



Shri Vile Parle Kelavani Mandal's
**MITHIBAI COLLEGE OF ARTS, CHAUHAN INSTITUTE OF SCIENCE & AMRUTBE
JIVANLAL COLLEGE OF COMMERCE AND ECONOMICS (AUTONOMOUS)**
*NAAC Reaccredited 'A' grade, CGPA: 3.57 (February 2016),
Granted under RUSA, FIST-DST & -Star College Scheme of DBT, Government of India,
Best College (2016-17), University of Mumbai*

Affiliated to the
UNIVERSITY OF MUMBAI

Program: S. Y. B.SC.

Course: I, II, III

Semester III & IV

**Choice Based Credit System (CBCS) with effect from the
Academic year**

2018-19

PROGRAMME SPECIFIC OUTCOMES (PSO'S)

On completion of the B.Sc - _____, the learners should be enriched with knowledge and be able to-

- PSO1:** _____
- PSO2:** _____
- PSO3:** _____
- PSO4:** _____
- PSO5:** _____
- PSO6:** _____
- PSO7:** _____
- PSO8:** _____

Preamble

Due to rapid advancement in technology, new ideas and concepts, and an ocean of information being generated every day necessitates updating the students in this present era of exponential information and knowledge hence in the present practice of syllabus revision, students are unable to imbibe new ideas and concepts as there was limited scope of including them within the syllabi that was theoretical with poor applicability but with autonomous status of the college it will be possible now.

Looking at the employment generating potential and need of trained human resource in various service sectors in our state, it has become imperative to make a breakthrough from the traditional practice of revising syllabus; and instead giving an opportunity to the stakeholders to adapt and acclimatize with the changes around them and imbibe knowledge which shall enable them to develop entrepreneurship and / or employment avenues and opportunities after pursuing the coveted degree which can be achieved under autonomy as complete flexibility and liberty is with the college with no constrained from the university setup.

With this intention, all the committee members worked extensively and exhaustively; and prepared this syllabus. The opinions of all stake holders are incorporated in the syllabus to make it versatile and student friendly with high applicability. We hope that the stakeholders will enjoy the learning of this syllabus in the classrooms, laboratories and on the field.

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
Jivanlal College of Commerce & Economics (AUTONOMOUS)**

Evaluation Pattern

The performance of the learner will be evaluated in two components. The first component will be a Continuous Assessment with a weightage of 25% of total marks per course. The second component will be a Semester end Examination with a weightage of 75% of the total marks per course. The allocation of marks for the Continuous Assessment and Semester end Examinations is as shown below:

a) Details of Continuous Assessment (CA)

25% of the total marks per course:

Continuous Assessment	Details	Marks
Component 1 (CA-1)	Assignments	15 marks
Component 2 (CA-2)	Class test	10 marks

b) Details of Semester End Examination

75% of the total marks per course. Duration of examination will be two and half hours.

Question Number	Description	Marks	Total Marks
Q1	Objective*	15	15 marks
Q.2.	UNIT 1 a. Answer any one of the two b. Answer any one out of the two	10 05	15 marks
Q.3.	UNIT 2 a. Answer any one of the two b. Answer any one out of the two	10 05	15 marks
Q.4.	UNIT 3 a. Answer any one of the two b. Answer any one out of the two	10 05	15 marks
Q.5.	Answer any Three out of six Unit 1 - (Two notes of five marks each) Unit 2 - (Two notes of five marks each) Unit 3- (Two notes of five marks each)	15	15 marks
Total Marks			75

Signature

Signature

Signature

HOD

Approved by Vice –Principal

Approved by Principal

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
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Program: B.Sc. (2021-22)				Semester: III	
Course: 5. Fundamentals of Genetics, Chromosomes and Heredity, Nucleic acids				Course Code: USMAZO301	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutori al (Hours per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)
03	03			25	75
Learning Objectives: To introduce basic terms of genetics To develop conceptual clarity of Mendelian principles of inheritance and other forms and pattern of inheritance To familiarize the learners with the structure, types and classification of chromosomes To introduce the concept of sex determination and its types, sex influenced and sex-limited genes To introduce the learner to the classical experiments proving DNA as the genetic material To introduce the learner the structure of nucleic acids and the concept of central dogma of molecular biology To familiarize the learner with the concept of gene expression and regulation					
Course Outcomes: After completion of the course, learners would be able to: CO1: Learner shall comprehend and apply the principles of inheritance to study heredity CO2: Learner will understand the concept of multiple alleles, linkage and crossing over CO3: Learner will comprehend the structure of chromosomes and its types CO4: Learner shall understand the mechanisms of sex determination CO5: Learner would be able to correlate the disorders linked to a particular sex chromosome CO6: Learner will understand the importance of nucleic acids as genetic material. CO7: Learner shall comprehend and appreciate the regulation of gene expressions					
Outline of Syllabus: (per session plan)					
Module	Description				No of Hours
1	Fundamentals of Genetics 1.1 Introduction to Genetics <ul style="list-style-type: none"> • Definition, Scope and Importance of Genetics. • Classical and Modern concept of Gene (Cistron, Muton, Recon). • Brief explanation of the following terms: Allele, Wild type and Mutant alleles, Locus, Dominant and Recessive traits, Homozygous and Heterozygous, Genotype and Phenotype, Genome. 1.2 Mendelian Genetics <ul style="list-style-type: none"> • Mendelian Genetics: Monohybrid & Dihybrid Cross, Test Cross, Back Cross, Mendel's Laws of Inheritance, Mendelian Traits in Man. • Exceptions to Mendelian inheritance: Incomplete dominance, Co- dominance, Lethal Genes, Epistasis - Recessive, Double recessive, Dominant and Double 				15 L

