KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

COIMBATORE – 641 029

DEPARTMENT OF BIOTECHNOLOGY (PG)

CURRICULUM AND SCHEME OF EXAMINATIONS (CBCS)

(2018 - 2019 and onwards)

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

Coimbatore – 641029

Vision

Developing the total personality of every student in a holistic way by adhering to the principles of Swami Vivekananda and Mahatma Gandhi.

Mission

- Imparting holistic and man-making education with emphasis on character, culture and value - moral and ethical.
- Designing the curriculum and offering courses that transform its students into value added skilled human resources.
- Constantly updating academic and management practices towards total quality management and promotion of quality in all spheres.
- Extending the best student support services by making them comprehensive and by evolving a curriculum relevant to student community and society at large.
- Taking steps to make education affordable and accessible by extending scholarships to the meritorious and economically disadvantaged students.
- Moulding the teachers in such a way that they become the role models in promoting Higher Education

DEPARTMENT OF BIOTECHNOLOGY

Vision

- To nurture world-class bioengineers with a potential to innovate, invent and disseminate knowledge for the benefit of society and environment.
- To develop the candidate with zeal towards Life Sciences with the spirit of moral, ethics, life and character building required for future Good Human being, a Genuine Scientist, a Hardworking Person, as Entrepreneur and as Bread Earner.
- To produce competent Biotechnologist's who can employ premium processes and applications which will profoundly influence the existing paradigm of agriculture, industry, healthcare and restoration of environment providing sustainable competitive edge to present society.

Mission

- The Department of Biotechnology of Kongunadu Arts and Science College, a family of Enthusiastic students, Committed teachers and Independent thinkers working and learning together to shape the future.
- We focus on implementing the valued education in the Life Sciences to bring about a new revolution in the field of Biotechnology.
- We encourage and comfort the candidate with the passion to undergo in the future to take the alleyway of education and research to serve the World with new energy of knowledge and beneficial products as life saver.

M.Sc. BIOTECHNOLOGY

PROGRAMME OUTCOME (PO)

PO1: Explain and properly apply the scientific method by developing valid hypotheses, designing experiments, gathering relevant data using current technology and to enable them to understand emerging and advanced concept in modern biology and help them to taken up their carrier in this field.

PO2: Apply the fundamentals of molecular biology theories, methodologies, and techniques by critically analyzing, interpreting, and presenting a recent and relevant scientific research paper that has been published in a refereed scientific journal.

PO3: The student will be able to get familiarized with professional and economic issues in biotechnology and foster important job related skills such as communications and experience in working as a team that will help them to become good Entrepreneurs.

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO1 : Apply knowledge of applied science and research fundamentals in the area of biotechnology – cell and molecular biology, microbial technology, genomics, proteomics, genetic engineering, advanced plant and animal sciences, computational biology, etc.

PSO2 : Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PSO3 : Understand the impact of the biological solutions / needs in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. Apply ethical principles and commit to professional ethics and responsibilities and norms of the current practice.

PSO4 : Demonstrate knowledge and understanding of concepts, principles and experimental approaches in Biotechnological to one's own work, as a member and leader in a team. Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

PSO5 : Demonstrate an ability to identify careers in biotechnology, domain like Pharmaceutical, Food Industry etc, and skills required to work in a biotechnology laboratory or manufacturing facility.

PBT01

KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)

COIMBATORE-641 029.

M.Sc. BIOTECHNOLOGY

Curriculum & Scheme of Examination under CBCS

(Applicable to Students Admitted from the Academic Year 2018-2019 and onwards)

