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Dr.A.Balakrishna,M.Sc.,Ph.D., Principal

Department of Biotechnology

Bachelor of Science (B.Sc, MBBCBT, CBCBT, BCBTHG,)

APSCHE, Revised Syllabus of Biotechnology under CBCS Framework

w.e.f.2016-17

Course outcomes(COs) for Biotechnology

Code	Title of the Paper	Outcomes
Course 1 (TH)	MICROBIOLOGY AND CELL BIOLOGY	 CO:1 To acquire knowledge about basic definitions ,facts and concepts of unicellular and multicellular organisms. History of microbiology . CO2: To learn about the structure of bacteria and their endemic nature. To acquire knowledge about the parasites and their life cycle. CO3: To have knowledge about physiological and metabolic processes and cell signalling pathways .To impart laboratory observation skills . CO4: To acquire knowledge about cell organelles-nucleus ,ER,Golgi apparatus,mitochondria and ribosomes . CO5: To acquire knowledge about the cell membrane and develop scientific attitude,laboratory discipline and interest.
Course 1 (PR)	PRACTICAL 1	CO1: To know about the bacterial culture streaking ,pouring and spreading methods. CO2: To learn about the use of microorganisms in food industries. CO3: To learn about shapes of bacteria like bacilli and coccus. CO4:To learn about mitosis and meiosis.



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MACROMOLECULES ENZYMOLOGY AND BIO ENERGITICS	CO1:Gain fundamental knowledge in biochemistry. Able to learn about energy producing pathways of glycolysis.
	CO2: To have knowledge of biochemical principles with specific emphasis on different metabolic pathways and regulators.
	CO3:To understand the molecular basics of various pathological conditions from the perspective of biochemical reactions .To have basic knowledge about how food and sunlight is converted in the body to form useful energy.
	CO4: The major learning objective of the course is to understand the theories of enzyme kinetics, the mechanisms of enzyme regulation in the cell.
	CO5:Able to understand how enzymes work through the relation between structure and function and how their fold into their native state.
RACTICAL 2	CO1: Able to determine the acid value of fats which is the general indication of the condition and edibility of oils
	CO2:To gain knowledge about immobilization of enzymes and effect of temperature and ph and enzyme activity.
a	203: To acquire knowledge about how to estimate carbohydrates, minoacids and proteins.
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Code	Title of the Paper	Outcomes
COURSE 3 (TH)	BIOPHYSICAL TECHNIQUES	CO1: To acquire knowledge about basic definitions, facts and concepts of light microscopy, fluorescent microscopy, image processing, confocal and multiphoton microscopy, phase contrast and electron microscopy.
	t Provinsi distancia Scollogio accesso	CO2: To know about X-ray diffraction and protein structure determination.
		CO3: To acquire knowledge about basics defenitions of chromatography techniques: thin layer chromatography and paper chromatography.
		CO4: To understand various molecular biology techniques like gel electrophoresis, southern blotting, northern blotting and western blotting.
	ere and some	CO5: To impart laboratory observation skills and to develop scientific attitude, laboratory discipline and interest.
COURSE 3 (PR)	BIOPHYSICAL TECHNIQUES	CO1: To understand about the biological research shares significant overlap with biochemistry.
		CO2: Know about the molecular biology and physical chemistry. CO3: To understand the physiology and nanotechnology.Know about the process of bioengeneering and computational biology.
Califford A		CO4: To understand the biomechanics and developments biology and system biology.



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Code	Title of the Paper	Outcomes
COURSE 4 (TH)	IMMUNOLOGY	CO1: To learn about basic mechanism and functional interplay of innate and adoptive immunity and cellular/ molecular pathways of humoral / cell mediated adoptive responses.
		CO2: To learn about structures, classes of antibodies and antigens and factors effecting antigenicity.
-		CO3: To understand how disease causing microorganisms can be used as a weapon to fight against same microorganisms. Able to learn about hypersensitivity and its types.
		CO4: To gain knowledge that helps to take up research to find medicines for present incurable diseases. To get better understanding about vaccination, blood transfusion,grafting etc.
		CO5: To have knowledge about hybridoma technology and its uses in immuno diagnosis.
COURSE 4	IMMUNOLOGY	CO1: To gain knowledge about lymphoid organ, production of antibodies, PCR and blotting techniques.
	da izmeniyi heri çısın	CO2:To learn about how to determine types of blood groups.
		CO3: To learn about production of antibodies and their titration used to eliminate antigens and pathogens.
	anophy to be the so	CO4: To learn about the estimation of haemoglobin.