	<p>dominant.</p> <ul style="list-style-type: none"> • Chromosome theory of inheritance. • Pedigree Analysis-Autosomal dominant and recessive, X- linked dominant, and recessive. <p>1.3 Multiple Alleles and Multiple Genes</p> <ul style="list-style-type: none"> • Concept of Multiple Alleles, Coat colour in rabbit, ABO and Rh blood group systems • Polygenic inheritance with reference to skin colour and eye colour in humans. • Concept of Pleiotropy. <p>1.4 Linkage and Crossing Over</p> <p>Linkage and crossing over, Types of crossing over, Cytological basis of crossing over.</p>	
<p style="text-align: center;">2</p>	<p>Chromosomes and Heredity</p> <p>2.1 Chromosomes</p> <ul style="list-style-type: none"> • Types of Chromosomes–Autosomes and Sex chromosomes • Chromosome structure - Heterochromatin, Euchromatin • Classification based on the position of centromere • Endomitosis, Giant chromosomes- Polytene and Lamp brush chromosomes and Significance of Balbiani rings <p>2.2 Sex- determination</p> <ul style="list-style-type: none"> • Chromosomal Mechanisms: XX-XO, XX-XY, ZZ-ZW • Sex determination in Honey bees- Haplodiploidy • Sex determination in <i>Drosophila</i>-Genic balance theory, Intersex, Gynandromorphs • Parthenogenesis • Hormonal influence on sex determination-Freemartin and Sex reversal. • Role of environmental factors- Bonelia and Crocodile • Barr bodies and Lyon hypothesis <p>2.3 Sex linked, sex influenced and sex-limited inheritance.</p> <ul style="list-style-type: none"> • X-Linked: Colour-blindness, Haemophilia • Y-linked: Hypertrichosis • Sex-influenced genes • Sex-limited genes 	<p style="text-align: center;">15 L</p>
<p style="text-align: center;">3</p>	<p>Nucleic acids</p>	<p style="text-align: center;">15 L</p>

	<p>3.1 Genetic material</p> <ul style="list-style-type: none"> • Griffith's transformation experiments, Avery-Macleod and McCarty, Hershey Chase experiment of Bacteriophage infection • Chemical composition and structure of nucleic acids • Double helix nature of DNA, Solenoid model of DNA • Types of DNA – A, B, Z & H forms • DNA in Prokaryotes -Chromosomal and Plasmid • Extra nuclear DNA -Mitochondria and Chloroplast • RNA as a genetic material in viruses • Types of RNA: Structure and function <p>3.2 Flow of genetic information in a eukaryotic cell</p> <ul style="list-style-type: none"> • DNA Replication • Transcription of mRNA • Translation • Genetic code <p>3.3 Gene expression and regulation</p> <ul style="list-style-type: none"> • One gene-one enzyme hypothesis /one polypeptide hypothesis • Concept of Operon • Lac Operon 	
	Total	45 L
PRACTICALS		
<ol style="list-style-type: none"> 1. Extraction and detection of DNA 2. Extraction and detection of RNA. 3. Mounting of Barr bodies. 4. Study of mitosis- temporary squash preparation of Onion root tip 5. Detection of blood groups and Rh factor. 6. Chromosome morphology: (photograph to be provided) 7. Problems in Genetics [a) Monohybrid/ Dihybrid Cross: b). X- linked inheritance: c). Multiple Alleles] 8. Problems based on molecular biology and Pedigree analysis <p style="text-align: center;">Suggested Readings</p> <ol style="list-style-type: none"> 1. Principles of Genetics. Gardner, E.J., Simmons, M.J and Snustad, D.P. John Wiley and Sons 2. Concepts of Genetics. Klug, W.S., Cummings M.R., Spencer, C.A. Benjamin Cummings 3. Genetics- A Molecular Approach. Russell, P. J Benjamin Cummings 4. Genetics: Analysis of Genes and Genomes. Daniel L., Hartl, Elizabeth W. Jones Jones& Bartlett Publishers 5. Introduction to Genetic Analysis. Griffiths, A.J.F., Wessler. S.R., Lewontin, R.C. and Carroll, S.B. W. H. Freeman and Co 6. Cell Biology Genetics, Molecular Biology Evolution and Ecology Verma P.S. and Agrawal P.K., 9th edition, S. Chand Publication, New Delhi 		

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Jivanlal College of Commerce & Economics (AUTONOMOUS)**

<p>7. Principles of Genetics – Eight edition- Eldon John Gardner, Michael J. Simmons, D. Peter Snustad</p> <p>8. Genetics- Weaver, Hedrick, third edition, McGraw Hill Education</p> <p>9. Genetics A Mendelian approach Peter J. Russel, Pearson Benjamin Cummings</p> <p>10. Genetics A conceptual approach, Benjamin A. Pierce, Southwestern University, W.H. Freeman and company, New York</p> <p>11. Genetics, Third Edition, Monroe W. Strickberger</p> <p>12. Genetics from gene to genome, third edition, Leeland H. Hartwell, Leroy Hood, Michael 7. L. Goldberg, Ann E. Reynolds, Lee M. Silver, McGraw Hill Education</p>	
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Program: B.Sc. (2021-22)	Semester: III
Course: 6. Amazing animals, Biodiversity and its Conservation	Course Code: USMAZO302

Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)
03	03			25	75

Learning Objectives:

To take learners through a captivating journey of hoarded wealth of marvellous animal world
 To orient learners about rich heritage of Biodiversity of India and make them understand significance of its conservation
 To teach learners about innovative and novel work of scientists/philosopher/entrepreneurs in the field of biological sciences.

