

## **ZOE456: HUMAN GENETICS**

**Teaching 10 hours/Unit**

### **COURSE OUTCOME**

1. The process of cell division and sex determination in human
2. Genesis and effect of Chromosomal abnormalities in human
3. Structure of DNA and Gene, Mutation, DNA fingerprinting
4. Mendelian and Non Mendelian inheritance in human
5. Basis of autosomal dominant and recessive traits and sex linked inheritance
6. Principle of hardy-Weinberg's law and important of twin study
7. Genetic counselling and it's important for the genetic disorder

### **UNIT-I**

**Cytogenetics:** Cell cycle, Mitosis, Meiosis, Gametogenesis, Fertilization. Human Chromosomes- Chromosome Morphology, Karyotyping and its application. Sex Chromatin-Barr Body, Lyon's Hypothesis, Sex determination, Genetic significance of X Inactivation. Milestones in the development of genetics

### **UNIT-II**

**Chromosomal Aberrations:** Structural aberrations, abnormalities: Structural abnormalities: Deletions, translocation, Insertion, Inversion, Isochromosomes, Ring chromosomes. Factors Playing role in Chromosomal Aberrations. Autosomal Abnormalities-Down's syndrome (Trisomy-21), Edward's syndrome (Trisomy-18), Patau's syndrome (Trisomy-13). Sex chromosome abnormalities- Klinefelter's syndrome and Turner's syndrome

### **UNIT-III**

**Molecular Genetics:** Structure of Nucliec acid, Types of DNA-Unique sequences, Satellite DNA, Interspersed repetitive DNA sequences, Single nucleotide polymorphism (SNPs) Short Tandem repeats (STRs), Variable number of tandem repeats (VNTRs), Restriction fragment length polymorphism (RFLP), Mitochondrial DNA, Triplet code. Brief introductions to Genes and its structure, Mutation, Gene bank, Recombinant DNA, DNA fingerprinting technology, DNA markers used for tracing human ancestry.

### **UNIT-IV**

**Modes of inheritance:** Mendel and Mendelism, Mendel's laws, Brief Introduction to Alleles, Phenotype, Genotype, Dominant and Recessive alleles, Wild type and mutant alleles, Codominant Alleles, Lethal Alleles, Multiple Alleles, Heterozygotes, Homozygotes, Penetrance and Expressivity. Pedigree analysis, Mode of Mendelian inheritance in human

(single gene disorders): Autosomal dominant, autosomal recessive, X-linked dominant, X-linked recessive. Non mendelian Inheritance -Polygenic/complex inheritance and extra chromosomal inheritance – Erythroblastosis Fetalis in Humans

#### **UNIT-V**

**Population Genetics:** Definition of population genetics, Calculation of allele frequencies (MN and ABO blood groups); Random mating, Hardy-Weinberg's Law, factors influencing Hardy-Weinberg equilibrium, Endogamy, consanguineous marriage. Eugenics, Twins and type of twins Prenatal diagnosis: Invasive and non-invasive techniques, Amniocentesis, Chorionic villus sampling, Ultrasound, Foetoscopy, Foetal blood sampling (FBS), Maternal serum screening, Carrier screening for autosomal recessive and X-linked disorders, Genetic Counselling.

#### **REFERENCES**

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2. Falconer, D. S., and Mackay, T.F. (1996) *Introduction to quantitative genetics*, Essex, England: Longman.
3. Gangane, S.D. (2017) *Human Genetics*, 5<sup>th</sup> ed. New Delhi, Elsevier.
4. Gersen, S., & Keagle, M. (2013). *The principles of clinical cytogenetics*. S. L. Gersen, & M. B. Keagle (Eds.). New York: Springer
5. Hartl, Daniel L., and Elizabeth W. Jones (1998) *Genetics: principles and analysis*, Sudbury, Mass: Jones and Bartlett Publishers.
6. Jorde LB, Carey JC and Bamshad, M.J.(2009) *Medical Genetics*, Elsevier Publication
7. Orlando J. Miller (2000) *Human Chromosomes* Springer-Verlag New York
8. Snustad, D P., and Simmons M.J. (2012) *Principles of genetics*. Hoboken, NJ: Wiley.
9. Strachan T and Read, A.P. (2011), *Human Molecular Genetics*, Garland Science/Taylor and Francis Group Publication, 4th Edition.
10. Steven L. Gersen and Martha B. Keagle (1999) *The Principles of Clinical Cytogenetics* Humana Press