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Code	Title of the Paper	Outcomes
COURSE 5 (TH)	MOLECULAR BIOLOGY	CO1: Get hold of thorough knowledge about gene and genome organization in variety of cell organelles / sps. Able to recognize and understand various proteins that associate the genomes.
Dr. d.25 Jacobs		CO2: Look up through various models of replication in both prokaryotic and eukaryotic organisms. Achieve knowledge on the basic concepts of mutations and diverse models of repair systems.
		CO3:Comprehensive acquaintance about transcription in both prokaryotes and eukaryotes.
		CO4: Be attentive of the concepts in post transcriptional modifications and distinguish the reverse transcription with normal transcription.
		CO5: Attain facts in relation to genetic code and revise the structural differences among RNA's. Be well informed variety of operon concepts in prokaryotes ,know how gene regulations happens.
COURSE 5 (PR)	MOLECULAR BIOLOGY	CO1: Be skilled in isolation of genetic material from various sources.
		CO2: Bring about expertise in valuation of phosphorous content in genetic materials .
		CO3: Able to design a valid protocol for isolation of chromosomal and plasmid DNA in bacteria.
		CO4 :capable to assess the quantitative fraction of genetic material by exclusive reagents.



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Code	Title of the Paper	Outcomes
COURSE 6 (TH)	rDNATECHNOLOGY	CO1: To acquire knowledge about basic definitions, facts and concepts of gene cloning.
		CO2: To acquire knowledge about plasmids and vectors.
		CO3: To learn about restriction and endonuclease.
an the start		CO4: To have knowledge about recombinant plants and to understand the genetic recombination.
anti-anti-theory anti-anti-theory anti-theory		CO5: To learn about the tools of genetic engineering which helps to produce new variety of products through rDNATechnology.
COURSE 6 (PR)	rDNATECHNOLOGY	CO1: To gain knowledge about PCR that is how to make copies of specific DNA segments.
		CO2: To learn about ligation of DNA molecules and their testing using electrophoresis.
	¥.	CO3: To learn about transformation in bacteria using plasmids'
		CO4: To estimate the activity of DNAase, RNAase and DNA and RNA respectively
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Code	Title of the Paper	Outcomes
COURSE 7A (TH)	Plant and Animal biotechnology	CO1: To learn about tissue cultutre ,callus and suspension culture and also know about maintenance of callus and suspension cultures and single cell clones.
		CO2: To have knowledge about micropropagation, regenation, production of haploids, protoplast culture and somatic hybridization.
		CO3: To know about growth factors laboratory facilities and characteristics of culture etc and also know about the tissue response to trophic factors.
		CO4: To learn about rDNA products in medicine and also know about the concept of gene therapy, transgenic animals and invitro fertilization.
		CO5: To have knowledge about intellectual property rights. Able to learn about society and ethical aspects of biotechnology and biosafety issues.
COURSE 7A (PR)	Plant and Animal biotechnology	CO1: To learn about cell count by haemocytometer.
		CO2: To learn about establishing primary cell culture of chick embryo fibroblasts.
		CO3: To determine the viability of seeds and seed germination.
		CO4: To study about cultivation of virus in animal tissue culture.



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Code	Title of the Paper	Outcomes
COURSE 7B (TH)	ENVIRONMENTAL BIOTECHNOLOGY	CO1: To learn about the principles of ecology, water and terrestrial ecosystem. Able to know about biogeochemical cycles and role of microbes in them.
		CO2: To have knowledge about inorganic and organic pollutants of air, land and water. To learn about environmental monitoring and biological indicators.
		CO3: To acquire knowledge about Refuse disposal-treatment methods. Able to learn about the production of biogas, bioethanol, microbial hydrogen production.
the main term of britighter		CO4: To learn about waste water management, solid waste management and microbial analysis of milk and food.
anti protetti di Succi di tipitati	and a second of the second sec	CO5: To have knowledge about bioremediation, biodegradation and role of genetically modified organisms in the environmental management.
COURSE 7B (PR)	ENVIRONMENTAL BIOTECHNOLOGY	CO1: Able to determine hardness, alkalinity and dissolved oxygen concentration of water sample.
	in a second second	CO2: To learn how to isolate xenobiotic degrading bacteria by selective enrichment technique.
		CO3: Detection of coliforms for determination of purity of potable water.
1.1.1.15678	share to mino several a l	CO4: Estimation of heavy metals in water and soil.

