



**OFFICE OF THE PRINCIPAL, S.K.C.G. (AUTONOMOUS) COLLEGE,
PARALAKHEMUNDI, GAJAPATI, ODISHA-761200**

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PROGRAMME OUTCOME

PG DEPARTMENT OF LIFE SCIENCE

SEMESTER -1 (Total Credits-20) COURSE OUTCOME		Papers	Learning Outcome & ATTAINMENT Level
CO 1	Describe and define the different concepts of Biophysics and Biochemistry, Intermolecular forces, Colloidal system, Ionisation of water and the ideas of Bio-energetics, steady state, Gibb's Free energy, enthalpy, entropy, Laws of Thermodynamics in relation to living organisms. Ultra-structure, Composition and functions, Ultra structure of Cell and organelles, Active and passive mechanisms of Membrane transport	Paper: LSC101-105	SGPA on basis of Credits earned from MSE (Mid Semester Examinations or CIA- Continuous Internal Assessments) & ESE (End Semester Examinations)
CO 2	Critically study and analyse the Structure and properties of Amino acids and Proteins including Domain and Motif concept, Ramachandran plot; Structure-classification-functions of polysaccharides; Properties and Classification of Enzymes and Co-enzymes, Mechanism of Enzyme action and Kinetics, Regulation of enzyme activity including Allosteric Enzyme regulation and Covalent modification.		
CO 3	Develop a strong foundational knowledge on Gluconeogenesis, Hexose Monophosphate shunt, Fatty acid biosynthesis, Amino acid metabolism; Electron transport in mitochondria and chloroplast. Oxidative phosphorylation & Photo-phosphorylation, proton pump. ATP Synthesis		
CO 4	Comprehensive ideas on Cell – Cell interaction, adhesion, Cell signaling. Cell cycle, cellular reproduction, Cell cycle check points, control mechanism and CDK. Life Cycle phenomena in Virus, Bacteria, Genetic Recombination: transformation, Conjugation & transduction. Bacteriophage Genome, Outline of Eukaryotic Phage, Microbes in industry and agriculture.		
CO 5	To assess-evaluate and summarize the complex topics/issues concerning Mendelism; Probability and pedigree analysis; Incomplete dominance and co-dominance; Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Recessive and Dominant traits, Penetrance and Expressivity, Numericals, Problems, Polygenic inheritance: Neo-Mendelism, Gene interaction, Linkage, Crossing over and Recombination, Aneuploidy and Euploidy		
CO 6	Hardy-Weinberg Law, EXTRA CHROMOSOMAL INHERITANCE, POPULATION GENETICS, Fossils, Fossilization, Sequential evolution, convergent and Divergent evolution, Micro, Macro and Mega evolution. Molecular evolution, Synthetic theory of evolution Theory of Natural selection; Continental drift and Species distribution, Speciation. A student should be able to articulate, express verbally or demonstrate/write comprehensively on any of the topics covered.		

SEMESTER - II(Total Credits-20) COURSE OUTCOME		Papers	LO & ATTAINMENT Level
CO 1	Have knowledge on the Salient features of different Concept of Ecosystem (Emergent Properties, Biological levels of Organisation, Structure, Classification of Ecosystems, Ecological energetics, Gaia hypothesis and Cybernetics). Leibig's Law of Minimum and concept of limiting factors, Law of Tolerance.	Paper: LSC206- 210	SGPA on basis of Credits earned from MSE (Mid Semester Examinations or CIA- Continuous Internal Assessments) & ESE (End Semester Examinations)
CO 2	Identify key concepts/ideas in Population Ecology, Community Structure, dynamics, Ecological niche, Biodiversity: Types/Levels, Conservation strategies; Environmental Pollution: sources and control of Air, Water, Land , Noise pollution; Greenhouse effect, Ozone depletion, Global warming, climate change		
CO 3	Comprehend the different physic-chemical processes Waste Management & Bioremediation, Environmental Management and Auditing, EIA. Concept and applications in biostatistics; Probability distribution (Normal, Binomial & Poisson), Students 't' test Goodness of fit and association analysis by chi-square test, Analysis of variance ratio test (Two-way & Three-way). Correlation and Regression analysis.		
CO 4	Conceptualize questions in Replication of Double stranded DNA; Rolling Circle and Θ models, Transcription and Reverse transcription, Gene Concept as recon, muton and cistron, split jumping gene, and over-lapping gene concepts, Regulation of gene expression; Operon Concepts, Negative and Positive regulations, C-Value paradox, repetitive and non-repetitive DNA sequence. In-vitro DNA hybridization and its applications. Sequencing of nucleic acids		
CO 5	Study Principles and types of Fluorescence Microscopy ,TEM & SEM. General Principles and types of centrifugation, of Chromatography (Paper, Thin layer and Gas), Spectrophotometry concept and working principle of colorimetry, Spectrophotometry, Elementary Principles and types of Electrophoresis; AGE and PAGE		
CO 6	Tools of new Biotechnology, Restriction enzymes, their types and functions, Extraction, Isolation and purification of RNA and genomic, organellar and plasmid DNA, Amplification of DNA; PCR –Types and applications, Blotting techniques (Sothern, Northern, Western, Dot and Slot); The course covers studies on Cell, tissue, organ and protoplast culture techniques, Cloning Vectors: Genetic Engineering technology along with Gene transfer technologies; Fermentation technology applications, Bioreactors, Monoclonal antibodies, Transgenic Plants and Animals, Waste water and Sewage treatment, Bioremediation, Bio-safety, Bioethics,		

