

# First Degree Programme in Zoology

## Complementary Courses

**Table I. Scheme of Instruction and Evaluation**

Semester	Course code	Course title	Instructional hours/week		Credits	Duration of ESE	Evaluation		Total Credits
			T	P			CE	ESE	
I	AUZO131.2a	Animal Diversity I	2		2	3hrs	20%	80%	2
		Practical		2					
II	AUZO231.2a	Animal Diversity II	2		2	3hrs	20%	80%	2
		Practical		2					
III	AUZO331.2a	Functional Zoology	2		3	3hrs	20%	80%	2
		Practical		2					
IV	AUZO431.2a	Applied Zoology	2		3	3hrs	20%	80%	2
	AUZO43.2a PI	Practical of S1, S2, S3 & S4		2	4				

**Theory, P – Practical, CE – Continuous Evaluation, ESE – End Semester Evaluation**

## Zoology Complementary Course

### Scheme of question paper – Theory Courses

Type of Questions	Question No.	No. of questions to be answered	Marks
I. Objective	1 - 10	10 out of 10	1 x 10 = 10
II. Short Answer	11 - 25	10 out of 15	2 x 10 = 20
III. Short Essay	26 - 34	6 out of 9	5 x 6 = 30
IV. Long Essay	35 - 38	2 out of 4	10 x 2 = 20
Total			80

**Table III. Scheme of question paper - Practical**

<b>Type of Questions</b>	<b>Marks</b>
I. Major Practical	25
II. Minor Practical	15
III. Qualitative analysis	15
IV. Spotters	10
V. Record	15
Total	80

# **First Degree Programme**

## **Zoology Complementary Course**

### **Scheme of Instruction**

Complementary courses offered by the department of Zoology to the students of other disciplines are distributed over the first four semesters. There are 5 complementary courses – four theory courses and one practical course. Semester I offers Complementary Course I -Animal Diversity I (Course Code AUZO131.2a) and Semester II offers Course II Animal Diversity II (Course Code AUZO231.2a) both with 36 hours of instruction (2hours/ week) and 2 credits. Semester III offers Complementary Course III Functional Zoology (Course Code AUZO331.2a) and Semester IV offers Complementary Course IV Applied Zoology (Course Code AUZO431.2a) both having 54 hours (3hours/week) and 3 credits. Complementary Course V is Practical I (Course Code AUZO43.2aPI) related to the four Complementary Theory Courses. Hours for the practical are allotted during all the four semesters, 2 each in the first and second semesters and 3 each in the third and fourth semesters. A total of 4 credits are given. University level examination of Complementary Course Practical I will be conducted at the end of fourth semester.

The scheme of Instruction Evaluation of Zoology Complementary Courses is given in Table I.

### **Scheme of Evaluation**

Evaluation of theory and practical courses involve Continuous Evaluation (CE) and End Semester Evaluation (ESE). The proportion of grade of CE and ESE is 1:3. CE is for 20% and ESE for 80%. All theory courses have ESE at the end of the corresponding semesters. But Practical course has ESE at the end of fourth semester. Both Continuous Evaluation and End Semester Evaluation are carried out with marks and then grading. The system of seven point grade scale adopted is given in Table.

## Criteria for Grading (SCPA/CCPA/Courses)

**Table A: .seven point scale of grading**

Sl. No.	% of marks	CCPA	Grade
1	90 & above	9 & above	A+ Outstanding
2	80 to <90	8 to <9	A Excellent
3	70to<80	7 to<8	B Very good
4	60 to <70	6 to <7	C Good
5	50 to <60	5 to <6	D Satisfactory
6	40 to <50	4 to<5	E Adequate
7	Below 40	< 4	F Failure

### I. Continuous Evaluation (CE)

Continuous Evaluation of each course will be done by the faculty member who is engaging the course. CE is based on the student's attendance, performance in the class tests, seminars / assignments and records of practical. Assignments and answer scripts are to be returned to the students after evaluation.

The process of Continuous Evaluation must be transparent. Monitoring of the First Degree Programme is done by committees at three levels – Department Level Monitoring Committee (DLMC) and College Level Monitoring Committee (CLMC). DLMC consists of the Head of the Department and all teachers of the Department. They monitor the conduct of courses and CE. The Head of the Department be the Chair person and a teacher selected by the DLMC from among the members is the Convener. College Level Monitoring Committee will consider the complaints not redressed by the DLMC.