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Code	Title of the Paper	Outcomes
COURSE 7C (TH)	INDUSTRIAL BIOTECHNOLOGY	CO1: To learn about isolate screening and improvement of industrially important micro- organisms.
granical		CO2: To learn about bioreactor and its classifications. And also to know about the analysis of batch ,continuous ,fed batch and semi continuous bioreactors .
	anan akati kapatén m alaganén ingelaka m	CO3: To have knowledge about production of Ethanol, Beer, Wine. And also about the production of citric acid by solid state and submerged fermentations.
	and a second provide and a second provide and the provide second	CO4: To achieve knowledge about production of enzymes like Amylase and protease. And to learn about the production of Backer's yeast, SCP, Penicillin.
		CO5: To study about production of rDNA proteins like Insulin, Growth Hormone, Recombinant vaccines, Monoclonal Antibody.
COURSE 7C (PR)	INDUSTRIAL BIOTECHNOLOGY	CO1: Able to estimate alcohol by titrimetry and calorimetric method.
		CO2: To know about the production of amylase from Bacillus spp.by shake flask culture.
		CO3: Production of alcohol or wine using different substrates.
1943		CO4: Isolation of amylase producing organisms from soil.



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Code	Title of the Paper	Outcomes
COURSE 8A1 (TH)	NUTRITIONAL BIOTECHNOLOGY	CO1: To learn about the components of food like carbohydrates, fats, proteins and their importance in daily diet. And also to know about their deficiency disorders.
	n ann a' Cathaire a Daoine Scattaire Cathaire Scattaire	CO2: To learn about types of vitamins their sources and the biological role of A,D,E,K,B Complex and C in metabolism.
		CO3: Able to determine metabolism rate and Body mass Index. Also to learn about factors that influence BMR(basal metabolism rate).
		CO4: Able to learn about the role of water ,Food allergy and its control.
		CO5: To have knowledge about essential minerals Ca, Mg, Fe, I, Co, Mo, Zn, etc, their role and disorders.
COURSE 8A1	NUTRITIONAL BIOTECHNOLOGY	CO1: Isolation of glycogen from sheep liver.
(PR)		CO2: To learn how to prepare chloroplast from green leaves .
		CO3: Able to learn about quantitative analysis of food for -moisture, ash, iron and calcium.
		CO4: To learn how to prepare carotens from carrots.

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Code	Title of the Paper	Outcomes
COURSE 8A2 (TH)	FOOD BIOTECHNOLOGY	CO1: Able to learn the peinciples of food preservation. To have knowledge about infection ,self life and perishable food.
(111)		dehydration and irradiation.
		CO3: To have knowledge about methods of cooking, microwave cooking . and to know the advantages and disadvantages of various food cooking methods.
		CO4: To have knowledge about animal ,sea food and their importance.
		CO5: To acquire knowledge microbiology of milk, milk products, preservation of food by salting, smoking etc,
COURSE 8A2	FOOD BIOTECHNOLOGY	CO1: To have knowledge about osmotic dehydration ,food spoiling microbes.
(PR)		CO2:To determine Ph of food using pHmeter.
		CO3: T perform pasteurization of fluids using different methods.
		CO4: Isolation and identification of food spoiling microorganisms.



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Code	Title of the Paper	Outcomes
COURSE 8(A3) (TH)	METABOLISM	CO1: To know about carbohydrate metabolism glycolysis. To learn about TCA cycle ,HMP stunt pathway etc
		CO2: To have knowledge about photosynthesis, calcium cycle, C4 pathway, nitrogen and urea cycles.
		CO3:To learn about degradation of fatty acids and cholesterol metabolism.
		CO4: Able to learn about amino acids reaction and biosynthesis of creatinine.
	ana data cuin	CO5: To acquire knowledge about metabolisms of nucleic acids, Denovo and salvage pathways.
COURSE 8(A3) (PR)	METABOLISM	CO1: To estimate aminoacids by ninhydrin method.
	content - un	CO2: To estimate proteins by Bieuret method .
	en monthly grant state	CO3: To estimate glucose by DNS and Benedicts titrimetric method.
	· ·	CO4: To estimate total carbohydrates by anthrone method.