	Students will acquire expression abilities on the above topics in writing, discuss or write in shapes of short and/or long, topic specific notes		
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SEMESTER - III(Total Credits-20) COURSE OUTCOME (Plant Science)		PAPERS	LO & ATTAINMENT Level
CO 1	Define and elaborate description about classification of cryptogams, range of thallic structure and reproduction in Algae, Fungi and Bryophytes, Progressive Sterilization of Sporogenous tissues in Bryophyta, Origin of land plants, Salient features, evolution of vascular tissues, Origin of Heterospory, Salient features of Gymnosperms; Palaeobotany	Paper: LSC 311- 315	SGPA on basis of Credits earned from MSE (Mid Semester Examinations or CIA-Continuous Internal Assessments) & ESE (End Semester Examinations)
CO 2	Botanically Identify and technically describe Origin and evolution of angiosperms, Different systems of classification up to order. International code of Nomenclature (ICN), Range of floral structure, affinities and phylogeny of Monocot and Dicots		
CO 3	Fundamentals of Water relations in plants: Concepts of water and solute potential; Principles of Absorption of water, Ascent of sap and their applications, Mechanism of Transpiration, Mineral Nutrition and Translocation of organic solutes		
CO 4	Develop a critical understanding of concepts of Phytochrome and photo-morphogenesis Mechanism Signal transduction and regulatory systems, mechanism if Photosynthesis; Principles of light absorption in chloroplast, LHC, mechanism of electron flow, C3, C4 and CAM pathway for carbon reduction and Photorespiration.		
CO 5	Ability in conceptualizing the processes of Anabolic and Catabolic Pathways, Regulation of Metabolism via Regulatory Enzymes, Allosteric and Covalent modulation and Isoenzyme; Explain with relevant examples the intricacies of fatty acid biosynthesis Oxidation of fatty acids, Sulphur metabolism, Nitrogen metabolism		
CO 6	Aerobic and Anaerobic respiration, Energetics of respiration; Electron Transport System, Action un-couplers, Cyanide resistant respiration. HMP pathway. Acquire the ability to express/articulate/write comprehensively on any of the topics covered across semesters enlisted above.		

SEMESTER - III(Total Credits-20) COURSE OUTCOME (Animal Science)		PAPERS	LO & ATTAINMENT Level
CO 1	Define and elaborate description about the Biology of Nonchordata, Locomotion in protozoa, Reproduction in protozoa, Parasitism in Protozoa, Reproduction in Porifera. Polymorphism in Coelenterata, Structure and affinities of Ctenophora, Archiannelida, Helminth Parasites with special reference to man and Metamerism in Annelida.	Paper: LSC 311- 315	SGPA on basis of Credits earned from MSE (Mid Semester Examinations or CIA-Continuous Internal Assessments) & ESE (End Semester Examinations)
CO 2	Study and technically describe Vision in insects, Larval forms in Crustacea, Respiration in Arthropoda, Structure and affinities of peripatus, Respiration in Mollusca, Larval forms in Echinodermata, Water vascular system in Echinodermata, Structure and affinities of Hemichordata, Lobophorates and Brochiopods; Economic Zoology: Apiculture, Sericulture, Lac culture, Pearl culture.		
CO 3	Fundamentals of the Biology and Origin of Chordata, Inter relationship of Cephalochordata and Urochordata, Structure and affinities of Cyclostomata, Distribution, structure and affinity of Dipnoi, Origin of Tetrapoda, Parental care in fishes and Amphibia, Structure & affinities of sphenodon, Mammal like reptiles, Flight adaptations and perching mechanism in birds.		
CO 4	Develop a critical understanding of concepts of prototheria and metatheria, Dentition in mammals, Adaptive radiation in mammals, Comparative anatomy of Integument and Jaw-suspensorium in Vertebrates, Ethology, Migration behaviour in fishes and birds, Reproductive behaviour in vertebrates (Courtship and Mating), Biological clocks, Social behaviour in insects and primates		
CO 5	Ability in conceptualizing the processes of Molecular events during fertilization, Cleavage, Morphogenic movements and mechanism of gastrulation, Concept of organizer and embryonic induction; Foetal membranes and their development, Placentation, Oestrous and Menstrual cycle		
CO 6	Have a critical look at the issues of Infertility and Artificial insemination, Invitro fertilization, Birth control, Regeneration, Apoptosis : Mechanism of PCD, genetic control, Cytological & Morphological abnormalities of cancer cell. Acquire the ability to express/articulate/write comprehensively on any of the topics covered across semesters enlisted above.		

