. Subba Rao, Dr. K. Vijaya Lakshmi, Dr. V. Shameem, Dr.B.V. Sandeep	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY012-RB1	Cell and molecular biology DE Robertis		
ZGY012-RB1	The cell Garald Karp		
ZGY012-RB1	Genetics of bacteria and virus William Hayes		
ZGY012-RB1	Genes Iewis1		
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY012-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY012-WL1			

ZGY013: ANIMAL PHYSIOLOGY AND PHYSIOLOGICAL CHEMISTRY

PROGRAMME INFORMATION

SN	Description	Details
1	University	YashwantraoChavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	VXX: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY013	ANIMAL PHYSIOLOGY AND PHYSIOLOGICAL CHEMISTRY	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully complete:</p> <ul style="list-style-type: none"> BSc with Zoology or equivalent from a recognized University/Board. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> Students will able to study basic understanding of fundamental process and mechanism that serve & control of various function of body

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4	Water Thermoregulation Respiration Circulation	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4	Nutrition and Digestion Excretion Immunology Nerve and receptor	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
3-1 3-2 3-3 3-4	Muscle Endocrinology and bioluminescence Enzyme Carbohydrate	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
4-1 4-2 4-3 4-4	Amino acids Proteins Lipids Biological oxidation	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	Water: objectives, Introduction: Water in the Cell Environment, Movement of water and Solutes across Cell membrane, Euryhaline and Stenohaline, Osmoregulation in Hetrosmotic media, Hormonal regulation of osmoregulation, summary, References	CR 01
1-2	Thermoregulation : objectives, Introduction, Concept of Poikilothermy and Homeotherms, Summary	
1-3	Respiration : objectives, introduction, Respiratory Organs, Respiratory mechanism in different animals, Transport of Respiratory Gases, Cascade of O2 transport, Transport of CO2,Oxygene Toxicity, Hypercapnea, summary	
1-4	Circulation: Objectives, Introduction, Types of heart concept of neurogenic and myogenic hearts, Cardiac cycle, ECG Pattern in mammals, Principles of haemodynamics, Haemostasis and blood clothe formation, summery, References.	
2-1	Neutrition and digestion: objectives, introduction, Nutritive patterns in animals, Role of vitamins, Digestion of carbohydrates, proteins and fates, Mechanisms of absorpition, Special aspects of digestion- ruminant digestion and coprohagy, Hormonal regulation of digestion, summary, Questions	CR 02
2-2	Excretion: Objectives, Intoduction, Generation of Ammonia, Ammonia Toxicity, Urea cycle, The formation of Urine, Purine Excretion, Summary, References.	
2-3	Immunology : objectives, Concept of antigen-antibody, humoral and cell mediated immunity, Types of antibodies- structure of antibody, antibody-antigen interaction, Opsonization-anibody, Allergy and hypersensitivity, summary, Model examination question	
2-4	Nerve and receptors : objectives, introduction, Structural elements, Concepts of membrane(resting) potential, Action potential, generation of impulse and propagation, Types of synapses and mechanism of transmission, Neurotransmitters, Concept of sensory receptors, Chemoreception, Phonoreception, Photoreception, Summery	
3-1	Muscle : Objective, introduction, Classification and Types of muscles, Ultra structure of skeleton muscle, Biochemistry of skeleton muscle, General mechanism of muscle contraction, Spread of Action Potential and Excitation contraction Coupling, Molecular mechanism of muscle contraction, changes during muscle contraction, Neuromuscular junction, summery,	CR 03
3-2	Endocrinology and Bioluminescence : Objectives, Introduction, Type of Hormones and mechanism of hormonal action, Protein and steroid hormones, Hormonal regulation of reproduction, Biochemistry and significance of bioluminescence, Summary, Check your progress.	
3-3	Enzyme : Objectives, Introduction, Classification, nomenclature and properties of enzymes- catalysis and energy activation, Co-enzyme and enzyme specificity, Enzyme kinetics, derivation of Km, Kt values and LB plots, Mechanism of enzyme action and regulation of enzyme activity, Summary	
3-4	Carbohydrate : Objectives, Introduction, Chemistry and structure of mono, di, amide polysaccharides, Deoxy sugar, Amino sugar and Glycosides, Metabolism of carbohydrate (Glycolysis, TCA cycle, Glycogenesis, Glycogenolysis ,Gluconeogenesis, HMP shut), Metabolic disease of carbohydrate metabolism , Summary, Model examination questions.	
4-1	Amino acid: Objective, Introduction, History of amino acids, Metabolic defects, Summary, Model Examination Questions	CR 04
4-2	Proteins: Objectives, Introduction, Classification of Protein, Structure of proteins, Defects in protein nutrition Metabolism of purines and pyrimidines, Summary	
4-3	Lipids: Objectives, Introduction, Structure of lipid, Classification of lipid, Fatty acids, Triglycerides, Phospholipids, Cerbrosides, Steroids, Prostaglandins, Biosynthesis of fatty acids, Metabolism of cholesterol, synthesis of steroids, Prostaglandins, Biosynthesis of fatty acids, Metabolism of cholesterol, Synthesis of steroid, porphyries and bile pigments, Lipdoses,	

	Summary, Model examination question.	
4-4	Biological Oxidation : Objective, Introduction, Breakdown of carbohydrates, B-oxidation of lipids, Bioenergetics of high energy compounds, Electron Transport chain, Summary, References	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY013	Animal physiology and physiological chemistry		
Text-Books			
ZGY013	Animal physiology and physiological chemistry Dr.Srinivas Reddy, Prof. T. Nagraju, Dr.K.Prastap Reddy, Dr. Radhakrishnaiah, Dr. Jane Theophilus.	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY013-RB1	Animal physiology P.S.Verma		
ZGY013-RB1	Animal physiology and Biochemistry R.A.Agrval		
ZGY013-RB1	General and Comparative Physiology By William S. Hoar,		Prentice-Hall of India pub. New Delhi
ZGY013-RB1	Principal of Animal physiology Dennis W. Wood		Arnots pub. Ltd.london
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
S30013 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
S30013-WL1			

ZGY014: HUMAN CYTOGENETIC AND DEVELOPMENTAL BIOLOGY

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	VXX: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY014	Human Cytogenetics and Developmental Biology	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: <ul style="list-style-type: none"> B.Sc. with Zoology or equivalent from a recognized University/Board. 	After successful completion of this course, student should be able to <ul style="list-style-type: none"> To understand transmission genetics problems, make accurate predictions about inheritance of traits, and map the location of gene

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4 1-5	Introduction to human Cytogenetic Chromosomes and Karyotypings Chromosomal Abnormalities Genetic Disorder Mutations and Repair of DNA	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4 2-5	Recombination DNA Technology Cytogenetic Culture setup and Harvest Slide Preparation and staining Glossary of Genetics Terms Glossary of Malformation	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
3-1 3-2 3-3 3-4	Basic concepts of Development Biology Gametes and Fertilization Cleavage and Gastrulating Early vertebrate Development	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
4-1 4-2 4-3 4-4	Differentiation Body Axis Tetrapod Limb Development Growth and post- embryogenic Development	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	Introduction to Human Cytogenetic: Introduction, Objective, History, Chromosomes, Cell division-Mitosis and Meiosis, Origin of Chromosome abnormality, Basics of Chromosome structure, Chromatin, Nucleosomes, Euchomatin and Heterochromatin, Nucleus, Nucleolus, The cell cycle in relation to Cytogenetic, Chromosome banding and Staining, Florescence In-Situ Hybridization (FISH), The future, Cytogenetic Workup, Summary, Check Your Progress, Model Examination Questions, Check your progress –Answers.	CR 01
1-2	Chromosomes and Karyotyping: Objective, Overview, Chromosome, Band Resolution, Objective of Karyotyping, Fundamental features of each chromosomes, Landmark to identify each chromosome under Banding procedure with standard ideograms indicating band locations with band resolution, Karyotype Description, Automated Karyotyping systems, Summary, Check Your Progress, Model Examination Questions, Check your progress –Answers.	
1-3	Chromosomal Abnormality: Introduction, Objective, Chromosomes, Chromosomal pattern of Inheritance, Impact of Chromosomal Abnormality, Chromosomal Abnormalities, Common Chromosomal Abnormalities with clinical consequences, Basic Dismorphology, Dismorphology and Chromosomal Databases, Summary, Check Your Progress, Model Examination Questions, Appendix A: Glossary of genetic terms, Appendix B: Glossary of malformations.	
1-4	Genetic Disorders: Objective, Introduction, Dominant trait, Recessive trait, Genetic Disorders and its modes of inheritance, Biochemical Disorders; Inborn error of metabolism, Teratogens, Parental Diagnosis, Genetic Counseling, Preconception and Parental Risk Assessment tools, Ethical and Social Implication of genetic disorders, Summary, Check Your Progress, Model Examination Questions, Check your progress –Answers.	
1-5	Mutation and repair of DNA: Objective, Introduction, Gene are made of DNA, Gene are like recipes for protein, Importance of reading the genetic code, Types of Mutation, the effect of mutation on the gene product, Frequency of mutations, Male contribute more mutation than females, Somatic Vs Germ line Mutation, Mutation detection AMES Test, Transgenic animal developed for detecting mutagens, Are there favorable mutation?, Mutagens mutation causing agents, Radiation, Mutagens and Carcinogens, DNA repair system, Summary, Check Your Progress, Check your progress –Answers.	
2-1	Recombinant DNA Technology: Objective, Introduction, Production of Recombinant DNA molecule, process of Recombinant DNA technology, DNA sequencing, Techniques used for mutation sequencing, Mutation analysis of Single Gene Disorders, Animal models of Inherited Diseases, Gene Mapping Identification and Cloning of Genes in Human beings, Application of Recombinant DNA technology, Summary, Model Examination Questions.	CR 02
2-2	Cytogenetic Culture Setup and Harvest: Introduction, Cell Culture Lab, The Substrate, Suspension culture, Media, Aseptic Condition, Culture method, Peripheral blood culture, Harvesting, Summary, Landmark in the development of tissue and cell culture, Check Your Progress, Model Examination Questions, Check your progress –Answers.	
2-3	Slide Preparation and Stain: Objective, Introduction, Theory Slide Making, Protocol for Slide Making, Technique Variation for Slide Making, Centrifugation, Fixative, Angle of the slide, Dilution Factor, Controlled Chromosome Spreading, Cell and Cell Type, Cell drying, Pre dropping techniques, Dropping techniques, Slide aging, Slide storage, Slide wash procedure, Slide Making Chambers (Drying Chamber), Staining, Microscopy of Imaging, Concept of Magnification, Part of the Standard Microscope, Image Quality, Digital Imaging, Contrast and resolution, Aperture, Lens faults, correct illumination, Maintenance, Cleaning the Microscope, Summary, Check Your Progress, Model Examination Questions, Check your progress –Answers.	
Appendix A	Glossary of Genetics Terms	