## CE of Theory courses (Weightage 20)

The different components considering for CE of theory courses and corresponding weightage are given in the Table B.

Sl. No.	Components	Marks
1	Attendance	5
2	Class test	10
3	Seminar/Assignment	5
Total		20

### 1. Attendance (5)

The allotment of grades for attendance is given in Table C.

**Table C. Grading of attendance**

Attendance	Marks
Above 90 %	5
86% to 90 %	4
81 % to 85 %	3
76 % to 80 %	2
75%	1

A student with attendance below 75% cannot appear for the ESE

### 2. One Class Test (Weightage 10)

Two class tests must be conducted for each course during the semester. CE is the average grade of the two test papers. Weightage for this is 2. Question pattern of ESE can be adopted for test papers. Grading process is similar to that of ESE.

### 3. Seminar/ Assignment (5)

Each student is required to do one seminar or one assignment for each course. Seminar, with mark 5, is to be graded based on the way of presentation, matter content, etc. These factors can be graded on the seven-point scale as given in Table A.

Each assignment is to be graded based on timely submission, content, etc. on the five-point scale as given in Table A.

### CE of Practical courses: (20 marks)

The different components considering for CE of Practical courses and corresponding marks are given in the Table D.

Sl. No.	Component	Marks
1	Attendance	5
2	Performance	5
3	One Class test	5
4	Record	5
Total		20

**1. Attendance:** (5) same as given for theory CE in Table C.

**2. Performance in Laboratory:** (5) Grade the students in the five-point scale as given for theory (Table A).

**3. Class test:** (5) One class tests must be conducted for a practical course during a semester. Grading process is similar to that of ESE.

**4. Record:** (5) Record is to be assessed taking into account the following points – timely presentation, content, accuracy of diagrams and neatness. Record grading is also on the seven-point scale as given for theory (Table A).

### **A. Theory**

All theory courses have End Semester Examination at the end of the corresponding semester. The duration of examination is 3 hours per course. Total marks of theory ESE are 80. Scheme of Instruction and Evaluation of Complementary Courses is given in Table I. Grading is according to the seven point scale

### **B. Practical:**

End Semester Examination of Practical I will be held at the end of the fourth semester. The duration of examination is 3 hours. Weightage of Practical ESE is 80 marks. The question papers for the conduct of ESE of Practical will be prepared by the Board of Examiners appointed by the University. Practical examination is to be conducted by a team of one external examiner and an internal examiner. A batch may contain a maximum of 15 candidates per session of the exam.

The scheme of question paper of practical course along with marks is given in Table III.

### **C. Record**

Practical Course has a record book. Candidates must submit the record of the Practical Course on the day of the examination before the External Examiners for ESE. Candidates without certified record book are not allowed to appear for the examination.

**First Degree Programme Semester I**  
**Zoology Complementary Course I Animal Diversity I**

**Course Code –AUZO131.2a**

**No. of credits - 2      Total hours 36**

**Aim of the Course**

- To inculcate in the student a love and understanding of the fascinating world of invertebrates
- Objectives of the course
- Impart to the student a concrete idea of the evolution, hierarchy and classification of invertebrate phyla
- Understanding the basics of systematics by learning the diagnostic and general characters of various groups
- Getting an overview of typical examples in each phyla
- To study the economic importance of invertebrates with the special reference to insect pests

**Module I                    (4hrs)**

Introduction: Classification of organisms - two kingdom system, three kingdom system, four Kingdom system, five kingdom system, six kingdom system.

**Kingdom Protista** -general features and classification: Phylum Rhizopoda (eg. Entamoeba), Phylum Dinoflagellata (eg. Noctiluca), Phylum Parabasalia (eg. Trichonympha), Phylum Ciliophora (eg. Paramecium), Phylum Apicomplexa (eg. Plasmodium - life history and pathogenicity).

**Module II                    (5hrs)**

**Kingdom Animalia:** Salient features, levels of organization- cellular, tissue, organ and organ system. Branches - Mesozoa, Parazoa and Eumetazoa-radiata and bilateria- Protostomia and Deuterostomia; acoelomata, pseudocoelomata and eucoelomata- schizocoela and enterocoela; body segmentation- metamerism and pseudometamerism.