# **ZOE457: ORNAMENTAL FISH PRODUCTION AND MANAGEMENT**

## **Teaching Hours 10 /unit**

### **COURSE OUTCOME**

1. Course focuses on the importance of ornamental fish farming in relation with entrepreneurship development.
2. Enable to setup aquarium
3. Enable to manage the home as well as commercial aquariums
4. Learn to handle different aquarium equipment's and decoration
5. Learn decorations of aquarium
6. Study breeding of Aquarium Fishes.
7. Students' knowledge about various techniques of ornamental fish breeding, rearing and its marketing to make them self-sustainable after completing course.

### **UNIT-I**

**Culture of ornamental fishes:** Introduction, definition, classification, varieties, relevance  
**Breeding:** Brood stock development, Breeding, larval rearing, induced breeding, environmental manipulation, water quality parameters, feeding, harvesting and conditioning. Commercially important- indigenous, exotic (egg –layers and livebearers) ornamental fishes. Breeding of live bearers and egg layers. Types of breeding, selective breeding and cross-breeding and hormonal induction and sex-reversal.

### **UNIT-II**

**Fabrication and setting up of aquarium-** Principles of setting up and maintenance of aquaria different types fish tanks, requirements, construction, and fabrication of glass tanks, Steps of aquarium fabrication, Aquarium accessories for small and large-scale units. Aeration and filtration. Latest trends in aquarium tanks. Uses of aquarium plants, Use of test kits for regular monitoring water quality. Common diseases and parasites of freshwater and marine ornamental fish. Fish diseases and their prophylactic measures.

### **UNIT-III**

**Management practices in ornamental fish farm-** Pond fish keeping, siting a pond, size of ponds, equipments, stocking of pond with plants, Pond construction fish production facilities, Permission from the competent authority, resources of water, water quality management, selection of suitable species of ornamental fishes. Construction of cement cisterns for indoor-facility, FRPTanks, and water re-circulation facility, water filtration systems, eco-friendly approach to manage the effluents. Quarantine policy and facility.

#### **UNIT-IV**

**Feeds and feed management** – Feeding and nutrition of ornamental fishes. Nutritional requirements of aquarium fish. Larval feeding. Live feed culture. Artemia culture, infusoria, brachionus culture, development of live feed culture lab. Formulated feeds. Preparation of aquarium fish food. Colour enhancement techniques. Feeding frequency. Feeding fry, feeding of young ones, feeding of adults. Water quality management.

#### **UNIT-V**

**Ornamental fish transportation and Marketing-** Fish packing systems, steps to be taken while transporting, condition of fish for packing, ornamental fish trade-supply - demand situation in India. Quality control, prices, demand. Global trade of ornamental fishes, contribution of culture and capture; marketing strategies; Green certification. Govt policies and subsidies.

#### **REFERENCES**

1. Anna Mercy, T V and Gopalakrishnan, A and Kapoor, D and Lakra, W.S (2007): Ornamental Fishes of the Western Ghats of India. National Bureau of Fish Genetic Resources, Kochi.
2. Arumugam N., Jayashree C. S., K.V 2015: Home Aquarium and Ornamental Fish Culture, Saras publication.
3. Dholakia A. D. 2016: Ornamental Fish Culture and Aquarium Management, Daya Publishing House
4. Edward J. Noga, 2010 : 2<sup>nd</sup> Edition, Iowa State University Press
5. Felix S., Anna Mercy T. V., Saroj Kumar Swain 2013: Ornamental Aquaculture: Technology and Trade in India, Publisher: Daya Publishing House.
6. Heiko Bleher, 2018 Indian Ornamental Fishes Volume 1, Aqua press Publishers.
7. ICAR, 2019: Fresh water ornamental fish breeding and aquascaping techniques (A training manual) CIARI, India.
8. Lewbart Gregory A, 2018: Ornamental Fish, Publisher: Manson Publishing Ltd
9. Smith S.A, 2019: Fish diseases and Medicine: 1<sup>st</sup> Edition, CRC press, Taylor and Francis publishers.
10. Wester C.D. 2015: Nutrient requirements and feeding of fishes for aquaculture publishers, CIBI, India.

**\*Visiting ornamental fish farming Unit and aquarium trading industry is compulsory and submit to the report.**