Appendix B	Glossary of Malformations	
3-1	Basic Concepts of Developmental Biology: Objective, Introduction, Historical roots of Developmental Biology, Principal features of development, Development patterns in Metazoa, Development in Unicellular Eukaryotes, Summary, Check Your Progress, Model Examination Questions.	CR 03
3-2	Gametes and fertilization: Objective, Introduction, Ultra structure of Gametes, Fertilization, Summary, Check Your Progress, Model Examination Questions.	
3-3	Cleavage and Gastrulation: Objective, Introduction, Cleavage, Gastrulation, Summary, Check Your Progress, Model Examination Questions.	
3-4	Early Vertebrate Development: Objective, Introduction, Neurulation and Ectoderm origin and fate crest cells, Mesoderm and Endoderm, Summary, Check Your Progress, Model Examination Questions.	
4-1	Differentiation: Objective, Introduction, Cellular basis of differentiation, Trans differentiation, Metaplasia, Regeneration, Summary, Check Your Progress, Model Examination Questions.	CR 04
4-2	Body Axis: Objective, Introduction, Establishment of Body Axis in mammals and birds, Proximate tissue Interactions, Genetics of axis specification in Drosophila, Summary, Check Your Progress, Model Examination Questions. Summary, Check Your Progress, Model Examination Questions.	
4-3	Tetra pod limb Development: Objective, Introduction, Tetra pod limb Development, Summary, Check Your Progress, Model Examination Questions.	
4-4	Growth and Post-embryonic Development: Objective, Introduction, Apoptosis, Aging, Senescence, Abnormal Development, Summary, Check Your Progress, Model Examination Questions.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY014	Human Cytogenetic and Developmental biology		
Text-Books			
ZGY014	Human Cytogenetic and Developmental biology Dr. Priyatham G., Dr. Vinitha, Dr. B.B. Hosetti.	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY014 –RB1	Fundamentals of cytogenetic and genetics mahabal ram		
ZGY014 –RB2	Developmental Biology Gilbert		
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY014 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY014-WL1			

Practical

ZGY015 ANIMAL DIVERSITY AND ECOLOGY (PRACTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	YashwantraoChavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/ and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY015	Animal Diversity and Ecology (Practical)	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: <ul style="list-style-type: none"> B.Sc with Zoology or equivalent from a recognized University/Board. 	After successful completion of this course, student should be able to <ul style="list-style-type: none"> Develop technical skill To empower our students with practical skills to comprehend the physiology and other functions of each ad every vital systems

UNITS

UN	Name of the Unit	CSs	Questions
1-1	Identification of evolutionary significant significant specimens and important connecting links and biodiversity.	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
1-2	Diversity of beak in birds.		
1-3	Mode of life and Modification of feet of birds.		
1-4	Preparation of check list of animal in a zoo-park or sanctuary or a National Park.		
1-5	Protected areas (sanctuaries and National Parks)		
1-6	Extinction and biodiversity conservation.		
2-1	Aquatic ecosystem and animal diversity.	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-2	7. Freshwater crab (paratelphusa) Nervous System		
2-3	8. Grasshopper (Locust) Reproductive System		
2-4	9. Digestive System in chick.		
2-5	10. Circulatory system in chick		
2-6	11. Urinogenital System in chick		
	12. Respiratory System in Chick		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	Identification of evolutionary significant specicant specimens and important connecting links and biodiversity. : Introduction, Echinoderm Larvae(Bipinnaria Larvae, Brachiolaria Larvae,	CR 01

	Echinopluteus Larva, Ophioluteus Larva, Dolliolaria Larva), Peripatus, Archaeopteryx, Ichthyophis, Ornithorhynchus (Duck-billed platypus), Rhynchocephalia, Dipnoian Fishes, Pteropus, Sea Cow, Transgenic Animals, Domesticated Biodiversity, Summary, Check Your Progress, Model Examination Questions	
1-2	Diversity of beak in birds. : Summary, Check Your progress, Model Examination Questions.	
1-3	Mode of life and Modification of feet of birds: Introductions, Material and Methods, observations(perching Feet, Cursorial or running Feet, Climbing Feet, Scratching Feet, Clinical Feet, Raptorial Feet, Wading Feet, Swimming Feet, Recording the Observation	
1-4	Preparation of check list of animal in a zoo-park or sanctuary or a National Park : Introduction, Material And methods, Observations Important Animal Types Described For Model study,(Tiger-Panther Tigris or Filis Tigris, Linnawus, Lion- oanthra Leo.Linnaeus, Sloth Bear- Marlursus Ursinus shaw, Organ gutan-Pongo, chimpanzee Pam=Anthropithecus, Otter- lutra lutra, Blackbuck or Indian Antelope, Elephants, Rhinoceros or the Great Indian One Horened Rhinoceros, Camel, Mangoos, Recording The observations, Model Of an Animal Feed Data Collections sheet.	
1-5	Protected areas (sanctuaries and National Parks) Extinction and biodiversity conservation. : Introduction, Material And Method, Observation, Nandur madhmeshwar bird sanctuary Nashik, Tadoba national park chandrapur, Sanjay Gandhi national park Mumbai, and chandoli national park, Model Examination Questions,	
1-6	Aquatic ecosystem and animal diversity: Introductions, Material and Methods, procedure for plankton Collection,Obserstion, Model Examination Questions	
2-1	Freshwater crab (paratelphusa) Nervous System : Introduction, Nervous system, Procedure For Dissection, Tracing of Ganglia and Nerves to Various Parts, Summary, Check Your Progress, Model Examination Questions.	CR 02
2-2	Grasshopper (Locust) Reproductive System : Introduction, Reproductive system, Procedure For Dissection, Tracing of male reproductive system, Tracing of Female Reproductive system, Model Examination Questions..	
2-3	Digestive System in chick: Introduction, Digestive system ,Procedure for Dissection, Tracing of different Parts of digestive System, Summary, Cheek Your Progress Model Examination Question	
2-4	Circulatory System in chick: introduction, Circulatory system, Procedure For Dissection, Tracing of different Vein System of chick, summary, Check Your Progress Model Examination Question	
2-5	Urinogenital /system in chick: introduction, Urinogenital System, Male Reproductive System. Female Reproductive System, Procedure.	
2-6	Respiratory system: introduction, Respiratory system, Procedure For Dissection, Tracing of Different Parts of Respiratory system, Model examination Questions.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY015	Animal Diversity and Ecology		
Text-Books			
ZGY015	Animal Diversity and Ecology	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY015-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY015-WL1			

ZGY016: CELL AND MOLECULAR BIOLOGY (PRACTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY016	Cell and Molecular Biology (Practical)	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully complete:</p> <ul style="list-style-type: none"> B.Sc. With or equivalent from a recognized University/Board. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> Develop technical skill To empower our students with practical skills to comprehend the physiology and other functions of each and every vital systems