**Phylum Porifera:** general characters (self study), classification up to classes- Class Calcarea e.g. Sycon, Class Hexactinellida e.g. Euplectella, Class. Desmospongiae e.g. Spongilla.



**Phylum Cnidaria:** general Characters (self study), classification up to classes, Class Hydrozoa e.g. Obelia, Physalia, Class Scyphozoa e.g. Aurelia (mention larval stage), class Anthozoa e.g. Sea anemone

### **Module III (9hrs)**

**Phylum Platyhelminthes:** general characters (self study), classification up to classes- Class Turbellaria eg. Bipalium, Class Cestoda eg. Taenia Solium, Class Trematoda e.g. Fasciola.

**Phylum Nematoda:** general characters (self study), classification up to classes- Class Secernentea (Phasmida) e.g. Ascaris, Class Adenophorea (Aphasmida) e.g. Trichinella.

**Phylum Annelida:** general characters (self study), classification up to classes- Class Polychaeta e.g. Neries (mention parapodium, heteroneries), Class Oligochaeta e.g. earthworm (mention vermiculture), Class Hirudinea e.g. Hirudinaria.

**Phylum Mollusca:** General characters (self study), classification up to classes- Class Aplacophora e.g. Neomenia, Class Monoplacophora e.g. Neopilina, Class Bivalvia e.g. Pearl oyster, Class Gastropoda e.g. Pila, Class Cephalopoda e.g. Sepia, class Scaphopoda e.g. Dentalium.

**Phylum Onychophora:** General characters, e.g. Peripatus.

### **Module IV (15hrs)**

**Phylum Arthropoda:** General characters (self study), classification up to classes- Supylum Trilobitomorpha- Class Merostomata e.g. Limulus, Class Arachnida e.g. scorpion, Class Pycnogonida e.g. Nymphon; Subphylum Mandibulata- Class Crustacea e.g. prawn (detailed study), Sacculina, Class chilopoda e.g. Scolopendra, Class Symphyla e.g. Scutigera, Class Diplopoda e.g. Spirostreptus, Class Pauropoda e.g. Pauropus, Class Insecta e.g. Cockroach (self study- external characters mouth parts, digestive system), mosquitoes-Anopheles, Culex and Aedes - pathogenicity of mosquitoes. Pest of paddy - Leptocorisa and Spodoptera, Coconut palm Oryctes rhinoceros and Eriophid mite, stored food grains -Sitophilus oryzae and Triholium.

### **Module V: (3hrs)**

**Phylum Echinodermata:** General characters (self study), classificationcn- Class Asteroidea: e.g. sea star; Class Ophiuroidea: eg. brttle star; Class Echinoidea: e.g. sea urchin; Class. Holothuroidea: e.g. Sea cucumber; Class Crinoidea eg. Sea lily (mention larval stages).

### **Suggested topics for assignments /seminars (not for ESE)**

- Life history and Pathogenicity of Plasmodium
- Metagenesis with reference to Obelia colony.
- Parasitic flat worms
- Human nematode Parasites
- Vermiculture
- Economic importance of Molluscs
- Evolutionary Significance of Peripatus
- Insect vectors
- Pest management

### **References**

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- Chandler, A.C. and Read. Parasitology.
- Hickman C.P. and Roberts L.S. (1994) Animal Diversity. Wm. C. Brown, Dubuque, IA
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- Ruppert E.E., Fox R and Barnes R.D. (2004) Invertebrate Zoology. Thomson Books.Cole. USA>

**First Degree Programme**  
**Semester II**  
**Zoology Complementary Course II Animal Diversity II**  
**Course Code – AUZO231.2a**

No. of credits – 2

Total hours 36

**Aim of the course**

To inculcate in the student a fascination for nature and learn the bionomics of vertebrates.

**Objectives of the course**

- Learn the evolution, hierarchy and classification of different classes of chordates
- To get an overview of the morphology and physiology of typical examples.
- To study the adaptations and economic importance of specific vertebrates.