Course Outcomes:

After completion of the course, learners would be able to:

- CO1:** Curiosity will be ignited in the mind of learners, to know more about the fascinating world of animals which would enhance their interest and love for the subject of Zoology.
- CO2:** Learners would appreciate treasure of Biodiversity, its importance and hence would contribute their best for its conservation.
- CO3:** Minds of learners would be impulsed to think differently and would be encouraged ipso facto to their original crude ideas from the field of biological sciences

Outline of Syllabus: (per session plan)

Module	Description	No of Hours
1	<p>Amazing animals</p> <p>1.1 Echolocation in Bats and Cetaceans - Dolphins and Whales</p> <p>1.2 Mechanism of Pearl formation in Mollusca</p> <p>1.3 Bioluminescence in Animals: Noctiluca, Glow worm, Firefly, Angler Fish (Mechanism and use for the animal)</p> <p>1.4 Regeneration in Animals - Earthworm (Annelida) and Lizard (Reptile)</p>	15 L

	<p>1.5 Mimicry in Butterflies and its significance: Great Eggfly and Common Crow, Common Palmfly and Plain Tiger.</p> <p>1.6 Mechanism of Coral formation and types of Coral reefs</p> <p>1.7 Bird migration: Definition, types and factors inducing bird migration</p> <p>1.8 Adaptive features of desert animals: Reptiles (Phrynosoma) and Mammals (Camel)</p> <p>1.9 Breeding and Parental care in:</p> <p>1.9.1 Pisces - Ovo-viviparous (Black Molly/Guppy), Mouth brooders (Tilapia), Brood pouches (Sea horse)</p> <p>1.9.2 Amphibia - Mouth brooders (Darwin's Frog), Egg carriers (Midwife Toad)</p> <p>1.9.3 Mammals-Egg-laying (Duck-billed Platypus), Marsupials (Kangaroo)</p> <p>1.10 Aves: Brood Parasitism (Cuckoo)</p>	
2	<p>Biodiversity and its Conservation</p> <p>2.1 Introduction to Biodiversity - Definition, Concepts, Scope and Significance</p> <p>2.2 Levels of Biodiversity - Introduction to Genetic, Species and Ecosystem Biodiversity</p> <p>2.3 Introduction of Biodiversity Hotspots- (Western Ghats and Indo-Burma Border)</p> <p>2.4 Values of biodiversity - Direct and Indirect use value</p> <p>2.5 Threats to Biodiversity - Habitat loss and Man-Wildlife conflict</p> <p>2.6 Biodiversity conservation and management</p> <p>2.6.1 Conservation strategies: <i>in situ</i>, ex-situ, National parks, Sanctuaries and Biosphere reserves.</p> <p>2.6.2 Introduction to International efforts : Convention on Biological Diversity (CBD), International Union for Conservation of Nature and Natural Resources (IUCN), United Nations Environment Program - World Conservation Monitoring Centre (UNEP-WCMC)</p> <p>2.6.3 National Biodiversity Action Plan, 2002</p> <p>2.6.4 Introduction to Indian Wildlife (Protection) Act, 1972 and Convention for International Trade of endangered species</p>	15 L
3	Case Studies	15 L
	Total	45 L
PRACTICALS		
<ol style="list-style-type: none"> 1. Mounting of foraminiferan shells from sand (any 3) 2. Study of types of Corals - Brain, Organ pipe, Stag Horn, Mushroom coral 3. Study of the following: <ul style="list-style-type: none"> • Symbiosis (Termite and Trychonympha, hermit crab and sea anemone) • Camouflage (leaf insect, chameleon) • Cannibalistic mate-eating animals (Spider and Praying Mantis) • Animal architects: Termites, Harvester ant and Baya weaver bird • Study of bioluminescent organisms – Noctiluca, glow worm, fire fly, angler fish 4. Breeding and parental care in Amphibia- <i>Rhacophorus</i>, Midwife toad, Darwin's frog, Caecilian. 		

5. Mounting of scales of fish (placoid, cycloid and ctenoid)
6.
 - a) Study of Adaptive radiation in Reptiles - Turtle, Tortoise, *Phrynosoma*, *Draco*
 - b) Identification and differentiation of venomous and non-venomous snakes (Scales, Fangs, Bite marks, etc.)
7. Study of Types of feathers(contour, filoplume, down), beaks(Nectar feeding , Insect catching, Fruit eating, Scavenging, Filter feeding), claws (perching, wading, swimming, hopping) in birds
8. a) Identification of birds - Coppersmith Barbet, Bulbul, Rose ringed Parakeet, Magpie Robin, two local birds
b) Field Report – To be done in a group of ten students (submission of written / typed report preferably along with photographs/ tables/ graphs)
9. Observations of fauna in the field (with reference to theory syllabus)

Suggested Readings

1. Wonders of the Animal World - University Text Book of Zoology, F.Y.B.Sc. Semester I Course 1. V.V. Dalvie, G.B. Raje, P. Sardesai, N.S. Prabhu, University Press.
2. Vertebrate Zoology Volume I- Jordan and Verma , S. Chand and Co.
3. Invertebrate Zoology Volume II- Jordan and Verma , S. Chand and Co.
4. Invertebrate Zoology- T. C. Majumuria , S. Nagin and Co.
5. Chordate Zoology- P. S. Dhami and J. K. Dhami , R. Chand and Co.
6. Invertebrate Zoology- P. S. Dhami and J. K. Dhami , R. Chand and Co.
7. Introduction to Vertebrates- Moore Cambridge University- Low Priced Edition
8. Zoology- S. A. Miller and J. B. Harley, Tata McGraw Hill
9. Modern Textbook of Zoology, Invertebrates, R. L. Kotpal
10. Fundamentals of Ecology- E. P. Odum , Sunders Publication
11. Fundamentals of Ecology- M.C.Dash-2nd edition, Tata McGraw Hill
12. Essentials of Ecology and Environmental Science - S.V.S Rana
13. Biodiversity- S.V.S Rana- Prentice Hall Publications
14. Modern Biology- V. B. Rastogi
15. Biology of Mollusca- D. R. Khanna
16. A Textbook of Zoology, Vol. II- T. Jeffery Parker and William. A. Haswell-Low Price Publications
17. Ecology and Environment- P. D. Sharma, R. K. Rastogi Publications
18. Introduction to Ecology- R. Dajoz
19. Wildlife Laws and its Impact on Tribes- Mona Purohit , Deep and Deep Publications
20. Biodiversity- K.C.Agarwal- Agro Botanica Publications
21. Butterflies of India – Isaac Kehimkar- BNHS Publication

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
Jivanlal College of Commerce & Economics (AUTONOMOUS)**

Program: B.Sc. (2021-22)				Semester: III	
Course: 7 Ethology, Parasitology, Economic Zoology				Course Code: USMAZO303	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)
				25	75

Learning Objectives:

- To equip learner with a sound knowledge of how animals interact with one another and their environment
- To enable the learner to understand different behavioural patterns.
- To acquaint the learner with the concepts of parasitism and its relationship in the environment.
- To introduce the learner to modes of transmission of parasites
- To disseminate information on economic aspects of animals like apiculture, vermiculture and dairy science. To encourage young learner for self-employment

Course Outcomes:

After completion of the course, learners would be able to:

- CO1:** Learner would gain insight into different types of animal behaviour and their role in biological adaptations._
- CO2:** Learner would be sensitized to the feelings which are instrumental in social behaviour.
- CO3:** Learner would understand the general epidemiological aspects of parasites that affect humans and take simple preventive measures for the same
- CO4:** Learner would comprehend the life cycle of specific parasites, the symptoms of the disease and its treatment
- CO5:** Learner would gain knowledge on animals useful to mankind and the means to make the most of it.
- CO6:** Learner would learn the modern techniques in animal husbandry.
- CO7:** Learner would pursue entrepreneurship as a career

Outline of Syllabus: (per session plan)

Module	Description	No of Hours
1	<p>Ethology</p> <p>1.1 Introduction to Ethology:</p> <ul style="list-style-type: none"> • Definition, History and Scope of Ethology • Animal behaviour : Innate and Learned behaviour • Types of learning: Habituation, Imprinting and Types of imprinting - Filial and sexual, Classical conditioning, Instrumental learning and insight learning. <p>1.2 Aspects of animal behaviour:</p> <ul style="list-style-type: none"> • Communication in bees and ants • Mimicry and colourations • Displacement activities, Ritualization • Migration in fish, schooling behaviour 	

	<ul style="list-style-type: none"> • Habitat selection, territorial behaviour <p>1.3 Social behaviour:</p> <ul style="list-style-type: none"> • Social behaviour in primates-Hanuman langur • Elements of socio-biology: Altruism and Kinship 	
2	<p>Parasitology</p> <p>2.1 Introduction to Parasitology and Types of Parasites</p> <ul style="list-style-type: none"> • Definitions: Parasitism, Host, Parasite, Vector-biological and mechanical. • Types of parasites-Definitive, Intermediate, Ectoparasites, Endoparasite and their subtypes • Parasitic adaptations in Ectoparasites and Endoparasites • Types of hosts: Intermediate and definitive, reservoir <p>2.2 Host-parasite relationship-Host specificity</p> <p>Definition, structural specificity, physiological specificity and ecological specificity.</p> <p>2.3 Life cycle, pathogenicity, control measures and treatment</p> <p><i>Entamoeba histolytica, Fasciola hepatica, Taenia solium, Wuchereria bancrofti</i></p> <p>2.4 Morphology, life cycle, pathogenicity, control measures and treatment</p> <p>Head louse(<i>Pediculus humanus capitis</i>), Mite (<i>Sarcoptes scabiei</i>), Bed bug (<i>Cimex lectularis</i>)</p> <p>2.5 Parasitological significance</p> <p>Zoonosis- Bird flu, Anthrax, Rabies and Toxoplasmosis</p>	
3	<p>Economic Zoology</p> <p>3.1 APICULTURE</p> <p>3.1.1 Methods of bee keeping and management</p> <ul style="list-style-type: none"> • An introduction to different species of honey bees used in apiculture. • Selection of flora and bees for apiculture. • Advantages and disadvantages of traditional and modern methods of apiculture. • Pests and Bee enemies- Wax moth, wasp, black ants, bee-eaters, king crow and disease control <p>3.1.2 Economic importance</p> <ul style="list-style-type: none"> • Honey- Production, chemical composition and economic importance • Bee wax- Composition and economic importance. • Role of honey bee in pollination. <p>3.2 VERMICULTURE</p>	

	<p>3.2.1 Rearing methods, management and economic importance</p> <ul style="list-style-type: none"> • An introduction to different species of earthworms used in vermiculture. • Methods of vermiculture. • Maintenance and harvesting <p>Economic importance: advantages of vermiculture, demand for earthworms; market for vermicompost and scope for entrepreneurship.</p> <p>3.3 DAIRY SCIENCE</p> <p>3.3.1 Dairy development in India</p> <p>Role of dairy development in rural economy, employment opportunities</p> <p>3.3.2 Dairy Processing</p> <p>Filtration, cooling, chilling, clarification, pasteurization, freezing</p> <p>3.3.3 Milk and milk products</p> <ul style="list-style-type: none"> • Composition of milk • Types of milk: <ul style="list-style-type: none"> A. Buffalo milk and B. Cow milk (A1 and A2) • Whole milk and toned milk <p>Milk products</p>	
	Total	
PRACTICALS		
<ol style="list-style-type: none"> 1. Extraction of Casein from Milk and its qualitative estimation 2. Preparation of paneer from given milk sample 3. Measurement of density of milk using different samples by Lactometer 4. Study of Honey Bee: <ol style="list-style-type: none"> a) Life Cycle of Honey Bee and Bee Hive b) Mouthparts of Honey Bee c) Legs of Honey Bee d) Sting Apparatus of Honey Bee 5. Study of ethological aspects <ol style="list-style-type: none"> a) Warning Colouration b) Animal Instinct c) Imprinting d) Communication in animals: Chemical signals and Sound signals e) Displacement activities in animals: Courtship and mating behaviour in animals and Ritualization 6. Study of Protozoan parasites 		

a. *Trypanosoma gambiense*

b. *Giardia intestinalis*

7. Study of Helminth parasites

a) *Ancylostoma duodenale*

b) *Dracunculus medinensis*

8. Parasitic adaptations: Scolex and mature proglottid of Tapeworm

9. Study of Ectoparasites

a. Leech

b. Tick

c. Mite

10. Project- Suggested topics on economic zoology (e.g. Apiculture/ Sericulture/ Lac culture / Vermicompost technique / Construction of artificial beehives /Animal husbandry/ Aquaculture etc) Project- Suggested topics on economic zoology (e.g. Apiculture/ Sericulture/ Lac culture / Vermicompost technique / Construction of artificial beehives /Animal husbandry/ Aquaculture etc)