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4 1-5 1-6 1-7 1-8	Preparation of blood Smear, Cell Type Identification and Differential Counts. Osmotic Fragility of Erythrocytes Estimation of RNs and DNA in Tissue Extraction of DNA Extraction of RNA Fractionation of proteins by Ammonium sulfate Precipitation Localization of RNA by methyl Green- Pyronin Y Fulgent reaction Method for DNA Localization	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4	Tissue Homogenization and fraction by differential Centrifugation for isolation of Nuclei and Mitochondria Separation of proteins by Polysacrylamide Gel Electrophoresis Polythene Chromosome Cell Division 12A Mitosis 12B Meiosis	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	Preparation of Blood Smeat, Cell Type identification and differential counts: Introduction, objectives, Materials, procedure(preparation of blood smear, Staining with Giemsa), Examination of Blood Film and Identification of Leukocytes, Examination of the Blood Firm for Differential Leukocyte Count (DLC), Precautions, observations, results/Exercise.	CR 01
1-2	Osmotic Fragility of erythrocytes : introduction, objectives, principle, procedure, precautions, result, observations, Result, observations, Result/ Exercise	
1-3	Estimation of RNA and DNA in Tissue: A) Estimation of RNA by orcinol method, introduction, objectives, principle, reagent, procedure, Table Estimation of RNA by Orcinol Method, calculation and result. B) Estimation DNA with Diphenylamine Reagent, Introduction, objectives, principle, reagent, procedure, calculation and result, observation, result/ Exercise	
1-4	Extraction of DNA : introduction, objectives, principle, reagent, procedure, report, observations, result/ Exercise	
1-5	Extraction of RNA: introduction, objectives, principle, material, procedure, Report, Observations, Result,/ Exercise	
1-6	Fractionation of proteins by Ammonium sulfate precipitation : introduction, objectives, principle, material, procedure, Report, Observations, Result,/ Exercise	
1-7	Localization of RNA by Methyl Green- Pronin Y : introduction, objectives, principle, material, procedure, Report, Observations, Result, Exercise	
1-8	Feulgen Reaction Method For DNA Localization : introduction, objectives, principle, material, procedure, Report, Observations, Result, Exercise	
2-1	Tissue homogenization and fractionation by differential centrifugation for isolation of nuclei and mitochondria : A) isolation of Nucle from rat liver : introduction, objectives, principle, material, procedure, Report, B) introduction, objectives, principle, material, procedure, Report, Observations, Result,/ Exercise	CR 02
2-2	Separation of proteins by polyacrylamide Gel Electrophoresis : introduction, objectives, principle, material, procedure, Report, Observations, Result,/ Exercise	
2-3	Polytene chromosomes : introduction, objectives, material & Reagent, procedure, observation, Result/exercise	
2-4	Cell Division – meiosis & mitosis : introduction, objectives, principle, material, procedure, Report, Obserations, Result,/ Exercise	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY016	Cell and molecular biology		
Text-Books			
ZGY016	Cell and Molecular Biology Dr.U. Shameen, Dr. Govindra Rao	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY016 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY016-WL1			

ZGY017 ANIMAL PHYSIOLOGY AND PHYSIOLOGICAL CHEMISTRY

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY017	Animal Physiology and physiological chemistry	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: <ul style="list-style-type: none"> B.Sc. With or equivalent from a recognized University/Board. 	After successful completion of this course, student should be able to <ul style="list-style-type: none"> Develop technical skill To empower our students with practical skills to comprehend the physiology and other functions of each and every vital systems

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4 1-5	Laboratory Techniques-1 Estimation Determination of protein by Biuret method. Determination of Glucose by Anthrone Method / Somagi method Determination of lipids by veiling method Determination of glycogen by kemp's method Determination of cholesterol by acetic anhydride method	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4 2-5 2-6 2-7 2-8	Laboratory techniques 2 Determination of Enzyme Activities of SDH, LDH, GDH. Effect of substrate Concentration and pH on Succinate Dehydrogenase Activity. Effect of Competitive inhibitor on SDH Activity. Estimation of Blood Chlorides under Hetero Osmotic Media. Estimation of acetyl cholinesterase (ACHE). Adrenaline and insulin induced changes in blood Glucose /levels in frog. Estimation of Hemoglobin, Erythrocyte Sedimentation Rate (ESR), Coagulation Time. Kymograph Recording of Muscle Twitch, Tetanus and Fatigue.	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	Determination of proteins by Burnet Method : introduction, objective, estimation of proteins by Biuret Method : introduction, objectives, Estimation of proteins by beret Method (Aim, Material, Chemical, Apparatus, principle) Experiment 2 : estimation of total proteins: (Aim, Material, Chemicals, Equipment Tissue and sample preparation, procedure, observation, calculation of protein content, result and Inference Experiment : Estimation of structural and soluble protein in tissue (Aim, Material, Chemical, Apparatus, procedure, observation, result/exercise	CR 01
1-2	Determination of glucose by enthrone method/ somogi method: introduction, objective, Apparatus and material, procedure(method1 : Enthrone method, Method 2: Nelosn-somgyi method, result and Exercise, observation, result/exercise.	
1-3	Determination of lipid by Valailline method : Introduction, objective, martial, Chemicals and reagent, Apparatuses, principle, procedure, Result, conclusion, inference, Preparation of standard graph, aim, chemicals and reagent apparatus, procedure, observations result,/ Exercise	
1-4	Determination of glycogen by KEMPs Method : introduction, objectives, apparatus and materials, procedure, result and observation, observations, results / Exercise .	
1-5	Determination of cholesterol by acetic anhydride method : introduction, objectives, material and chemicals, apparatuses, principle, procedure, calculation, Result, Inference. Application, preparation standard graph of cholesterol, Observation, result, Exercise	
2-1	Determination of enzyme activities of SDH, LDH and GDH : introduction, objectives, Determination of Succinct Dehydrogenate Activity : SDH. (Principle ,materials and Reagents, procedure, preparation of Formosan standard Graph,), Estimation of lactate Dehydrogenate Activity : LDH (Aim, Principle, Materials and Reagent, procedure, observations,) Estimation of Glutamate Dehydrogenate Activity : GDH(Aim, Principle, Materials and chemicals, Procedure, observations, observations, result/ Exercise	CR 02
2-2	Effect of substrate concentration and PH on succinct Dehydrogenate activity : Introduction, objective, Effects of substrate concentration on SDH activity, (procedure, observation), Effects of ph on enzyme activity(procedure, observation & presentation, Inference) Observations, Results/ Exercise..	
2-3	Effect of competitive inhibitor on SDH activity : introduction, objectives, Materials/Apparatus(chemicals, Apparatus), procedure & presentation, observations, results/Exercise	
2-4	Estimation of blood chlorides under hetero osmotic media : introductions, objective, material methods, apparatus, reagent, procedure, Standards value, observations, calculations, result inference, observations result/ excise, end to end session)	
2-5	Estimation of acetyl cholinesterase (Ache) : introductions, objectives, principle, materials and methods/apparatus(materials, chemicals, Apparatuses), Procedure, Results and calculation, inference, observations, results/ Exercise	
2-6	Adrenalin and insulin induced changes in Blood Glucose levels in frog : introduction, objectives, apparatus and Materials, procedure, observations, results/ Exercise	
2-7	Estimation of Hemoglobin, Erythrocyte sedimentation rate (ESR), Coagulation time : Estimation of Hemoglobin(introduction, objectives, chemicals/Apparatus, procedure for Estimation of Hemoglobin,), Erythrocyte Sedimentation Rate(ESR)Procedure for coagulation, observations, results/ exercise	
2-8	Kymograph recording of muscle twitch, tetanus and fatigue : introduction, objectives, materials and apparatus, procedure, B simple Muscle Concentration or twitch, C Trappe pr stair Case phenomenon, D Summation, E. Fatigue, G. Concentration, observations & Results, observations, results/ Exercise	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY017	Animal physiology & physiological chemistry		
Text-Books			
ZGY017	Animal physiology & physiological chemistry DR. Pratap Reddy, DR. P. Nagaraj	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY017-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY017-WL1			

ZGY018 HUMAN CYTOGENETIC AND DEVELOPMENT BIOLOGY (PRACTICAL)

SN	Description	Details
1	University	YashwantraoChavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY018	Human Cytogenetic and Developmental Biology (Practical)	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully complete:</p> <ul style="list-style-type: none"> B.Sc. With or equivalent from a recognized University/Board. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> Develop technical skill To empower our students with practical skills to comprehend the physiology and other functions of each and every vital systems