Semester	Subject Code	Title of the Paper	Instruction Hours / cycle	Exam. Marks			Duration of Exam. Hrs.	Credits
				CIA	ESE	Total		
I	18PBT101	C.P.1 – Biological Chemistry	5	25	75	100	3	5
	18PBT102	C.P.2 – Biostatistics and Bioinstrumentation	5	25	75	100	3	5
	18PBT103	C.P.3 - Cell Biology and Molecular Genetics	5	25	75	100	3	5
	18PBT104	C.P.4 – Microbiology	5	25	75	100	3	5
	18PBT1E1	Major Elective I	5	25	75	100	3	5
	18PBT1CL	C.Pr.1- Lab in Biochemistry, Molecular Genetics and Microbiology	5	40	60	100	6	3
		Total	**30**	**-**	**-**	**600**	**-**	**28**
II	18PBT205	C.P.5 – Genetic Engineering	5	25	75	100	3	4
	18PBT206	C.P.6 – Immunotechnology	5	25	75	100	3	4
	18PBT207	C.P.7 - Animal Biotechnology	5	25	75	100	3	4
	18PBT208	C.P.8 - Environmental Biotechnology	5	25	75	100	3	4
	18PBT2CM	C.Pr.2 - Lab in Molecular Biology and Genetic Engineering	5	40	60	100	6	3
	18PBT2CN	C.Pr.3 - Lab in Immunotechnology, Animal Biotechnology and Environmental Biotechnology	5	40	60	100	6	3
		Total	**30**	**-**	**-**	**600**	**-**	**22**
III	18PBT309	C.P.9 - Bioprocess Technology	5	25	75	100	3	4
	18PBT310	C.P.10 - Plant Biotechnology	5	25	75	100	3	4
	18PBT311	C.P.11 - Nanobiotechnology and Computational Biology	5	25	75	100	3	4
	18PBT3E2	Major Elective II	5	25	75	100	3	5
	18PBT3CO	C.Pr.4 -Lab in Bioprocess Technology, Plant Biotechnology and Bioinfomatics	5	40	60	100	6	3
	18PBT3N1	Non-Major Elective I – (On-line)	5	25	75	100	3	5
	18PBT3ST	Summer Training @	-	-	-	-	-	-
		Total	**30**	**165**	**435**	**600**	**-**	**25**
IV	18PBT412	C.P.12 - Genomics, Proteomics & Systems Biology	5	25	75	100	3	5
	18PBT4N2	Non-Major Elective II - (On-line)	5	25	75	100	3	5
	18PBT4Z1	Project Work *	20	40	160*	200	3	5
		Total	**30**	**90**	**310**	**400**	**-**	**15**
			120	-	-	2200	-	90

Note: CBCS – Choice Based Credit System; CIA – Continuous Internal Assessment;
ESE – End of Semester Examinations; C.P. - Core Paper; C. Pr. – Core Practical

***** Project Report – 140 marks; Viva-voce – 20 marks; Internal – 40 marks

@ The students shall undergo an Internship training/field work for a minimum period of 3 weeks at the end of the fourth semester during summer vacation and submit the report in the fifth semester. The report will be evaluated for 100 marks along with the internal viva voce by the faculty members and HoD. According to their marks, the grades will be awarded as given below.

Marks %	Grade
85-100	O
70-84	D
60-69	A
50-59	B
40-49	C
<40	U (Reappear)

Major Elective Papers *(2 papers are to be chosen from the following 4 papers)*

1. Pharmaceutical Biotechnology
2. Bioethics, Biosafety, IPR, Total Quality Management and Bioentrepreneurship
3. Marine biotechnology
4. Medical Biotechnology

Non-Major Elective Papers *(2 papers are to be chosen from the following 2 papers)*

1. Competitive Science – I
2. Competitive Science - II
3. Food Technology
4. Cancer Biology

Tally Table:

Part	Subject	No. of Subjects	Total Marks	Credits
I	Core – Theory / Practical / Project	18	1800	70
	Major Elective Paper	2	200	10
	Non Major Elective Paper	2	200	10
	Grand Total	**22**	**2200**	**90**

Advanced Learner's Course (ALC) under self-study scheme (optional)

Subject Code	Title of the Paper	Exam Marks		Duration of Exam (hours)	Credits
		ESE	Total		
18PBTD1	ALC.1- Frontier Technologies in Biosciences	100	100	3	2
18PBTD2	ALC.2- Stem Cell Technology	100	100	3	2

- 25 % CIA is applicable to all theory subjects. Proportion of CIA and ESE for practical is 40: 60.
- JOCs are optional for earning extra credits and are conducted 4 hours / cycle after college hours.

Job Oriented Courses (JOC):

1. JOC 1 – Plant Tissue Culture and Organic Farming (18PBTJ1)
2. JOC 2 – Herbal Biotechnology (18PBTJ2)

Note: JOC and ALC which are offered at present will be applicable for the students admitted during the academic year 2018-2019 and will be considered as extra credit courses.