**Module I (10hrs)**

**Phylum Chordate:** Salient features of the phylum Chordata (self study), classification up to classes- Subphylum Urochordata e.g. Ascidia- general characters, external features and retrogressive metamorphosis; Subphylum Cephalochordate – general characters, e.g. Amphioxus (detailed study except developmental biology)

**Module II (10hrs)**

**Subphylum Vertebrata:** General characters (self study), classification - Super class Agnatha e.g. Petromyzon; Super class Pisces e.g. Scoliodon, Narcine, Anguilla, Echeineis, Hippocampus, Etroplus, mackerel, sardine, pomfret; Super class Tetrapoda- Class Amphibia- general characters and Type: frog (self study), e.g. Ichthyophis, Rhacophorus, Amblystoma- axolotl larva.

**Module III (9hrs)**

**Class Reptilia:** General characters (self study), eg. Calotes, Draco, Chaemeleon, Chelone, snakes- general features, non poisonous snakes eg. Lycodon, Ptyas (external features and peculiarities of examples), poisonous snakes e.g. Naja, viper, Bungarus, Enhydrina (characteristic features), identification of poisonous and non poisonous snakes, different types of venom, mode of action.

#### **Module IV 7hrs**

Class Aves: General characters (self study), flightless birds- eg. ostrich and kiwi, flying birds eg. pigeon- mention different types of feathers and pea fowl. Flight adaptations of birds. Class Mammalia- general characters(self study), eg. echidna, kangaroo, bat, loris, tiger and whale.

#### **Suggested topics for assignments / seminars (not for ESE)**

1. Retrogressive metamorphosis in Ascidia
2. Feeding mechanism in Amphioxus
3. Common edible fishes of Kerala.
4. Metamorphosis of Frog
5. Arboreal adaptations of Reptiles
6. Identification of poisonous and non poisonous snakes
7. Snake bite and its first aid
8. Flight adaptations of birds
9. Aquatic adaptation in Mammals
10. Larvivorous fishes
11. Bird migration

#### **References**

- Dhama, P.S. and Dhama, J.K. Vertebrate Zoology. R. Chand and Co.
- Ekambaranatha Ayyar, M. and Ananthkrishnan, T.N. A Manual of Zoology. Vol II
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- Mayer E. (1980) Principles of Systematic Zoology. Tat Mc Graw Hill Publishing Co. New Delhi.
- The New Encyclopedia Britannica, Macropedia, (1998). Encyclopedia Britannica

# First Degree Programme

## Semester III

### Zoology Complementary Course III: Functional Zoology

Course Code – AUZO331.2a

No. of credits – 3

Total hours 54

#### Aim of the course

To familiarize students on the physiology of their own body and urge them to take precautionary measures to safeguard their health.

#### Objectives of the course

- To study the structure and function of each system in the human body.
- To study the etiology of common physiological disorders, syndromes and diseases.

#### Module I (4hrs)

Nutrition: Types of nutrition autotrophy and heterotrophy. Outline classification of food – components. Brief mention of malnutrition disorders. Vitamins - physiological role and disorders (deficiency diseases).

#### Module II (6hrs)

Respiration: Respiratory pigments and their functions with special emphasis on haemoglobin. Transport of oxygen and carbon dioxide. Neural and hormonal control of respiration in man. Respiratory disturbances – brief mention of Apnoea, Dyspnoea, Hypoxia, Hypo and Hypercapnia, Asphyxia and Carbon monoxide poisoning. Physiological effects of smoking.

#### Module III (8hrs)

Circulation : Blood-composition and functions, blood groups, mechanism of blood clotting (intrinsic and extrinsic pathways), anticoagulants, disorders of blood clotting -haemophilia and thrombosis. Heart - neurogenic and myogenic, peculiarities of cardiac muscle. Heart beat, pace maker. Blood pressure, ECG, cardiovascular disorders- arteriosclerosis, myocardial infarction, and hypertension; angiogram and angioplasty.

#### **Module IV (6hrs)**

Excretion and osmoregulation: Classification of animals based on excretory wastes. Human nephron - structure and urine formation - ultrafiltration, selective reabsorption, tubular secretion and countercurrent mechanism; hormonal control of renal function; composition of urine. Kidney diseases - proteinuria, uremia, acidosis and alkalosis; dialysis.