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4 1-5 1-6	Human Cytogenetic Culture setup and harvest Slide preparation Staining Microscopy Training and Mitotic Index Calculation Scoring Karyotyping	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4 2-5 2-6	Developmental Biology Procedure for isolating and culturing early hours chick embryo by filter paper ring method. Development of a Microlecithal Eg. Spiral cleavage in a snail. Demonstration of vitellogenesis by classifying the developmental stage of oocytes in the crustacean ovary. Fecundity index. Culturing of Drosophila and observing its embryonic and larval stages. Regeneration.	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	Culture setup and harvest : objective, introduction, materials for culture setup, Specimen procurement(sample collection, Blood Sample Collection Protocol for Chromosomal analysis, Specimen logging), Culture setup (Cell culture, Peripheral blood, peripheral blood constituents, Lymphocytes, PHAV, RPMI Media preparation, L-Glutamine, FBS, Penciline G buffered solution, preparation of streptomycin solution, Micro method and macro method, culture setup steps), Harvesting(Equipment, reagent, Preparation of the equipment, procedure of harvesting), Trouble shooting, observations result/Exercise	CR 01
1-2	Slide Preparation : objectives, introduction, materials (pre washed slides, slide warmer, Pasteur pipette, hot air oven at 90 c, inverted microscopic, tissue papers), Reagent (fixative, pallete suspended in fixative, distilled water), Slide washing, Slide preparation 2 (principle, specimen, equipment, reagents, preparations, quality control preparation, unacceptable results, procedure trouble shooting) slide aging, check your process, check your progress answers, observations, results/ exercise	
1-3	Staining : objectives, introduction, materials (equipment, reagent), Protocol for Geisma staining for high resolution analysis, Trouble shooting, Comparison of chromosomes in different grades of staining, observations, results/exercise	
1-4	Microscopy training and mitotic index calculation : objectives, part of standard microscope, microscope its operation and maintenance (warning labels, Getting ready, Maintenance and storage, caution, summary of observation procedures), Screening a slide(vertical method, Horizontal method, fusion method), slide shots/ microscopy training examples. Mitotic index training sheet, observations, results/ Exercise	
2-5	Scoring : objectives, procedure, Worksheet 1, Worksheet 2, Worksheet 3, Worksheet 4, observations, results/ Exercise	
1-6	Karyotyping : objectives, introduction, procedure, worksheet 1 (Metaphase spread), worksheet2 (Representative Field with Metaphase Spreads), worksheet3(Example Karyotype), worksheet5(Key to human chromosomes), worksheet6(Karyotype sheet), Karyotyping – practice exercise karyotype answers, observations , results/ exercise	
2-1	Procedure for isolating and culturing early hoarse chick embryo by filter paper ring method : objectives, introductions, materials required, procedure (preparation of culture assembly, filter paper rings, preparation of culture platform, isolation of blastoderm, setting up the culture), observations, self evaluation, observations, results / Exercise	CR 02
2-2	Development of a micro lecithal egg: spiral cleavage in a snail : objective, introduction, materials required, procedure, inference, self evaluations, observations, results/ exercise	
2-3	Demonstration of vitellogenesis by classifying the developmental stages of oocytes in the crustacean ovary : objective, introduction, materials required, procedure(immature ovary, vitellogenesis-1, vitellogenesis-2) inference, self evaluations, observations, results/ exercise	
2-4	Fecundity index: objective, introduction, materials required, procedure(stages of ovary to be selected, required parameter for calculations, Fecundity index, histosomatic index)) inference, self evaluations, observations, results/ exercise	
2-5	Culturing of Drosophila and observing its embryonic and larval stages : objective, phylogenetic position of drosophila, introduction, collection of drosophila from the wild, equipments for handling drosophila, culturing techniques(Media preparation, handling of drosophila, etherizer, observing external features of drosophila, identification between male and female pupae and adults, collection of virgin females, life cycle, inference, self evaluation. Observation, result/ exercise	
2-6	Regeneration : objective, introduction, materials required, procedure (grouping, observations), inference, observations, results/ exercise	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY018	Human Cytogenetic and Developmental Biology		
Text-Books			
ZGY018	Human Cytogenetic and Developmental Biology Dr. U. Anuradha, Prof. Krupanidhi Srirama	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY018-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY018-WL1			

YEAR 02

ZGY021: IMMUNOLOGY

PROGRAMME INFORMATION

SN	Description	Details
1	University	YashwantraoChavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem.	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY021	Immunology	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: <ul style="list-style-type: none">B.Sc. with Zoology or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to <ul style="list-style-type: none">An understanding of the characteristics of antigen and antibodiesAnd understanding of the nature of antigen and antibody.

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4	Introduction to the Immune system The Lymphoid System Cell Involve in Immune Response Structure and functions of Immunoglobulin	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4	Major Histocompatibility Complex in mouse and Humans Humoral Immunity Cell Mediated Immunity, The complement system	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
3-1 3-2 3-3 3-4	Hypersensitivity Auto Immunity and Immune diseases Immunity to Infectious disease Immunity to Parasitic disease	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
4-1 4-2 4-3 4-4	Vaccinology Transplantation and Organ Rejection Tumor Immunology Immunodiagnostic and Applications	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	Introduction to Immune System: Introduction, History of Immunology, Innate and Acquired immunology, Antigens Haptens and carriers, Summary, Test your progress-Question and Answers, Model examination Questions.	CR 01
1-2	The Lymphoid System: Objective, Introduction, Primary Lymphoid organs, Secondary Lymphoid organs, Clonal Selection theory, Lymphocyte traffic, Summary, Test your progress-Question and Answers, Model examination Questions.	
1-3	Cells Involve in Immune Response: Objective, Introduction, Origin of cell involved in Immune Response, Cells of the Immune System- Lymphocytes, Cells of the Immune System- Phagocytes Granulocytes and Dendrite cells, Cell involve in antigen processing and presentation, Summary, Test your progress-Question and Answers, Model examination Questions.	
1-4	Structure and Function of Immunoglobulin: Objective, Introduction, Basic structure of Immunoglobulin, Immunoglobulin classes and their functions, Immunoglobulin genes and their diversity, Summary, Test your progress-Question and Answers, Model examination Questions.	
2-1	Major Histocompatibility Complex in Mouse and Humans: Objective, Introduction, Organization of MHC, MHC Molecule- Class-I and Class II Molecule, Pathway for Antigen presentation, Self MHC restriction of T cells, MHC and disease susceptibility, Summary, Test your progress-Question and Answers, Model examination Questions.	CR 02
2-2	The Humeral Immunity: Chapter Outline Objective, Introduction, Kinetics of Humeral Immune response, Immunological Memory, Antibody Production, Regulation of Immune Response, Summary, Test your progress-Question and Answers, Model examination Questions.	
2-3	Cell Mediated Immunity: Objective, Introduction, Overview of cell mediated Immunity, Cells involve in cell mediated Immune Response, Function of cell mediated Immunity, Role of cytokines, Summary, Test your progress-Question and Answers, Model examination Questions.	
2-4	The Complement System: Objective, Introduction, Components of the complement, The Complement Pathways, Complement deficiencies, Summary, Test your progress-Question and Answers, Model examination Questions.	
3-1	Hypersensitivity: Objective, Introduction, Classification of hypersensitivity reaction, Type I Hypersensitivity reaction, Type II Hypersensitivity reaction, Type III Hypersensitivity reaction, Type VI Hypersensitivity reaction, Inflammation, Summary, Test your progress-Question and Answers, Model examination Questions.	CR 03
3-2	Autoimmunity and Immune Diseases: Objective, Introduction, Organ Specific Autoimmune diseases, Systemic Autoimmune diseases, T-cell deficiency diseases, B-cell deficiency diseases, Secondary Immunodeficiency, , Summary, Test your progress-Question and Answers, Model examination Questions.	
3-3	Immunity to Infectious diseases: Objective, Introduction, Viruses, Bacteria, Summary, Test your progress-Question and Answers, Model examination Questions.	
3-4	Immunity to Parasitic Diseases: Objective, Introduction, Immunity response to Protozoan Parasites, Immune Response to Helminthes, Summary, Test your progress-Question and Answers, Model examination Questions.	
4-1	Vccinology: Objective, Introduction, History, Immunity - immunization, Classification of Vaccines, Summary, Test your progress-Question and Answers, Model examination Questions.	CR 04
4-2	Transplantation and Organ Rejection: Objective, Introduction, Transplantation antigens, Transplantation Immunity, Immune Mechanism of Graft Rejection, GvHr, Immune tolerance and immunosuppressive agents Summary, Test your progress-Question and Answers, Model examination Questions.	

4-3	Tumor Immunology: Objective, Introduction, Tumor antigens, Immune response to tumors, Immune surveillance, Immunodiagnostic and Immunotherapy, Summary, Test your progress-Question and Answers, Model examination Questions.	
4-4	Immunodiagnostic and Applications: Objective, Introduction, Antigen antibody interaction, Precipitation and agglutination reaction, RIA and ELISA and Immunofluorescence, Hybridoma Technology and monoclonal Antibodies, Summary, Test your progress-Question and Answers, Model examination Questions.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY021	Immunology		
Text-Books			
ZGY021	Immunology Dr. A. Rama Rao, Dr. U. Shameen, Dr. T. R. Aghava Rao, Dr. D. Govinda Rao, Dr. I. Shubrahmanyam. Dr. B.R. Ambedkar Open University, Hyderabad.	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY021 –RB1	Immunology Dulsy Fatima and N Arumugam		Saras publication
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY021 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY021-WL1			

ZGY022: ANIMAL BIOTECHNOLOGY

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	S25021	Animal Biotechnology	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully complete:</p> <ul style="list-style-type: none"> B.Sc with Zoology or equivalent from a recognized University/Board. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> Identification & characterization of animal breeds. Developing DNA based diagnostics and genetically enquired various for animals.