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1-Remember; **K2**-Understanding; **K3**-Apply; **K4**-Analyze; **K5**-Evaluate

1. Theory Examination - Part I, II & III

(i) CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 10	A (Answer all)	10 x 1 = 10	MCQ	75
K2 Q11 to 15	B (Either or pattern)	5 x 5 = 25	Short Answers	
K3 & K4 Q16 to 20	C (Either or pattern)	5 x 8 = 40	Descriptive / Detailed	

(ii) CIA I & II and ESE: 55 Marks

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 10	A (Answer all)	10 x 1 = 10	MCQ	55
K2 Q11 to 15	B (Either or pattern)	5 x 3 = 15	Short Answers	
K3 & K4 Q16 to 20	C (Either or pattern)	5 x 6 = 30	Descriptive / Detailed	

2. Practical Examination:

Knowledge Level	Section	Marks	Total
K3	Experiments	50	60
K4	Record Work	10	
K5			

3. Project Viva Voce:

Knowledge Level	Section	Marks	Total
K3	Project Report	160	160
K4	Viva voce	20	
K5			

PBT04

Components of Continuous Internal Assessment

Components			Marks	Total
Theory	CIA 1	75	(75+75 = 150/10) 15	25
	CIA 2	75		
	Assignment/Seminar		5	
	Attendance		5	
Practical	CIA Practical		25	40
	Observation Notebook		10	
	Attendance		5	
Project	Review		15+15	40
	Regularity		5+5	

18PBT2CN

Programme code: 08		Programme title: M.Sc. Biotechnology		
Course code : 18PBT2CN		C.Pr.3 - Lab in Immunotechnology, Animal Biotechnology and Environmental Biotechnology		
Batch 2018-2019	Semester II	Hours / Week 5	Total Hours 75	Credits 3

Course Objectives

- To teach students the latest techniques and principles in Immunotechnology, animal biotechnology and environmental biotechnology
- To give hands on experience in immunological techniques
- To provide hands on training on animal cell culture techniques and environmental biotechnology

Course Outcomes (CO)

K3	CO3	Defining the fundamental concepts of immunology, disease diagnosis and animal tissue culture techniques
K4	CO4	Developing and applying the recent technology involved in diagnostic techniques of immunology and animal cell culture
K5	CO5	Examining and analyzing the results involved in immune techniques animal biotechnology and environmental biotechnology

Syllabus

I – IMMUNOTECHNOLOGY

1. Production and purification of IgG.
2. Immunoassay for particulate antigens.
3. Qualitative and Quantitative haemagglutination.
4. Radial immunodiffusion.
5. Ouchterlony double diffusion.
6. Immunoelectrophoresis.
7. Rocket immunoelectrophoresis.
8. Immunodiagnosis (ELISA).
9. Western blotting.
10. Peripheral Blood mononuclear cell separation.

18PBT2CN

II – ANIMAL TISSUE CULTURE

1. Preparation of tissue culture medium and membrane filtration
2. Chick fibroblast cells isolation
3. Preparation of primary cells
4. Cell counting and cell viability
5. Trypsinization of monolayer and subculturing
6. Cytotoxicity test-MTT assay
7. DNA fragmentation analysis
8. Demonstration of animal handling for experimental purposes, cervical dislocation, dissection of mice, cardiac puncture, blood sample preparation and its handling

III – ENVIRONMENTAL BIOTECHNOLOGY

1. Estimation of biological oxygen demand in water / sewage samples
2. Estimation of chemical oxygen demand in water / sewage samples
3. Determination of total dissolved solids in water / sewage samples
4. Water Quality analysis by MPN test
5. Isolation xenobiotic degrading bacteria by selective enrichment technique

Teaching Methods

Board teaching; Demonstration of experiments; Providing hands on training in all the experiments as well as the preparation of reagents; Discussion and Interpretation of results

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO3	M	S	M	S	M
CO4	H	S	H	M	H
CO5	S	M	M	H	S