#### **Module V (6hrs)**

**Neurophysiology:** Neurone-structure, nerve resting potential; action potential and impulse; latent period; All or none law; Synapse and synaptic transmission- refractory period, neurotransmitters; Saltatory transmission and EEG.

#### **Module VI (8hrs)**

Muscle Physiology: Ultra-structure of a striated muscle fibre, mechanism of muscle contraction, brief mention of muscle twitch, summation, tetanus and tonus, all or none law, fatigue, oxygen debt and rigor mortis.

#### **Module VII (8hrs)**

Endocrinology: List the various endocrine glands and their corresponding hormones, brief description of hormonal influence, action and hormonal disorders- goitre, cretinism exophthalmic goitre, diabetes mellitus, diabetes insipidus, dwarfism, gigantism and acromegaly. Role of hormones in reproductive cycle.

#### **Module VIII 8hrs**

Immunology: Types of immunity-innate, acquired, active, passive, humoral and cell mediated. Cells, tissues and organs of immune system- lymphocytes, lymphoid tissue and organs (Lymph nodes, spleen, bone marrow, thymus and mucosa associated lymphoid tissue). Antigens. Antibodies-structure and function of immunoglobulin, classes of immunoglobulins. Hypersensitivity and allergy; immunization-passive and active; vaccination. AIDS and its etiology.

#### **Suggested topics for assignments / seminars (not for ESE)**

1. Vitamins and deficiency diseases

2. Health hazards of smoking
3. Respiratory disorders
4. Cardiac disorders
5. Dialysis and Artificial kidney
6. Impulse transmission in a nerve
7. Physical and Chemical events in muscle contraction
8. Hormonal disorders in Man
9. Allergic conditions
10. AIDS
11. Osmoregulation
12. Immune dysfunction

## References

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## **First Degree Programme Semester IV**

### **Zoology Complementary Course IV**

#### **Course code – AUZO431.2a: Applied Zoology**

**No. of credits – 3      Total hours 54**

#### **Aim of the course**

To introduce the methodology and perspectives of applied branches of zoology with a view of educating youngsters on the possibilities of self employment

#### **Objectives of the course**

- To learn the basic principles involved in the culture and breeding of common edible and ornamental fishes of Kerala and the art of aquarium keeping.
- To get a basic understanding of human genomics and reproductive biology including stem cell research and prenatal diagnostic techniques

#### **Module I      17hrs**

**Aquaculture:** Traditional methods of aquaculture, fishing crafts and gears, common fishes used for culture in Kerala, Catla, Etroplus, Tilapia and Mugil; capture fishes- sardine, mackerel.

**Pond culture:** Construction, maintenance and management; carp culture, shrimp culture, shellfish culture, composite fish culture and pearl culture **Ornamental fish culture:** Fresh water ornamental fishes – biology, breeding habits, spawning, hatching and rearing techniques. **Construction and maintenance of aquarium:** Construction of home aquarium, materials used, setting up of freshwater aquaria, aquarium plants, ornamental objects, cleaning the aquarium, maintenance of water quality, control of snail and algal growth.

#### **Module II      10hrs**

**Sericulture:** Brief account of morphology and life history of silkworm, varieties of silkworm, rearing technique, mulberry cultivation, diseases and pests of silkworm. Processing of cocoon, reeling and marketing of silk. **Apiculture:** Species of honey bees, social organization of honey bees, apiary management and maintenance, bee keeping equipments, bee pasturage, honey and bees wax and their uses.



### **Module III 8hrs**

**Live Stock Management:** Poultry farming-poultry breeds: mention American, Asiatic, Mediterranean, English and indigenous breeds. Poultry breeding and poultry products; rearing of chicks, growers, layers, broilers, ducks, turkeys and quails; diseases of poultry.

Dairy farming: Types, loose housing system and conventional barn system; advantages and limitations of dairy farming; establishment of dairy farm and choosing suitable dairy animals, feed, diseases of dairy animals.

### **Module IV 7hrs**

**Human Genetics:** Normal chromosome complements; karyotype study, pedigree analysis. Syndromes- autosomal syndromes (Down's syndrome and Edwards syndromes), sex chromosomal syndromes (Turners syndrome and Klinefelter's syndrome), genetic disorders-single gene disorders (sickle cell anemia and phenyl ketonuria), multifactorial disorders (cleft lip, and cleft palate), genetic counseling.