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4	Introduction, History and Scope of Biotechnology General Histology and Cell Tissue Culture Preparation of Culture Media The Stem cell	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4	Propagation and Maintenance of Tissue Culture Preparation of Cell Lines Cellular aspects of Tumor Cells In Vitro Fertilization and Embryo Transfer	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
3-1 3-2 3-3 3-4	Agricultural Biotechnology Aquatic Biotechnology Microbial Biotechnology Environmental Biotechnology-I: Environmentally important microorganisms, Waste water treatment, waste water utilization.	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
4-1 4-2 4-3 4-4	Environmental Biotechnology-II: Landfill, Composting, Bioremediation Enzyme Biotechnology Industrial Biotechnology	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	Introduction, History and Scope of Biotechnology: Objective, Introduction, History, New products and Techniques, Molecular Engineering, Link between Science and Technology, Risk and Hazards, Scope and Importance, Summary, Model Examination Questions, References.	CR 01
1-2	General Histology and Cell Tissue Culture: Objective, Introduction, Morphology and different cell types, Media for cell and tissue culture, Summary, Model Examination Questions, References.	
1-3	Preparation of Culture Media: Objective, Introduction, Simple Growth Media, Serum and its Quality, Sterilization and Aseptic culture techniques for animal cells, Summary, Model Examination Questions, References.	
1-4	The Stem cell: Objective, Introduction, the Stem cell, The Embryonic stem cell, The Adult stem cell, Hematopoietic stem cell, Summary, Model Examination Questions, References.	
2-1	Propagation and Maintenance of Tissue Culture: Objective, Introduction, Basic techniques of Animal cell primary culture and their application, Preparation of primary culture, Maintaining the culture, Applications of cell culture, Summary, Model Examination Questions, References.	CR 02
2-2	Preparation of Cell Lines: Objective, Introduction, Preservation and maintenance of animal cell lines Cryopreservation and Transport of animal germ plasma, Purification and Processing of animal cell culture product, production of monoclonal Antibodies, Processing of animal cell culture Products, Purification of Monoclonal Antibodies, Application of monoclonal antibodies, Summary, Model Examination Questions, References.	
2-3	Cellular aspects of Tumor Cells: Objective, Introduction, Characterization of benign and malignant tumors, Molecular aspect of transformation and malignancy, Different kinds of Oncogenes. Mechanism of Activation and tumor suppressor genes, Summary, Model Examination Questions, References.	
2-4	In Vitro Fertilization and Embryo Transfer: Objective, Introduction, Animal transgenesis: aims and concepts, Gene transfer into gametes, Gene transfer into embryos, Gene transfer via cells, Vectors for gene addition and replacement, Gene- knock in and knock-out, Application, Limitations, Summary, Model Examination Questions, References.	
3-1	Agricultural Biotechnology: Objective, Introduction, Production of disease free plant, Tissue culture as a source of genetic variability and its application in crop management, Molecular biology of Nitrogen fixation, Herbicide resistance and stress tolerant plants, Bio insecticides, Bio fertilizers, Summary, Model Examination Questions.	CR 03
3-2	Aquatic Biotechnology: Objective, Introduction, Fish genetics and Development of transgenic fish, Hybridization Studies, Construction and Delivery of vector DNA INTO Cytoplasm /Nucleus of the fertilized Eggs, Methods of transgenic Integration, Fish antifreeze Protein Gene Promoter in the Production of growth Hormone (Transgenic salmon With Enhanced Growth Performance), Future Prospective and Thrust areas in Fish gene Transfer technology, Biotechnological tools for disease diagnosis in Aquaculture, Disease Management Technologies, Biotechnological approach to pearl production, Summary, Model Examination Questions.	
3-3	Microbial Biotechnology: Objective, Introduction, Fermentation and fermentable microbes: Design and type (any three) of bioreactor (fermentor)- construction of Bioreactor (Control of temperature, aeration and agitation), downstream Processing, Production of microbial product, Microbial biotransformation, Microorganisms related to plant growth promoting-mycorrhizae rhizobia Azospirillum Azotobacter, Production of bacteria Bio fertilizer, Green manuring, (Algae, mass cultivation of cyanobacteria and azolla), Summary, Model Examination Questions.	
3-4	Environmental Biotechnology-I: Objective, Introduction, Environmentally important microorganisms, Waste water treatment, waste water utilization, Fermentative bacterial- technical process, Summary, Model Examination Questions.	

4-1	Environmental Biotechnology-I: (landfill, composting Earth worm treatment, degradation of plastic : Objective, Introduction, Landfill, Composting, Earth worm treatment, Recycling of Organic wastes, Hazardous Wastes, Source and Management, Degradation of Plastics, Release of Genetically engineered microbes in the environment, Summary, Model Examination Questions.	CR 04
4-2	Bioremediation: Objective, Introduction, Principal Overview and application of Bioremediation, Factors of Types of Bioremediation, Microbial Bioremediation, Phytoremediation, Role of genetic engineering in Bioremediation, Bioremediation strategies, Zoo remediation, Summary, Model Examination Questions.	
4-3	Enzyme Biotechnology: Objective, Enzyme immobilization-Classification and Techniques, Enzyme Reactors, Properties of Immobilized Enzymes, Uses of Immobilized Enzymes, Important strategies for Commercial Uses of Immobilized Enzymes, Summary, Model Examination Questions.	
4-4	Industrial Biotechnology: Objective, Introduction, Scope; Characteristics and Composition of bio processing with chemical processing, Bioconversion process and design of media, Isolation preservation and Improvement of industrial of microorganisms, , Summary, Model Examination Questions.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY022	Animal Biotechnology		
Text-Books			
ZGY022	Animal Biotechnology Prof. P. Prakash Babu, Dr. A. Padmini, Prof. A. Indira, Prof. Jayraj, Prof. Radha. D. Kale. Dr. B.R. Ambedkar Open University, Hyderabad.	2010	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY022-RB1	Animal Biotechnology V Kumaresan		
ZGY022-RB2	Animal Biotechnology R Sasidhara		
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY022-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY022-WL1			

ZGY023: TOXICOLOGY

PROGRAMME INFORMATION

SN	Description	Details
1	University	YashwantraoChavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
	ZGY023	Toxicology of insecticides	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: <ul style="list-style-type: none"> BSc with Zoology or equivalent from a recognized University/Board. 	After successful completion of this course, student should be able to <ul style="list-style-type: none"> Identify various aspects of chemicals\ exposure & identify method & common application of toxicology in chemicals

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4	Formulation and Classification of insecticide Evaluation of insecticide Insecticide and Cuticle Effects of insecticides on the Nervous System	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4	Botanical insecticide Organ chlorines Organ phosphorus Insecticide Carbonate Insecticide	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
3-1 3-2 3-3	Synthetic Pyrethoroides Molecules with Different Chemistry Synthetic Insect Control Agents	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
4-1 4-2 4-3 4-4 4-5	Photochemistry of Pesticide Microsomal Mono-Oxygenizes Extra- Microsomal Metabolism of Insecticide Insecticide Resistance Pesticide Residues	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	Formulations and Classification of Insecticide: Objective, Introduction, History of insecticides, Formulations of insecticides, (common Formulation: Dust, Water Soluble Powders, Emulsifiable Concentrates, Solution Concentrate, Oil Solutions, Suspension Concentrates of Flowable, Aerosols, Granular, Fumigants, Ultra-low Volume Concentrates, Fogging Concentrate, Poison Baits, Slow-Release Insecticides) Function and Classification of insecticides, inorganic compounds, summary, Model Examination Questions, Suggest References.	CR 01
1-2	Evaluation of insecticide toxicity : Objective, Introduction, Evaluation Of toxicity, describing Adverse Toxicological Effects, Use of Animals in Toxicity studies, Toxicological Testing and Evaluation of pesticides, Sub chronic Test (Repeated Exposure, Intermediate Dose, Moderate Duration) Chronic Test(Multiple Exposure, Low Dose, Long Duration) Reproductive Toxicology, Genetic Toxicology, Testing for Mutagenicity, Pharmacokinetics: Absorption, Distribution, Excretion, and metabolism, Method of testing Chemicals on Insects, Prohibit Analysis, Summary , etabolism, Method of testing Chemicals on Insects, Prohibit Analysis, Summary , Model Examination Questions, Suggest References.	
1-3	Insecticides and Cuticle: Objective, Introduction, Cuticle, Penetration and distribution of insecticides, Effect of physical agents on Cuticle, Chemical Agents. Summary, Model Examination Questions, Selected References.	
1-4	Effects of insecticides on the Nervous: Objectives, Introduction, Background basis of ionic permeability changes, Voltage-dependant channels, Insecticides and ionic channels. Synaptic mechanism, presynaptic mechanism, postsynaptic mechanism, Physiological consequences of neuron toxicities, Summary, Model Examination Questions, Selected Books.	
2-1	Botanical insecticide : Objective, Introduction, Nicotinoids, physical and chemical property, structure-toxicity relationship, mode of action, Effects of nicotine on mammals, Toxicity to insects, Molecular target, Metabolism, Therapy, Pyrethrum, Neem, Rotenone and retinoid, Summary, Model Examination Questions, Selected reference	CR 02
2-2	Organochlorines : objectives, Introductions, DDT and analogues, DDT toxicity, Mode of action, Metabolism of DDT, Lindane, Cyclo-diene insecticides, Summary, Model Examination Questions, Selected References.	
2-3	Organophosphorus insecticides : Objectives, Introduction, Structure of Poisoning, Mode of action, Aging of the inhibited Cholinesterase, metabolism of organophosphorus Insecticides, Activation Reactions, Degradation reactions, Treatment of Poisoning, Summary, Model Examination Questions, Selected Reference	
2-4	Carbamate insecticides: Objective, Introduction, Development of Carbamate Insecticides, Mode of action Symptoms of Toxicity, Metabolism of carbamates, Effects of synergists, Therapy, Structure-activated Correlations, Selective Toxicity of carbamates, Summary, Model Examination Questions, Selected References.	
3-1	Synthetic pyrethroids : Objective, Introductions, Development of synthetic Pyrethroids, Chemical Structure and Toxicity, Toxicity, Mode of action, Influence of Temperature on toxicity, Metabolism(Ester Cleavage, Acid Moiety, Intact Ester Metabolites, Metabolism in Mammals, metabolism in Plant, metabolism in soil and water, Enzymes involved in parathyroid Degradation, Resistance to References, Model Examination Questions.	CR 03
3-2	Molecules with different chemistry : objective, Introduction, Neonicotinoids or nicotinic insecticides, Nereistoxin, Spinosad, Avermectins, Milbemycins, Fipronil, Formamidines, Indoxacarb, Chlorfenapyr, Pymetrozine, Summary, Model Examination, Selected References	
3-3	Synthetic insect control agents: objective, introduction, Insect Chemosterilants. Alkylating agents, Nonalkylating chemosterilants, Insect growth regulators(Chitin synthesis Inhibitors, Benzoyl phenyl Urea's, Buprofezin, Juvenile Hormones Mimic, Edison Agonists, Attraction, Sex	