S – Strong **H** – High **M** – Medium **L** – Low

18PBT3CO

Programme code: 08		Programme title: M.Sc. Biotechnology		
Course code : 18PBT3CO		C. Pr. 4 – Lab. in Bioprocess Technology, Plant Biotechnology and Bioinformatics		
Batch 2018-2019	Semester III	Hours / Week 5	Total Hours 75	Credits 3

Course Objectives

1. To gain hands-on experience and to learn the principles behind bioprocess technology, plant biotechnology and bioinformatics
2. To know the process involved in isolation, separation, manipulation of bioprocessing, plant cell culture techniques
3. To apply the technology in pharmaceutical industries and plant tissue culture based industries

Course Outcomes (CO)

K3	CO1	Applying the concepts involved in bioprocess technology, plant biotechnology and bioinformatics and demonstrating the techniques involved in Fermentation technology, plant cell culture and bioinformatics
K4	CO2	Executing the recent technology involved in bioinformatics, bioprocessing and plant cell culture
K5	CO3	Evaluating and analyzing the results involved in bioprocess technology, plant biotechnology and bioinformatics

Syllabus

I - BIOPROCESS TECHNOLOGY

1. Parts and design of a bioreactor.
2. Isolation of Protease producing bacteria
3. Optimization of culture condition for growth and protease production (media, pH & temperature).
4. Wine production and estimation of ethanol.
5. Production of organic acid- Lactic acid.
6. Immobilization of cells and test for its activity
7. Purification of fermentation product by Ion exchange Chromatography
8. Preparation of Biofertilizer
9. Mushroom cultivation

18PBT3CO

II - PLANT BIOTECHNOLOGY

1. Laboratory organization
2. Preparation of media and sterilization
3. Micropropagation- Nodal and shoot tip culture
4. Callus culture- DPPH assay
5. Cell suspension culture
6. Synthetic seed preparation
7. Somatic Embryogenesis
8. Anther culture
9. Regeneration and Hardening
10. *Agrobacterium* mediated transformation – hairy root culture

III - BIOINFORMATICS

1. File Formats of Nucleic acid and aminoacid sequences
2. Sequence similarity searching using NCBI (BLAST)
3. Protein Data banks (SWISPROT and ExPASy)
4. Multiple sequence alignment (ClustalW)
2. Phylogenetic analysis
3. Docking

Teaching Methods

- Board teaching
- Demonstration of experiments
- Providing hands on training in all the experiments as well as the preparation of reagents
- Discussion and Interpretation of results

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	M
CO2	H	M	S	M	S
CO3	M	H	H	S	S

S – Strong **H** – High **M** – Medium **L** – Low

18PBT412

Programme code: 08		Programme title: M.Sc. Biotechnology		
Course code : 18PBT412		C.P.12- Genomics, Proteomics and Systems Biology		
Batch 2018-2019	Semester IV	Hours / Week 5	Total Hours 75	Credits 5

Course Objectives

1. To study and deduce the molecular characterization of human genome
2. To study the techniques involved in structural and functional proteomics
3. To utilize the bioinformatic tools to design and development of novel drugs

Course Outcomes (CO)

K1	CO1	Commemorating the molecular techniques involved in characterization of genomes and proteomes
K2	CO2	Recognizing and interpret the techniques involved in genomics, proteomics, bioinformatics
K3	CO3	Administering the principles of genomics, proteomics, bioinformatics to discovery novel drug development
K4	CO4	analyzing the molecular markers and its applications

Syllabus

UNIT I (15 Hours)

Genomics: Genomes of bacteria and eukaryotes- topology, organization. Human Genome Project: Historical background; Human genome features-protein coding regions repetitive sequences and pseudogenes. **Ethical, legal, social implications of HGP*.**

UNIT II (15 Hours)

Mapping and Sequencing: Molecular markers for genome analysis - RFLP and SNP, Genetic and Physical maps- Pedigree analysis, Restriction mapping, STS mapping with radiation hydrid panels; DNA and Genome sequencing- Automated sequencing of DNA, Shotgun sequencing; Contig assembly.

UNIT III (15 Hours)

Proteomics: Structural proteomics- NMR, X-ray crystallography and Mass spectroscopy. Functional Proteomics - 2D analysis of cell proteins, Yeast two hybrid system, Protein micro arrays.