SEMESTER IV(Total Credits-20) COURSE OUTCOME (Plant Science)		PAPERS	LO & ATTAINMENT Level
CO 1	Students should be able to define/state the different aspects of Plant Anatomy; anomalous secondary growth in-adaptive and Non-adaptive type Dicot Stem and Roots, Mechanical Tissues studies, Concept of Double Fertilisation & Triple Fusion; Endospore and Embryo Types and development, Apomixis, Seeds types and Germination	LSC 416- 420	SGPA on basis of Credits earned from MSE (Mid Semester Examinations or CIA-Continuous Internal Assessments) & ESE (End Semester Examinations) The CGPA(Cumulative Grade Point Average) is the final scores reflected in the final Statement of Marks
CO 2	Have a clear idea on the mechanisms involved in Physiology of flowering photoperiodism, Senescence, Regulation of plant growth and phytohormones, Molecular mechanism of responses of plants to Auxins, Gibberellins, Cytokinins, ABA and Ethylene.		
CO 3	Study and acquire knowledge on concepts of stress, Acclimation and Homeostasis, Bioassays, Synergism and Antagonism, Water deficit stress and adaptations of plants and animals to water deficit stress, Ionising radiation, effects and radiation standards, Oil Pollution, Eutrophication, Pollution in Indian Rivers		
CO 4	Develop comprehensive ideas on Primary, Secondary Production, methods of measurement of eco-efficiency and conservation, Natural habitat conservation in Odisha, forest management, Wild life and soil conservation, Environmental monitoring and management through appropriate Environmental Laws.		
CO 5	Study different concepts and tools of Biotechnology, Restriction enzymes: Types and functions, Cloning Vectors for recombinant DNA, gene Library (BAC,YAC and MAC), Gene Cloning concepts and Strategies, PCR, DNA Polymorphism studies, Sequencing of genes and General Idea about OMICs.		
CO 6	Details of Plant and animal cell-tissue culture strategies and applications, Plant Protoplasts isolation, animal Stem Cell culture and applications, protein engineering, drug designing, fermentation Biotechnology and applications, Bioreactors; Concept of Energy conservation and Green energy prospects. Students, on completion of all the topics across semesters will come up with comprehensive notes, articulate, express, write in any verbal or written assessment/evaluation processes.		

SEMESTER IV(Total Credits-20) COURSE OUTCOME (Animal Science)		PAPERS	LO & ATTAINMENT Level
CO 1	Students should be able to define/state the different aspects of animal physiology, immunology and taxonomy; Digestion and absorption of food, Cardiac cycle and its regulation, Breathing and gaseous exchange and transportation Muscle contraction, mechanism of Nerve impulse conduction, synaptic transmission and physiology of excretion.	LSC 416- 420	SGPA on basis of Credits earned from MSE (Mid Semester Examinations or CIA-Continuous Internal Assessments) & ESE (End Semester Examinations) The CGPA(Cumulative Grade Point Average) is the final scores reflected in the final Statement of Marks
CO 2	Have a clear idea on the types of Immunity, specificity and memory, Lymphoid Organs, Immunoglobulins, major Histocompatibility complexes and their role in Antigen-Antibody recognition, some common Human Immune-deficiency diseases.		
CO 3	Study and acquire knowledge on concepts of Principles of classification and procedures in animal Taxonomy, Species concept, chemotaxonomy, cyto-taxonomy and numerical taxonomy, Preservation and Identification of animals, Ecology and physiology in taxonomy.		
CO 4	Develop comprehensive ideas on Primary, Secondary Production, methods of measurement of eco-efficiency and conservation, Natural habitat conservation in Odisha, forest management, Wild life and soil conservation, Environmental monitoring and management through appropriate Environmental Laws.		
CO 5	Study different concepts and tools of Biotechnology, Restriction enzymes: Types and functions, Cloning Vectors for recombinant DNA, gene Library (BAC,YAC and MAC), Gene Cloning concepts and Strategies, PCR, DNA Polymorphism studies, Sequencing of genes and General Idea about OMICs.		
CO 6	Details of Plant and animal cell-tissue culture strategies and applications, Plant Protoplasts isolation, animal Stem Cell culture and applications, protein engineering, drug designing, fermentation Biotechnology and applications, Bioreactors; Concept of Energy conservation and Green energy prospects. Students, on completion of all the topics across semesters will come up with comprehensive notes, articulate, express, write in any verbal or written assessment/evaluation processes.		