Course	**Generic Elective**
Semester	II
Paper Number	HBTGE2022T & HBTGE2022P
Paper Title	BIOTECHNOLOGY AND HUMAN WELFARE
No. of Credits	6
Theory/Composite	Composite
No. of periods assigned	4 Theory + 2 Practical
Course description/objective	The course aims to 1. impart a comprehensive understanding of the basic techniques as applied to biological systems and living organisms to produce or modify products or processes for human welfare. 2. enable students understand the basic biology of plants and their utilization in biotechnological improvement through tissue culture and genetic engineering. 3. familiarize students with basic techniques applied for improving plant variety, creating transgenic organisms and in animal husbandry. 4. provide an overview of techniques used for genome analysis. 5.provide an overview of medical diagnostics and disease biology. 6. familiarize students with laboratory techniques and equipment used in biotechnology laboratories and for acquisition of physiological and environmental data.
Syllabus	**Theory** **Module A: (25 marks)** **UNIT I: Plant groups:** Characteristic features of different plant groups. **UNIT II: Plant tissue culture:** Aseptic techniques; culture media and nutritional requirements; totipotency and micropropagation; explant types (meristem, shoot tip, embryo, leaf, node, anther, pollen, ovary, endosperm, protoplast); response of explants (callus, organogenesis, embryogenesis); suspension culture; somatic hybridization. **UNIT III: Genetic engineering of plants:** Biology of Agrobacterium tumefaciens, plant transformation techniques; concept of transgenic plants with emphasis on their application in crop improvement **No. of Classes:** 2 Classes per week **Module B: (25 marks)** **UNIT IV: Genome analysis:** Methods of isolating nucleic acids, visualization of nucleic acids by gel electrophoresis, restriction endonucleases and their use, techniques for DNA sequencing and DNA fingerprinting. **UNIT V: Medical Diagnostics:** Composition of blood, types of blood cells, blood clotting, blood groups, estimation of blood glucose, measurement of blood pressure, causes, symptoms, diagnosis and prevention of diabetes and malaria, basic idea of drug designing.

	UNIT VI: Aquaculture: Types of fisheries, composite culture of fish, fish hybridization, induced breeding in carps. **No. of Classes:** 2 Classes per week **Practical** 1. Resolution of DNA samples by agarose gel electrophoresis. 2. Restriction digestion of DNA 3. Demonstration: Overexpression of protein through IPTG induction 4. Demonstration of SDS-PAGE to check overexpression of protein 5. Study of epithelial tissue by methylene blue staining. 6. Determination of human blood groups. 7. Identification of different types of leucocytes from human blood sample. 8. Estimation of dissolved CO_2 and alkalinity from water samples. 9. Spot identification and significance of zoological specimens: Cnidaria (jellyfish), Platyhelminthes (tapeworm, liver fluke), Aschelminthes (roundworm), Annelida (earthworm), Arthropoda (termite queen, honey bee queen), Mollusca (apple snail, garden snail), Echinodermata (starfish), Cartilaginous fish (shark), Bony fish (rohu, koi, mrigal).
Readings	1. Ganguly, Kar. College Botany, Vol II. 2. Bhattacharya, Hait, Ghosh. A Text Book of Botany Vol I & Vol II. 3. T.B. Jha, B. Ghosh. Plant Tissue Culture: Basic and Applied 4. H.S. Chawla. Introduction to Plant Biotechnology 5. A. Slater, N.W. Scott, M.R. Fowler. The Genetic Manipulation of Plants 6. G.M. Cooper, R.E. Hausman. The Cell – A Molecular Approach. 7. T.A. Brown. Genomes 3. 8. A.C. Guyton, J.E. Hall. Textbook of Medical Physiology. 9. S. Sarkar, G. Kundu, K.K. Chaki. Introduction to Economic Zoology.
Evaluation	Theory: Continuous Internal Assessment: 10 marks End-Semester Theory Examination: 50 marks Practical: Continuous Internal Assessment: 10 marks End-Semester Examination: 30 marks
Paper Structure for End Sem Theory	Module A (25 Marks) Five questions 1 mark each, i.e. 1x5=5 Two questions 10 marks each, i.e. 10x2=20 Module B (25 Marks) Compulsory objective questions: 1x 5 = 5 marks Any two from three subjective questions with subparts: 10 x 2 = 20 marks (No sub-part will be less than 1 mark or more than 5 marks)