	Pheromones(Monitoring of pest densities, Mass trapping, Mating Disruption, Insect Repellents, Antifeedants) Summary, Model Examination Questions, Selected Reference	
4-1	Photochemistry of pesticides : objectives, introductions, Basic process in photochemistry, Factors affecting pesticides photodecomposition studies, Chlorinated hydrocarbon pesticides(DDT and analogues, HCH, Cyclodienes) Organophosphate pesticides, carbonate pesticides, pyrethroids, Rotenone, Summary, Model Examination Questions, Selected References.	CR 04
4-2	Microsomal mono-oxygenase : Objectives, Introduction, Mode of action of microsomal Oxygenizes, mode of action of mono- oxygenize, insect mono- oxygen's s systems, Cytochrome p-450-dependent mono- oxygenase system, factors affecting mono-oxygenase activity, Multiplicity of cytochrome p-450, Inductions and inhibition of mfos, functions of the microsomal cytochrome p-450, inductions and inhibitions of mfos, functions of the microsomal cytochrome p-450-dependent mono-oxygenize system, Role in pheromone biosynthesis, Role in xenobiotic metabolism, Role in resistance and tolerance to toxicant , Lipid metabolism and phospholipids, Non-mono oxygenize enzyme, summary, Model examination questions, Selected References.	
4-3	Extra Microsomal Metabolism of insecticides : Objectives, Introductions, Phase1 reaction(hydrolysis, Reduction) Phase 2 reactions, Role of detoxication enzymes in insecticide resistance, Introduction of detoxication enzymes, Microbial degradation, Composting, Mechanism affecting Biological Degradation, Microbial Metabolic Pathway, Summary, Model Examination Questions, Selected References	
4-4	Insecticide resistance : objective , introduction, Development of insecticide resistant traits, Mechanism of insecticides resistance, Factors conducive to rapid development of resistance, Genetic basic of resistance, summary, Model Examination Questions, Selected References	
4-5	Pesticide residues : objective, introductions, critical terms and definition. Biomagnifications, Bio concentration, and Biomagnifications, Effects of pesticide residues on human beings, Environment and Non-target Animals, pesticide residue standard in food and water, principle and method of pesticides residues Analysis, Principle of chromatography (Column chromatography, Thin layer Chromatography, Gas chromatography, GC equipment, Basic operation, types of GC detectors, HPCL) pesticide residues standards in foods, principles of chromatography, Summary, Model Examination Questions, Selected References	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY023	Toxicology of insecticide		
Text-Books			
ZGY023	Toxicology of insecticides Prof. M.sriranulu, Dr.ch. Sreenivasa Rao, T.B Gour	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY023-RB1	Physiology And Eco-toxicology : Vol - II	2010	Hardcover
ZGY023-RB2	Biological Insect Pest Suppression (Advanced Series in Agricultural Sciences)		
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY023-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY023-WL1			

ZGY024: APPLIED ENTOMOLOGY

PROGRAMME INFORMATION

SN	Description	Details
1	University	YashwantraoChavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY024	Applied Entomology	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully complete:</p> <ul style="list-style-type: none"> BSc with Zoology or equivalent from a recognized University/Board. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> The infirmity between insect and environment was emphasized to the entomological research in many dissection which later proved of immense value in the indigenous control measure so as to provide more food for growing population

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4	Classification and structure Insect taxonomy External Morphology-study of generalized insect Internal Morphology Insect Behavior	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4	Economic Entomology Pests of field Crops of stored grains Horticulture Crop Pests Integrated Pest Management Non Insect Pest (Biology), Damage and Management	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
3-1 3-2 3-3	Silkworm (Biology, nature of produce, uses) Honeybees (Biology, nature of produce, uses) Lac insect and other beneficial insects	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
4-1 4-2 4-3 4-4 4-5	Livestock, urban and medical entomology Livestock Urban Entomology Medical Entomology Forensic Entomology Aquatic Entomology	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit (Application Oriented problems)	CR
1-1	Insect taxonomy : Objective, introduction, character and classification of phylum Arthropod, Character and classification of class insect, Characters and classification of phylum Arthropod, Character and classification of class insecta, Character of insect orders (Thysanura, Diplura, Protura, Collembola, Ephemeroptera, Odonata, Plecoptera, Grylloblattodea, Orthoptera, Phasmida, Dermaptera, Embioptera, Dictyoptern, Isoptera, Zoraptera, Psocoptera, Mallophaga, Siphunculata or Anaplura, Hemiptera, Thysanoptera, Neuroptera, Coleoptera, Strepsiptera, Mecoptra, Diptera, Lepidoptera, Trichoptera, Hymenoptera) summary, Model Examination Question Suggested books	CR 01
1-2	External Morphology Study of Generalized insects : objectives, Introduction, Head, Thorax, Appendages(Mouthparts, Antennae, Leg of insects, General Characters of wings of insects, wing variation) Summary, Model Examination Questions, Suggested books.	
1-3	Internal Morphology : objective, Introduction, integument(cuticle, Epidermis, Basement Membrane, chitin), Endocrine system, Digestive system, Excretory system, Circulative system, Respiratory system, Nervous system, Reproductive system, Summary, Model examination questions, Suggested books	
1-4	Insect Behavior : Objectives, Introductions, Pattern of behavior (innate behavior, Learning), Communication and modes of communication, Courtship and mating behavior, Copulation, Migration, Feeding behavior, Social behaour, Escape behavior, Defense behavior, Clocks and circadian rhythms, Diapauses, Summary, Model Examination Questions, Suggested books.	
2-1	Pest of field crops and storage grains : Objectives, Introduction, Pest o rice, Pest of Millets, Pest of sugarcane, pest of groundnut, pest of castor, pest of cotton, pest of chilies, pest of red gram, Coleopteran pests of stored Grains, Lepidopteron [pests of stored grains, Storage pest management, Summary, Model Examination Questions, Suggested books.	CR 02
2-2	Horticultural crop pests : objectives, Introduction, Pest of Brinjal, Pest of Okra, Pest of tomato, pest of cabbage and cauliflower, pest of mango, pest of citrus, pest of Grapevien, pests of Ginger and Turmeric, Pest of pepper, pest of tobacco, pest of Roses, Pest of chrysanthemum pest of Turerose, pest of jasmine, pest of coconut, summary, Model Examination Questions, Suggested books,	
2-3	Integrated pest management : Objectives, introductions, Definitions, Aims of IPM, Ecology and IPM, Principles of IPM, Component (Tools) of IPM< Curative measures(Mechanical control, Biological control, Microbial control. Chemical control, Achievements in IPM, Summary, Model Examination Questions, Suggested books..	
2-4	Non- Insects (Biological, Damage and Management) : objectives, introductions, plants mites, nematodes, Rodents(Striped Squirrel, Indian Crested Porcupine, The Indian Gerbille, The Indian Desert Gerbille, House rat, Soft-Furred Filed Rat, The House Mouse, Lesser Bandicoot Rat, Large Bandicoot Rat), Rodent Control, Birds, Birds pest Management, summary, Model Examination Questions, Suggested Books	
3-1	Silkworms (Biology, Nature of produce, uses) : objectives, introduction, Kinds of silkworms, Morphology of silkworms, Voltinism and molting, Exploitation of hererosis, Silkworm rearing, Disease of silkworms(Protozoan, Bacterial, Viruses, Fungal Desases), Pest of silkworm, Use of silk and its economic importance, Summary, Model Examination Questions, suggested books.	CR 03
3-2	Honeybees : (Biological, nature of produce, uses) : objectives, introductions, Kinds of honeybees, structural adaptations in honeybees (Legs, Digestive system, Stings, Specialized glands) The Bea Colony(Queen, Drones, Workers) Foraging of Bees, Evolution of Social life in honeybees, Social behaviors of honeybees, beekeeping, Appliance in beekeeping, Diseases of honeybees, Pests of honeybees, Uses of honey, Beeswax and its uses, Bee Venom, Summary, Model Examination Questions, Suggested Reference books	
3-3	Lac insects and other beneficial insects : objective, introduction, Historical background of Lac, life history of Lac insect. Lac cultivation. Host plants of Lac insect. Problems of Lac insects. Problem of	