Suggested readings

1. Animal Behaviour- David McFarland

2. Animal Behaviour- Mohan Arora

3. Animal Behaviour- Reena Mathur

4. An introduction to Animal Behaviour- Dawkins

5. Animal Behaviour- Agarwal

6. Animal Behaviour- Tinbergen

7. Biology of Insects- 1992 Saxena S. C. Oxford and IBH Publishing Co New Delhi. Bombay. Calcutta

8. Bee and Bee Keeping- Roger A. Morse, Cornell University Press London

9. Vermiculture Technology - Clive A. Edwards, Norman Q. Arancon and Rhonda Sherman

10. Parasitology- Chatterjee K.D., Chatterjee Medical Publishers.

11 Medical Parasitology- Arora

12. Textbook of Medical Parasitology-.C.K Jayaram Paniker, Jaypee Brothers.

13. A text book of Parasitology- Kochhar S.K. Dominant Pub.& Dis, New Delhi.

14. Essentials of Parasitology- Gerald D. Schmidt: Universal Bookstall, New Delhi.

15. Introduction to Parasitology- Sharma P.N.and Ratnu L.S., Chand S &Co.Pvt.Ltd.

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
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16. Introduction to Parasitology- Chandler and Read John Wiley & Sons						
17. Economic Zoology Biostatistics and Animal behaviour – S.Mathur, RastogiPublicatons.						
18. Economic Zoology- Shukla G.S. & Upadhyay V.B., Rastogi Publications.						
19. A handbook on Economic Zoology, S.Chand & Co						
Program: B.Sc. (2021-22)						Semester: IV
Course: 8. Origin and Evolution of Life, Population Genetics and Evolution, Scientific Attitude, Methodology, Scientific Writing and Ethics in Scientific Research						Course Code: USMAZO401
Teaching Scheme						Evaluation Scheme
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)	
3	3			25	75	
Learning Objectives:						
To impart scientific knowledge about how life origin of life on our planet _						
To develop an understanding of genetic variability within a population and learn as to how the change in the gene pool leads to evolution of species						
Course Outcomes:						
After completion of the course, learners would be able to:						
CO1: Learner will gain insights into the origin of life						
CO2: Learner will analyse and critically view the different theories of evolution						
CO3: Learner would understand the forces that cause evolutionary changes in natural populations						
CO4: Learner would comprehend the mechanisms of speciation						
CO5: Learner will be able to distinguish between microevolution, macroevolution and megaevolution ____						
CO6: To inculcate scientific temperament in the learner						
CO7: The learner shall develop qualities such as critical thinking and analysis						
CO8: The learner will imbibe the skills of scientific communication and he/she will understand the ethical aspects of research						
Outline of Syllabus: (per session plan)						
Module	Description					No of Hours
1	Origin and Evolution of Life					15 L
	1.1 Introduction					
	<ul style="list-style-type: none"> • Origin of the Universe • Chemical evolution - Miller-Urey experiment, Haldane and Oparin theory • Origin of life • Origin of eukaryotic cell 					

	<p>1.2 Evidences in favour of organic evolution</p> <p>Evidences from geographical distribution, palaeontology, anatomy, embryology, physiology and genetics</p> <p>1.3 Theories of organic evolution</p> <ul style="list-style-type: none"> • Theory of Lamarck • Theory of Darwin and Neo- Darwinism • Mutation Theory • Modern synthetic theory • Weismann's Germplasm theory 	
2	<p>Population Genetics and Evolution</p> <p>2.1 Introduction to Population genetics</p> <ul style="list-style-type: none"> • Definition • Brief explanation of the following terms: • Population, Gene pool, Allele frequency, Genotype frequency, Phenotype frequency, Microevolution <p>2.2 Population genetics</p> <ul style="list-style-type: none"> • Hardy- Weinberg Law • Factors that disrupt Hardy Weinberg equilibrium: Mutation, Migration (gene flow), Non-random mating (inbreeding, inbreeding depression, assortative mating = positive and negative, disassortative mating), Genetic drift (sampling error, fixation, bottleneck effect and founder effect) • Natural Selection Patterns of Natural Selection: Stabilizing selection, Directional selection (examples: peppered moth, antibiotic resistance in bacteria, pesticide resistance) and Disruptive selection <p>2.3 Evolutionary genetics</p> <ul style="list-style-type: none"> • Genetic variation: Genetic basis of variation-mutations and recombination (crossing over during meiosis, independent assortment of chromosomes during meiosis and random union of gametes during fertilization) • Nature of genetic variations: Genetic polymorphism, Balanced polymorphism, Mechanisms that preserve balanced polymorphism-Heterozygote advantage and frequency dependent selection, • Neutral variations • Geographic variation (Cline) • Species concept: Biological species concept and evolutionary species concept • Speciation and Isolating mechanisms: Definition and modes of speciation (allopatric, sympatric, parapatric and peripatric) • Geographical isolation • Reproductive isolation and its isolating mechanisms (prezygotic and postzygotic) 	15 L