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Code	Title of the Paper	Outcomes
COURSE 8 B1 (TH)	TISSUE CULTURE	CO1: To learn about Animal tissue culture. Able to learn about culture media and sterilization .
		CO2:To have knowledge about isolation disaggregation and sub culturing of explant.
	2 ¹ 1	CO3:To know about cell lines and their maintenance. To acquire knowledge about organ culture and Hybridoma technology.
		CO4: To learn about plant tissue culture and callus cultures. To learn about embryogenesis.
		CO5: To know about somatic hybrids and cybrids. To have knowledge about invitro pollination and embryo culture.
COURSE 8 B1 (PR)	TISSUE CULTURE	CO1: To learn about preparation of medium for plant and animal tissue culture.
		CO2: To study about gene transfer techniques (Transformation).
	·	CO3: To have knowledge about micropropagation and cell counting.



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Code	Title of the Paper	Outcomes
COURSE 8 B2	INDUSTRIAL BIOTECHNOLOGY	CO1:To learn about primary and secondary metabolic products of micro- organisms.
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and the line line of state of state of		CO2: To know about screening and preservation of micro-organisms.
singl		CO3:To learn about fermentation design, types , principles , operating mechanisms, medium conditions and sterilization.
ACCUMENTS AND ACCUMENTS AND AND AND AND AND AND AND AND AND AND AND		CO4: To have knowledge about Intellectual property rights and patenting.
		CO5: To acquire knowledge how to produce antibiotics and r- DNA proteins and dairy products.
COURSE 8 B2	INDUSTRIAL BIOTECHNOLOGY	CO1:To isolate amylase from soil microbes.
(PR)		CO2: To produce wine from grapes.
		CO3: To learn about estimation of alcohol by calorimetry.

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Code	Title of the Paper	Outcomes
COURSE 8(B3) (TH)	ENVIRONMENTAL BIOTECHNOLOGY	CO1:To learn about Ecology ,various Ecosystems, Bio-geo,chemical cycles.
		CO2: To learn about pollutants ,maintenance of standards , Biological indicators.
		CO3: To learn about Biocides, Waste disposal-Effluent treatment methods.
		CO4: To have idea about Bioremediation, role of microbes in the environmental management.
		CO5:Able to know about microbiological analysis of milk and food.
COURSE 8(B3) (PR)	ENVIRONMENTAL BIOTECHNOLOGY	CO1:Able to determine hardness and alkalinity of water.
		CO2: Able to learn about titrymetry.
		CO3: To learn about isolation of microbes food and soil .



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Code Title of the Paper Outcomes COURSE **CELL BIOLOGY** CO1: To learn about basic cell unit, cell organelles and cell theory. 8C1 (TH) CO2: To have knowledge about ultrastructure of Eukaryotic and prokaryotic. CO3: To learn about organization and function of cell wall of plants, animals and fungi. CO4: To learn about cytosol ,cytoskeletal system ,morphology and types of chromosomes. CO5: To have knowledge about cell division, cell division and cancer biology. COURSE CELL BIOLOGY CO1:Able to observe stages of mitosis and meiosis in onion root tips and 8C1 buds. (PR) CO2: Able to acquire knowledge about karyotyping . CO3: To observe cell organelles under microscope.

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Code	Title of the Paper	Outcomes
COURSE 8C2	GENE BIOTECHNOLOGY	CO1:Tolearn about mendals law of inheritance
(TH)		CO2: Able to know about linkage and crossing over.
		CO3: To learn about multiple allels and structure of gene .
		CO4: Able to have knowledge about inherited disorders and types of mutations.
		CO5: To learn about induced mismatch repairs and role of Rec gene in DNA repair.
COURSE 8C2 (PR)	GENE BIOTECHNOLOGY	CO1: To learn about DNA repair.
		CO2: To study different stages of mitosis and meiosis.
		CO3: To learn about inheritance and many disorders.



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Code	Title of the Paper	Outcomes
COURSE 8C3 (TH)	BIOSTATISTICS AND BIO INFORMATICS	 CO1:Able to have knowledge about use of computers in biological research. CO2: Able to learn about branches of Bioinformatics and phylogenetic applications. CO3: To have knowledge about measurements of central tendency and computer application in Biotechnology. CO4:To have knowledge about concepts of system biology and computer aided drug design. CO5: To have knowledge about genomics , proteomics ,sampling test and ch2 tests.
COURSE 8C3 (PR)	BIOSTATISTICS AND BIO INFORMATICS	CO1: To isolate plasmid DNA from E.coli. CO2: To learn how to use software for sequence analysis of nucleotides and proteins.
		CO3: To learn about the problems related to t-tests and chi2 tests.

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