	Lac growers, Enemies of Lac insects, Yield, Preparation for the market, Technology of Lac processing. Uses of shellac, Various products of Lac, Predators and parasitoids, insect pollinators, Summary, Model Examination Questions, Suggested books.	
4-1	Livestock entomology : objectives, introduction, insect associate with Cattle(horse fly, stable fly, Cattle fly, Blow fly, Ox-warble fly, House fly, Blood Sucking Sand flies, Eye flies, Eye Frequenting Moths, Insects Associated with Poultry, Summary, Model Examination, Suggested Books.	CR 04
4-2	Urban Entomology : objectives, introduction, Termites, (character, Classification of termites, cats of Termites, Biological and caste Differentiation, Feeding Habits, Habitations of termites, Control) Cockroaches (Character, Biology, Economic Importance, control), Ants(Biology, Economic importance, control) Summary, Model Examination Questions, Suggested books	
4-3	Medical Entomology : Objectives, introduction, Insect of Medical Importance(Mosquitoes, Sand flies, The sumulium or Black flies, Eye-flies, the housefly, Bed bug, The Assassin Bug, Fleas, Human Body Louse, Summary, Model Examination Questions, Suggested Books.	
4-4	Forensic Entomology : objectives, introduction. scope of forensic entomology (Estimating PMI, Corpse relocation, finding the cause of death, Detecting physical Abuse, Detection controlled/contraband substances, Forensic Entomology in wildlife Investigation) history of Forensic entomology in wildlife investigation, process after death, Estimating time of death(Principle 1: ager and stage of insect, Accumulated Degree hours, factor affecting rate of development of maggots on a Body, principle 2 faunal succession,) Arthropod diversity on the carrion(Flies Associated with carrion, Beetles Associated with carrion, Moths associated with carrion, Wasps, ants and bees Associated with Carrion, Death Sense procedures (Sense observation and whether data, Collection of insect from sense after body removal, Laboratory Finding, Data Analysis, Interpretation of Blood Spatter Pattern, Entomological Collection Equipment, Collection and observation of insect, Summary, Model examination questions, Suggested Books)	
4-5	Aquatic Entomology: Objectives, Introduction, Taxonomic Position of Aquatic insects, Respiration in Aquatic insects, Aquatic Locomotion, Summary, Model Examination Questions.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY024	Applied Entomology		
Text-Books			
ZGY024	Applied Entomology Prof. T.B. Gour, Prof. T.V.K Singh, Dr. J. Sathyanarayana	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY024-RB1	An introduction to the study of insects	1976	Hardcover
ZGY024-RB2	Essential Entomology: An Order-by-Order Introduction 1st Edition		George C. McGavin
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY024 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY024-WL1			

ZGY025 IMMUNOLOGY (PRACXTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY025	Immunology (Practical)	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: <ul style="list-style-type: none"> BSc with Zoology or equivalent from a recognized University/Board 	After successful completion of this course, student should be able to <ul style="list-style-type: none"> Develop technical skill To empower our students with practical skills to comprehend the physiology and other functions of each and every vital systems

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4 1-5	Blood Film preparation and identification of cells. Total count and differential count of leukocyte Determination of total red blood cell and white blood cells in the blood sample Estimation of serum proteins Estimation of Albumin and globulin	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4 2-5 2-5 2-6	Histology of lymphocyte organs Blood groups Widal test Pregnancy test Immune diffusion Immune electrophoresis ELISA- demonstration	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	Blood film preparation and identification of cells: introduction, Aims, objective, Material, p[procedure (Preparation of Blood Smear, Staining with Ginemsa), Examination of blood Film and identification of leukocytes.	CR 01
1-2	Total Count and differential count of leukocytes: introduction, Aim, objective, Material, producer, precautions	
1-3	Determination of total red blood cells and white blood cells in the blood sample :Determination of total red blood cells present in the given sample of blood(introduction, Aim, Objective, Apparatuses, producer, Calculations, precautions) Determination of total white blood cells present in the blood sample (introduction, aim, objective, apparatus, procedure, calculations, precaution	
1-4	Estimation of total serum proteins: Introduction, Aim, Objective, Principle, Reagents, Procedure , Estimation.	
1-5	Estimation of albumin and globulin: Introduction, Aim, Objective, Principle, Reagents, Procedure, Calculation.	
2-1	Histology of lymphoid organs: Introduction, Aim, Objective, Primary lymphoid organs- thymus and bursa of fabricius, Secondary lymphoid organs-lymph node and spleen.	CR 02
2-2	Blood groups : Introduction, Aim, Objectives, Principle, Materials, Procedure, Observation, Report.	
2-3	Widal test for typhoid fever: Introduction, Aim, Objectives, Principle, Materials, Procedure, Observation, Report.	
2-4	Pregnancy test: Introduction, Aim, Objective, Principle, Materials, Procedure, Report.	
2-5	Immuno diffusion: Introduction, Aim, Objective, Principle, Materials, Procedure, Report.	
2-6	Immuno electrophoresis: Introduction, Aim, Objective, Principle, Reagents and Equipment, procedure.	
2-7	Enzyme linked immunosorbent assay: Introduction, Aim, Objective, Principle, Materials, Reagents, Procedure, Report.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY025	Immunology		
Text-Books			
ZGY025	Immunology Dr. U. Shameem, Dr. D. Govinda Rao	2006	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY025-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY025-WL1			

ZGY026: ANIMAL BIOTECHNOLOGY (PRACTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY026	Animal Biotechnology (Practical)	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: <ul style="list-style-type: none"> BSc with Zoology or equivalent from a recognized University/Board. 	After successful completion of this course, student should be able to <ul style="list-style-type: none"> Classify and solve integral equations Apply integral equations to solve ODEs

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4 1-5 1-6	Fundamental Techniques of Biotechnology General Histology and Cell Tissue Culture Cell Culture The Stem cell Propagation and maintenance of tissue culture Cell culture from cell line Cellular aspects of tumors cell.	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-5 2-6 2-7	Applied Biotechnology Microbiology – testing and evaluation of coliform bacteria Phytoplankton and Zooplanktons Production of Pathogen-free plants through meristem culture Vermitechnology Penicillin production and testing of antimicrobial activity Enzyme immobilization	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	General Histology And Cell Tissue Culture: Introduction, Aim, Objectives, Procedure- fixation, processing, embedding, sectioning, Staining Procedure- studying the histopathology of brain using haematoxylin and eosin stain, Preparation of Haemotoxylean, Preparation of eosin (stock solution), Observation and results, Histological study Connective tissue-fibroblasts, adipocytes, Morphages, collagen, fibro collage nous tissue, Epithelial Tissue-Stratified squamous epithelium, Simple columnar epithelium, pse0075dostratified columnar epithelium, Cuboidal epithelium, Simple squamous epithelium, Glandular epithelium, Liver and Pancreas, Liver, Pancreas, Muscle, Smooth muscle, Cardiac muscle, Skeletal muscle, Nervous Tissue- Nerve cell, Axon, Dendrites Observation and record.	CR 01
1-2	Cell Culture: Introduction, Aim, Material and method, Material, Equipment, Reagents, Work Area and Equipment, Preservation and storage, Maintenance, Procedure To Sanitize the Laminar hood, Resuscitation of frozen Cell lines, procedure, Subculture of Adherent(monolayer) cell lines, procedure, Key Points, Sub Culture Short Protocol And Splitting Guide, Daily Culture Check , Cell Culture Splits, Trypsinizing T25 Flasks, T25 or Two 6-Well plates, T25 to 12-35 mm Dishes, Culture and Passage Cells, Freezing Cells Observation and Results.	
1-3	The Stem Cell: Introduction, Aim, Protocol for the culturing of bone marrow stem cells, Materials and Methods, Materials, Equipment, Reagents, Reagent setup, Procedure, Isolation of Bone marrow(BM) from Murine (Mice), Culture of Messenchymal Stem cells from isolated Murine Bone Marrow(BM), Contamination, Anticipated results , Protocol for the culturing for cord blood stem cells, Materials and Methods, Materials, Equipment, Reagent, Reagent setup, Procedure, Isolation of Human UCB Stem Cell Lineages, Mononuclear cell enrichment by Density gradient method, CD34+ cell enrichment, Cell Culture and Expectation, Nucleated Cell Count, Viability and CD34 Cell analysis, Immune cytochemistry, Flow Cytometry, Cytokine-induced expansion, Directed engineering towards the pancreatic phenotype , Immunocytochemistry, Materials and Equipments required, Materials, Reagents, Equipment, Procedure for Immunocyto chemistry, Observation and Results .	
1-4	Propagation And Maintenance of Tissue Culture: Introduction, Aim, Material and Methods, Material, Equipment, Reagents, Procedure, Sterile condition, Protocol for isolation of Chick embryo, Collagenase Disaggregation in collagens, Disaggregation , Observation and Result.	
1-5	Cell Culture From Cell line: Introduction, Aim, Basic techniques-The 'Do's and Don' ts' of cell culture, Aseptic Technique and Good Cell Culture Practice, Resuscitation of frozen cell Lines, Subculture of Adherent Cell Lines, Subculture of Semi- Adherent cell Lines, Subculture of Suspension Cell Line, Cell Qualification, Cryopreservation of cell Lines, Subculture Short Protocol and Splitting Guide, Establishment Maintenance and Cloning of Human primary cell Stains, Observation and Result.	
1-6	Cellular Aspects of Tumors Cell: Introduction, Aim, Materials and Methods, Morphological Characteristics Feature of Transformed cells in culture, Differences between benign and Malignant tumors in histological sections, Different characteristics features of the Glioma and Neuoblastoma from the histological sections, Observation and Result.	
2-1	Microbiology – Testing and evaluation of coliform bacteria : introduction, Determination of total bacteria population by stranded plate count technique, Bacterial examination of water by multiple-tube fermentation test, Detection of coliforms to determine water purity using membrane filter method, observation,result.	CR 02
2-2	Phytoplankton's and zooplanktons : introduction, food cycle in fresh water pond, Qualitative Estimation of plankton, material required, procedure for plankton identification, Qualitative estimation of planktons, materials required, procedure, Calculation and result	
2-3	Procedure of pathogen- : free plants through merited culture : introduction, materials required, procedure, observation and results, Exercise.	