	<ul style="list-style-type: none"> • Macroevolution and megaevolution: Concept and Patterns of macroevolution (stasis, preadaptation /exaptation, mass extinctions, adaptive radiation and coevolution), Megaevolution 	
3	<p>Scientific Attitude Methodology, Scientific Writing and Ethics in Scientific Research</p> <p>3.1 Process of science:</p> <ul style="list-style-type: none"> • A dynamic approach to investigation: The Scientific method, Deductive reasoning and inductive reasoning, Critical thinking, Role of chance in scientific discovery (serendipity) • Scientific research: Definition, difference between method and methodology, characteristics, types • Steps in the Scientific method: Identification of research problem, formulation of research hypothesis, testing the hypothesis using experiments or surveys, preparing research/study design including methodology and execution (appropriate controls, sample size, technically sound, free from bias, repeat experiments for consistency), documentation of data, data analysis and interpretation, results and conclusions • Dissemination of data: Reporting results to scientific community (publication in peer-reviewed journals, thesis, dissertation, reports, oral presentation, poster presentation) • Application of knowledge: Basic research, Applied research, Translational research, Patent <p>3.2 Scientific writing:</p> <ul style="list-style-type: none"> • Structure and components of a research paper: (preparation of manuscript for publication of research paper- title, authors and their affiliations, abstract, keywords and abbreviations, introduction, material and methods, results, discussion, conclusions, acknowledgement, bibliography; figures, tables and their legends) <p>3.3 Writing a review paper</p> <ul style="list-style-type: none"> • Structure and components of research report: Report writing, Types of report • Computer application: Plotting of graphs, Statistical analysis of data. Internet and its application in research-Literature survey, online submission of manuscript for publication <p>3.4 Ethics</p> <ul style="list-style-type: none"> • Ethics in animal research: The ethical and sensitive care and use of animals in research, teaching and testing, approval from Dissection Monitoring Committee (DMC) • Ethics in clinical research: Approval from clinical research ethics committee or/and informed consent • Approval from concerned/ Appropriate Authorities: National Biodiversity Authority, State Biodiversity Board, Forest Department • Conflict of interest 	15 L

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Jivanlal College of Commerce & Economics (AUTONOMOUS)**

		3.5 Plagiarism			
		Total			45 L
PRACTICALS					
<ol style="list-style-type: none"> 1. Study of population density by Line transect method & Quadrant method and calculate different diversity indices. <ol style="list-style-type: none"> A. . Index of Dominance B. Index of frequency C. Rarity Index D. Shannon Index E. Index of species diversity 2. Study of prokaryotic cells (bacteria) by Crystal violet staining technique 3. Study of eukaryotic cells (WBCs) from blood smear by Leishman's stain 4. Identification and study of fossils <ol style="list-style-type: none"> a. Arthropods: Trilobite b. Mollusca: Ammonite c. Aves: Archaeopteryx 5. Identification of <ol style="list-style-type: none"> a. Allopatric speciation (Cyprinodont species) b. Sympatric speciation (Hawthorn fly and Apple maggot fly) c. Parapatric speciation (Snail) 6. Bibliography/ Abstract writing 7. Preparation of Power Point Presentation based on research paper 					
Suggested readings					
<ol style="list-style-type: none"> 8. Theory of Evolution- Smith, Cambridge Press, and Low price Ed 9. Evolution - Strickberger, CBS publication 10. Evolution- P.S.Verma and Agarwal 11. Introduction to Evolution by Moody 12. Biology. E. P. Solomon, L. R. Berg, D. W. Martin, Thompson Brooks/Cole 13. Biology -The Unity and Diversity of Life. C. Starr, R. Taggart, C. Evers, L.Starr, Brooks/Cole Cengage learning International Edition 14. Research Methodology, Methods and Techniques- by C.R. Kothari, Wiley Eastern Ltd. Mumbai 15. Practical research planning and design 2nd edition- Paul D Leedy, MacmilanPublication 					
Program: B.Sc. (2021-22)				Semester: IV	
Course: 9. Cell Biology				Course Code:USMAZ O402	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE)

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
Jivanlal College of Commerce & Economics (AUTONOMOUS)**

		per week)		25	(Marks- 75 in Question Paper)
					75

Learning Objectives:

To study the structural and functional organization of cell with an emphasis on nucleus, plasma membrane and cytoskeleton

To acquaint the learner with ultrastructure of cell organelles and their functions

Course Outcomes:

After completion of the course, learners would be able to:

CO1: Learner would acquire insight into the composition of the transport mechanisms adopted by the cell and its organelles for its maintenance and composition of cell

CO2: Learner would appreciate the intricacy of endomembrane system

CO3: Learner would understand the interlinking of endomembrane system for functioning of cell

Outline of Syllabus: (per session plan)

Module	Description	No of Hours
1	<p>Cell Biology</p> <p>1.1 Introduction to cell biology</p> <ul style="list-style-type: none"> • Definition and scope • Cell theory • Generalized prokaryotic, eukaryotic cell: size, shape and structure • <p>1.2 Nucleus</p> <ul style="list-style-type: none"> • Size, shape, number and position • Structure and functions of interphase nucleus • Ultrastructure of nuclear membrane and pore complex • Nucleolus: general organization, chemical composition & functions • Nuclear sap/ nuclear matrix • Nucleocytoplasmic interactions • <p>1.3 Plasma membrane</p> <ul style="list-style-type: none"> • Fluid Mosaic Model • Junctional complexes • Membrane receptors • Modifications: Microvilli and Desmosomes <p>1.4 Transport across membrane</p> <ul style="list-style-type: none"> • Diffusion and Osmosis • Transport: Passive and Active • Endocytosis and Exocytosis 	15 L

	<p>1.5 Cytoskeletal structures</p> <ul style="list-style-type: none"> • Microtubules: Composition and functions • Microfilaments: Composition and functions 	
2	<p>Endomembrane System</p> <p>2.1 Endoplasmic reticulum (ER): General morphology of endomembrane system, ultrastructure, types of ER and biogenesis of ER</p> <p>Functions of Rough Endoplasmic Reticulum(RER) and Smooth Endoplasmic Reticulum(SER)</p> <p>2.2 Golgi complex: Ultrastructure of Golgi complex, functions of Golgi complex (protein glycosylation, lipid and polysaccharide metabolism, protein sorting and secretion, Golgi Anti-Apoptotic Protein -GAAP)</p> <p>2.3 Lysosomes: Origin, occurrence, polymorphism and functions;</p> <p>Peroxisomes: Origin, morphology & functions</p> <p>2.4 Mitochondria: Ultrastructure, chemical composition, functions of mitochondria and bioenergetics (Chemical energy & ATP, Krebs cycle, respiratory chain and oxidative phosphorylation)</p>	15 L
3	<p>Biomolecules</p> <p>3.1 Biomolecules: Concept of micromolecules and macromolecules</p> <p>3.2 Carbohydrates:</p> <ul style="list-style-type: none"> • Definition classification, properties and isomerism, glycosidic bond • Structure of Monosaccharides (glucose and fructose); Oligo-saccharides (lactose and sucrose); Polysaccharides (cellulose, starch, glycogen and chitin) • Biological role and clinical significance <p>3.3 Amino Acids and Proteins:</p> <ul style="list-style-type: none"> • Basic structure, classification of amino acids, • Essential and Non-essential amino acids, Peptide bond, • Protein conformation: Primary, Secondary, Tertiary, Quaternary • Types of proteins – Structural (collagen) and functional proteins (haemoglobin) • Biological role and clinical significance <p>3.4 Lipids:</p> <ul style="list-style-type: none"> • Definition, classification of lipids with examples, ester linkage, • Physical and chemical properties of lipids, • Saturated and unsaturated fatty acids, • Essential fatty acids; Triacylglycerols; Phospholipids (lecithin and cephalin); Steroids (cholesterol). • Biological role and clinical significance 	15 L