### **Module V 12hrs**

Developmental Biology and Biotechnology: Types of egg; fertilization; types and pattern of cleavages; blastulation and different types of blastula; gastrulation-morphogenetic movements (epiboly and emboly); brief description of organizers and embryonic induction; Cloning experiments in animals and man; Embryonic stem cell research; Prenatal diagnostic techniques- amniocentesis, chorionic villus sampling, ultrasound scanning; Test tube babies, gene cloning, human genome project, human gene therapy.

### **Suggested topics for assignments/seminars ( not for ESE)**

1. Genetic disorders
2. Karyotypes of different types of syndromes
3. Prenatal diagnosis
4. Gene cloning
5. Setting up of freshwater aquarium
6. Aquarium fishes

7. Ornamental fishes
8. Advantages and Limitation of dairy farming
9. Different breeds of Cattle

### **References**

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- Lewin, B. (1983). Genes, John Wiley and Sons, New York.
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**First Degree Programme Zoology Complementary Course V**  
**Practical I Animal Diversity I &II,**  
**Functional Zoology and Applied Zoology**  
Course code AUZO43.2aPI  
No. of credits 4

Aim of the course

To provide an hands- on training experience in anatomy through simple dissections and mountings

Objectives of the course

- To familiarize students with conventional organ system in common, easily available animals.
- To emphasize the adage that ‘seeing is believing’ typical examples and economically important specimen (preserved) to be studied.
- To study and carry out routine clinical analysis of blood and urine

**Animal Diversity I &II**

**Study specimens**

1. **Protista:** *Noctiluca, Paramecium, Entamoeba, Trichonympha* [any 3]
2. **Porifera:** *Sycon*
3. **Cnidaria:** *Obelia, Aurelia, Sea anemone (Adamsia)*
4. **Platyhelminthes:** *Bipalium, Fasciola, Taenia solium*
5. **Nematoda :** *Ascaris, Ancylostoma*
6. **Annelida:** *Nereis, Hirudinaria*
7. **Arthropoda:** *Limulus, Scorpion, Scolopendra, Sacculina, Leptocorisa , Oryctes, Larval stages of prawn* [any 5]
8. **Mollusca:** Freshwater mussel, *Sepia, Pila*
9. **Echinodermata:** Starfish, Sea urchin, Brittle star, Sea cucumber, sea lily [any 3]
10. **Chordates:** *Branchiostoma (entire), Ascidia.*  
*Petromyzon*  
*Scoliodon, Narcine, Echeneis, Hippocampus, Anguilla* [any 3]  
*Ichthyophis, Amblystoma, Rhacophorus* [any 2]  
*Chamaeleon, Bungarus, Naja, Vipera, Chelone* [any 4]  
Pigeon – different types of feathers, *Pteropus*

### **Minor Practicals (Mounting) – any three**

1. **Earthworm:** Setae in situ
2. **Penaeus:** Appendages
3. **Cockroach:** Mouth parts
4. **Nereis:** Parapodium
5. **Shark:** Placoid scales

### **Major Practicals (Dissection) – any two**

1. Earthworm: Alimentary canal and associated glands
2. *Penaeus*: Nervous system
3. Cockroach: Alimentary canal

### **Osteology**

1. Study of the skeleton of frog
2. Vertebrae (typical, 8th , 9th and urostyle)
3. Limb girdles: pectoral girdle with sternum, pelvic girdle, astragalus & calcaneum.

### **Functional and Applied Zoology Functional Zoology**

1. Preparation of human blood smear to study the different types of WBCs.
2. Human blood grouping: ABO and Rh Systems.
3. Urine analysis for abnormal constituents: albumin and glucose.
4. Study of slides/models of different types of eggs, blastula and gastrula of animals.

### **Applied Zoology**

1. Study of beneficial insects: Apis (worker, drone and queen), Bombyx (life cycle)
2. Study of the following items of economic importance: Perna, Pinctada, Penaeus, Sardinella, Rastrelliger

### **Human Genetics**

Study of the following using charts/photographs

1. Study of normal human karyotype.
2. Study of abnormal human karyotypes. [Klinefelter's, Turner, Down's and Edwards syndrome]