2-4	Vermi technology : introduction, source of raw materials, initial conditioning of waste, watering the beds, harvesting of vermicompost, harvesting of cocoons and newly emerged earthworms, packing of vermin compost, vermicompost Tea, Vermiwash, Estimation of nitrogen, estimation of organic carbon, Estimation of Acid phosphatase, Estimation of alkaline phosphate, estimation of phosphorous by Fiske-Subbarow method	
2-5	Enzyme immobilization : introduction, principles of enzymes immobilization, types of immobilization, Diastase Enzyme Immobilization-Alginate immobilization, α -Amylase Enzyme Immobilization-Alginate, Immobilization using sodium alginate with calcium chloride, Activity studies of immobilized enzyme, Effect of temperature on free and immobilized lipase, Effect of pH on free and immobilized lipase, Kinetic studies of immobilized lipase, temperature studies, pH studies, observation, result & record.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY026	ANIMAL BIOTECHNOLOGY		
Text-Books			
ZGY026	Animal Biotechnology Prof. P. Prakash Babu, Dr. A. Padmini. Prof. A. Indira, Prof. Jayraj, Prof. Radha D. Kale	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books:			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY026-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY026-WL1			

ZGY027 TOXICOLOGY (PRACTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	YashwantraoChavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY027	Toxicology (Practical)	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: <ul style="list-style-type: none"> BSc with Zoology or equivalent from a recognized University/Board. 	After successful completion of this course, student should be able to <ul style="list-style-type: none"> Develop technical skill To empower our students with practical skills to comprehend the physiology and other functions of each and every vital systems

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4 1-5 1-6	Computation of toxicity- Probit Analysis Estimation of contact toxicity of insecticide film. Evaluation of efficacy of mosquito repellent coils Evaluation of efficacy of mosquito repellent creams Testing efficacy of household insecticides Detection of insecticide resistance in <i>helicoverpa armigera</i>	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4 2-5 2-6 2-7 2-8	Nerve cells in insects Mixed Function oxidizes (MFO) Assay Assay of carboxyl esterase Estimation of acetyl cholinesterase in insects Emulsion Stability test Determination of pesticide residues in water Determination of pesticide residues in Soil Determination of pesticides in fat	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit (Exercises word should not be mentioned here as it is a part of each unit)	CR
1-1	Computation of toxicity- probity Analysis: Aim, Objectives, Materials, Procedure,(Method 1: Graphical Method, Method 2Aritjematical Estimation) Exercise, references, model Examination Questions.	CR 01
1-2	Estimation of contact toxicity of insecticide films: Aim, objectives, materials, procedure (preparation of stock solutions, preparation of insecticide concentrations for tests), Observations, References, model examination questions.	
1-3	Evaluation of efficicacy of mosquito Repellent coils : Aims, objectives, materials, procedure, observations, references, model examination questions	
1-4	Evaluation of mosquito repellent creams: aims, objectives, materials, procedure, observations reference, model examination questions.	
1-5	Testing efficiency of household insecticide: Aim, Objectives materials, procedure, observations, references, model examination questions.	
1-6	Detection of insecticide resistance in helicoverpa armigera (hubn): Aims, objectives, Materials, Procedure, observations, eferances, model examination questions.	
2-1	Observation of nerve cells in insects : Aims, objectives, materials, procedure, observations, reference, Model examination questions	CR 02
2-2	Mixed function oxidizes (MFO) assay: Aims, objectives, materials, procedure, observations, and reference. Model examination questions,	
2-3	Carboxyl esterase's assay : Aim, objectives, materials, procedure, observations, reference, Model examination questions	
2-4	Determination of acetyl cholinesterase in insects : Aim, objectives, materials, procedure, observations, reference, Model examination questions	
2-5	Emulsion stability test : Aim, objectives, materials, procedure, observations, reference, Model examination questions	
2-6	Determination of pesticide residues in water : Aim, objectives, materials, procedure, observations, reference, Model examination questions	
2-7	Determination of pesticide residues in Soil : Aim, objectives, materials, procedure, observations, reference, Model examination questions	
2-8	Determination of pesticide residues in Fat : Aim, principle, objectives, materials(Apparatus, pesticides, Reagents) procedure (Glorisil Column Cleanup, chromatography) observations, reference, Model examination questions	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY027	Toxicology		
Text-Books			
ZGY027	Toxicology Prof.M. Sriramulu, Prof. T.B. Gour, Dr. Ch. Srinivasa Rao	2010	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY027-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY027-WL1			

ZGY028 APPLIED ENTOMOLOGY (PRACTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY028	Applied Entomology (Practical)	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully complete:</p> <ul style="list-style-type: none"> BSc with Zoology or equivalent from a recognized University/Board. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> Develop technical skill To empower our students with practical skills to comprehend the physiology and other functions of each and every vital systems

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4 1-5 1-6 1-7	General histology and cell Tissue culture External characters of typical insect (viz. Grasshopper) Demonstration of chitin in the Integument Identification of some common orders of class insect. Identification important pests and their symptoms of damage Identification of important pests stored grains-and their symptoms of damage Important pests of horticulture; crops-and their symptoms if damage Attractions by insect sex pheromones	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4 2-5 2-6	Forensic Entomology Practical Excavation of an Active Termite Mound Collocation of silk Gland, Appendages, Digestive system Dissection of Mouth parts of Insects. Dissection of silk gland appendages digestive system. Visit to biological control laboratory	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	External characters of a typical: introduction, apparatus/ materials/chemicals, procedure(The head, the thorax, the abdomen), observations and records, types of wings, (Wings coupling apparatus) legs of insect (A typical leg, types of legs) end to end session	CR 01
1-2	Demonstration of chitin in the integument: introductions, apparatuses/ materials/chemicals required procedure, observation and records.	
1-3	Identification of some common orders of class insect : introduction, apparatus/ materials/chemicals required, insect collecting nets, aspirator, killing bottles, mounting and preserving insects, procedure (order thysanurum, Ephemeroptera, odonata, orthoptera phasimda, dermaptera, dictyoptera, isoptera, mallophaga, siphunculata, hemiptera, Coleoptera, Lepidoptera, hymenoptera)	
1-4	Identification of Important pests-and their symptoms of damage : introduction, apparatus/materials/chemicals required, important parts and their symptoms of damage, (rice gall midges), rice green leaf hopper, sorghum shootfly, sorghum stem borer, sorghum earhead bug, sorghum midge, Ragi Pink borer, red gram pod borer, lentil pod borer, red gram pod fly, sugarcane pyralis, castor semi-looper, Ground hunt leaf miner, Hairy caterpillars, cotton aphid, cotton pink boll worms, tobacco caterpillar, cotton whitefly, observation and record)	
1-5	Identification of important pests stored grains and their symptoms of damage: introduction, materials and method, important pests of stored grains (red flour beetle, rice moth, Angoumois grain moth, pulse beetle) observation and record	
1-6	Important pests of horticulture crops-and their symptoms of damage: introduction, apparatus/materials/chemicals required (okra shoot and fruit borer, brinjal shoot and fruit borer, brinjal epilachna beetle, Diamond –back moth, chili thrips, scirtothrips dorsalis hood, Grapevine meal bug, mango hopper, citrus leaf miner, citrus butterfly, coconut black headed caterpillar, observation and records, model examination questions	
1-7	Attraction by insect sex pheromones: instructions, Apparatus. required, observations and records	
2-1	Forensic entomology : introductions, procedure (collection of specimens, apparatus/ materials/chemicals required, preparing the bait, setting the bait, observations, record, identification insects and the adult flies (materials, procedure, observation and record) procedure a report discussion, end to end session	CR02
2-2	Excavation of an active termite mound : introduction, materials & methods, procedure, observations and record, supposing theory materials (social organization, scientific classification, termite nests	
2-3	Collection and identification of mosquito vectors: introduction, procedure for mosquito collection, material (insect collecting nets, Aspirator, killing bottles), adult mosquito collection (collection with aspirator, animal or human bait collections, spray sheet collections) Mosquito larvae collections (the shallow skim, partial submersion, complete submersion, dipper as a background, "flow in: method, scraping, simple scoop, precautions, observations and records, model examination questions, supporting theory materials, scientific classification, development, Differences among species	
2-4	Types of mouth parts of insects: introductions, apparatus/ materials/ chemicals required, procedure (chewing and biting type-grasshopper, piercing and sucking type-bug, piercing and sucking type-mosquito, sponging type-house fly, siphoning type-moth /butterfly, types of mouthparts, observations and records, model examination questions.	
2-5	Dissection of silk gland, appendages, digestive system : introduction, materials requires, dissection of silk gland, dissection of spiracles and appendages, caudal horn (dissection of spiracles, dissection of appendages, dissection of caudal horn, observation and precaution, model examination question	

2-6	Visit to biological control laboratory (to observe the multiplication of insect parasitoids) : introduction(biology and life cycle of trichogramma, using trichogramma in a biological control program, mass rearing of trichogramma, release basic, relapse rates, observations and records, model examination questions	
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LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY028	Applied entomology		
Text-Books			
ZGY028	Applied entomology Prof. T.B. Gour, Dr. J. Sathyanarayana	2009	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY028-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY028-WL1			

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