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Jivanlal College of Commerce & Economics (AUTONOMOUS)**

	<p>3.5 Vitamins:</p> <ul style="list-style-type: none"> • Water soluble vitamins(e.g. Vit C, Vit B12) • Lipid soluble vitamins (e.g. Vit A, Vit D) • Biological role and clinical significance 	
	Total	45 L
<p>PRACTICALS</p> <ol style="list-style-type: none"> 1. Study of permeability of cell through plasma membrane (osmosis in blood cells) 2. Measurement of cell diameter by oculometer (by using permanent slide) 3. Qualitative tests for carbohydrates (Molisch's test, Benedicts test, Barfoed's test, Anthrone test) 4. Qualitative tests for protein (Ninhydrin test, Biuret test, Millon's test, Xanthoproteic test) 5. Qualitative test for lipids (Solubility test, Sudan III test) 6. Study of rancidity of lipids by titrimetric method 7. Ultrastructure of cell organelles (Electron micrographs) of: <ol style="list-style-type: none"> a. Nucleus b. Endoplasmic reticulum (Smooth and Rough) c. Mitochondria d. Golgi apparatus e. Lysosomes 8. Study of clinical disorders due to carbohydrates, proteins and lipid imbalance (Photograph to be provided / symptoms to be given and disorder to be identified) a. Hyperglycemia, Hypoglycemia. b. Thalassemia, Kwashiorkar, Marasmus c. Obesity, Atherosclerosis <p>Suggested readings</p> <ol style="list-style-type: none"> 1. Cell Biology. Singh and Tomar, Rastogi Publication. 2. Cell and Molecular Biology E.D.P De Robertis and E.M.R Robertis ,CBS Publishers and Distributors. 3. The cell A molecular Approach GoeffreyM.Coper ASM Press Washington D.C. 4. A textbook of cytology SuruchiTyagi Dominant Publishers and Distributors New Delhi. 5. Cell and molecular biology Gupta P.K ,Rastogi Publication, India. 6. Cell Biology Pawar C.B. Himalaya publication 7. Molecular Biology of the cell (6th ed) by the Insertus 8. Campbell Biology (9th Ed.) 9. Principles of Biochemistry, 2005, 2nd and 3rd edn. Lehninger A.L. Nelson D.L. and Cox M.M , 10. Biochemistry, Dushyant Kumar Shurma, 2010, Narosa Publishing house PVT.Ltd. 11. Fundamentals of Biochemistry, Dr AC Deb, 1983, New Central Book Agency Ltd. 12. A Textbook of Biochemistry, 9th edition, Dr. Rama Rao A.V.S.S and Dr A Suryalakshmi. 13. Biochemistry-G Zubay , Addison Wesley, 1983 14. Biochemistry, L Stryer, 3rd/4th/5th ed, 1989 , Freeman and Co. NY 15. Harper's Biochemistry,1996, 26th edition, Murray R.K. Granner D.K. Mayes P.A. Rodwell V.M. Hall international USA 16. Outline of Biochemistry, 1976, E.E. Conn and P.K. Stumpf. John Wiley and Sons USA 		
Program: B.Sc. (2021-22)		Semester: IV

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Course: 10. NUTRITION, APPLIED HAEMATOLOGY, COMMON HUMAN DISEASES AND DISORDERS					Course Code: USMAZO40 3
Teaching Scheme					Evaluation Scheme
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)
3	3			25	75
Learning Objectives: To make learners understand the importance of balanced diet and essential nutrients of food at different stages of life To introduce to the learner the basics of applied haematology and to impart knowledge of diagnostic techniques used in pathology To educate learners about causes, symptoms and impact of stress related disorders and infectious diseases					
Course Outcomes: After completion of the course, learners would be able to: CO1: Healthy dietary habits would be inculcated in the life style of learners in order to prevent risk of developing health hazards in younger generation due to faulty eating habits CO2: The learner will be familiar with the terminology used and diagnostic tests performed in a pathological laboratory CO3: The learner shall be acquainted with diagnostic approaches in haematological disorders CO4: The learner will be better equipped for further pathological course or working in a diagnostic laboratory CO5: Learners will be able to promptly recognize stress related problems at initial stages and would be able to adopt relevant solutions which would lead to psychologically strong mind set promoting positive attitude important for academics and would be able to acquire knowledge of cause, symptoms and precautions of infectious diseases.					
Outline of Syllabus: (per session plan)					
Module	Description				No of Hours
1	Nutrition and Health 1.1 Concept of balanced diet, dietary recommendations to a normal adult, infant, pregnant woman and aged 1.2 Malnutrition disorders – Anemia (B12 and Iron deficiency), Rickets, Marasmus, Goiter, Kwashiorkar (cause, symptoms, precaution and remedy). 1.3 Constipation, piles, starvation, acidity, flatulence, peptic ulcers (cause, symptoms, precaution and remedy). 1.4 Obesity (Definition and consequences). 1.5 Importance of fibres in food 1.6 Significance of breast feeding 1.7 BMI calculation and its significance				15 L

2	<p>Applied Haematology</p> <p>2.1 Introduction and scope of Applied Haematology: Clinical, oncological and forensic haematology</p> <p>2.2 Clinical significance of Diagnostic Techniques</p> <ul style="list-style-type: none"> • Microscopic examination of blood: • Blood cancer (lymphoma, myeloma), • Infectious diseases (malaria, leptospirosis) • Haemoglobinopathies (sickle cell anaemia, thalassemia) <p>2.3 Biochemical examination of blood:</p> <ul style="list-style-type: none"> • Liver function tests: AST, ALT, Alkaline phosphatase • Kidney function test: Serum creatinine, Blood Urea Nitrogen (BUN) • Carbohydrate metabolism tests: Blood sugar, Glucose tolerance test, Glycosylated haemoglobin test 	15 L
3	<p>Diseases and precautions</p> <p>3.1 Stress related disorders</p> <p>3.1.1: Hypertension, Diabetes type II, anxiety, insomnia, migraine, depression (cause, symptoms, precaution and remedy)</p> <p>3.2 Communicable and non-communicable diseases</p> <p>3.2.1: Tuberculosis and Typhoid</p> <p>3.2.2: Hepatitis (A and B), AIDS, Gonorrhoea and Syphilis</p> <p>3.2.3: Diseases of respiratory system- Asthma, Bronchitis.</p> <p>3.2.4: Swine flu and Dengue (cause, symptoms, precaution and remedy)</p>	15 L
	Total	45 L
PRACTICALS		
<ol style="list-style-type: none"> 1. Qualitative estimation of Vitamin C by Iodometric method 2. Study of microscopic structure of starch granules of different cereals (wheat, maize and jowar). 3. a. Estimation of maltose from brown/white bread b. Moisture content from biscuits or other suitable food products 4. Food adulteration Test: 5. a. Estimation of protein content of two egg varieties b. Study of efficacy of different antacids (any two antacids) 6. Study of Human Parasites Endoparasites - Protozoans (<i>Entamoeba</i>, <i>Plasmodium</i>), Helminths (<i>Ascaris</i>, <i>Wuchereria</i>), Ectoparasites (Head louse, tick) and Exoparasites (Bed bug, Mosquito). 7. Screening of anaemic/non-anaemic persons using CuSO₄ method 		

Suggested readings

1. Harrison's Hematology and Oncology; 3rd Edition (Harrison's Specialty); Dan Longo; McGraw-Hill.
2. Essentials of Haematology; Second Edition; Kawthalkar Shirish M.; Jaypee; 2013
3. Parks Textbook of Preventive and Social Medicine K. Park M/S Banarasidas Bhanot Jabalpar.
4. Essentials in Hematology and Clinical Pathology; Nayak, Ramadas
5. Parasitology (Protozoology and Helminthology) - K. D. Chatterjee, Chatterjee Medial Publishers.
6. Practical Hematology; Dacie J V; Churchill Livingstone; 2006
7. Lecture Notes: Haematology; Hatton, Chris S. R. Hughes-Jones, Nevin C. Hay Deborah; Wiley-Blackwell
8. Epidemiology and Management for Health Care for all. P.V. Sathe, A. P. Sathe, Popular Prakashan, Mumbai.
9. Textbook of Medical Parasitology- C. K. JayaramPaniker. Jaypee Brothers.
10. ABC series: ABC of Clinical Haematology; Provan; Drew Publisher: BMJ Books
11. Prevention of Food Adulteration, Act 1954. Asian Law House.
12. Clinical Dietetics and Nutrition - F. P. Antia and Philip, Oxford University Press.
13. A Complete Handbook of Nature Cure - Dr. H. K. Bakru, Jaico Publishing House.
14. Dietetics - B. Srilakshmi, New Age International (P) Ltd. Publishers.
15. Nutrition: Principles and Application in Health Promotion - J. B. Lippincott Company. Philadelphia.
16. Are You Healing Yourself Mr. Executive - Dr. R. H. Dastur. IBH Publishing Company.
17. Food Nutrition and Health- Dr. Shashi Goyal, Pooja Gupta, S. Chand Publications.
18. Public Health Nutrition. Edited - Michael J. Gidney, Barrie M. Margetts, John M. Kearney and Lenore Arab. Willey Blackwell Publication.
19. Food and Nutrition – Vol. I and II - Dr. Swaminathan , Bappco Publication.
20. Textbook of Human Nutrition - Mahtab Bamji, Prahlad Rao.
21. Total Health by Paramjit Rana.

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Date: 19th October, 2020

To,
Member Secretary,
Academic Council,
Mithibai College (Autonomous),
Vile Parle- West

Subject: Agenda for Academic Council meeting scheduled on _____

Dear Member Secretary,

Kindly include the following agenda for the meeting of Academic Council scheduled for 27th October, 2020.

(Example- Agenda items to be in brief statements)

- i) To approve the format for submission of agenda, notes thereto and curriculum to Academic council
- ii) To confirm/ approve syllabus for _____
- iii) To confirm/ approve-----

Thanking you,

Yours Sincerely,
Head of _____

Recommended by :

Vice-Principal

and Approved by:

I/C Principal

DEPARTMENT OF _____

BOARD OF STUDIES – MEETING

Date - _____ 2020

Time: 2:00 PM

Online on MS Teams

AGENDA

- 1)
- 2)
- 3)
- 4)

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Jivanlal College of Commerce & Economics (AUTONOMOUS)**

RESOLUTION

At the online Board of Studies - _____ meeting held on _____ at _____ on MS Teams, it was resolved that –

- 1)
- 2)
- 3)
- 4)

S.No.	BOS Members	Signature
1	_____ – Chairperson	
2	Two subject experts outside the parent University: a) b)	
3	Vice-Chancellor -University of Mumbai nominee a)	
4	Representative from Industry a)	
5	Post-graduate meritorious alumnus a)	
6	Members of same faculty - a) b)	
7	Member appointed by Management a)	
8	Faculty members a)	

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Jivanlal College of Commerce & Economics (AUTONOMOUS)**

	b)	
	c)	
	d)	

MINUTES OF MEETING

S.No.	Agenda Item	Discussion
1.		
2.		
3.		
4.	Any other matter:	