



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited "A" Grade by NAAC | 12B Status by UGC | Approved by AICTE

www.sathyabama.ac.in

SCHOOL OF BIO AND CHEMICAL ENGINEERING

CENTRE FOR MOLECULAR AND NANOMEDICAL SCIENCES

1.2.1 New Courses Introduced in 2022- 2023

Programme: M.Sc.- Medical Biotechnology and Clinical Research

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1	SMBA7005	Introduction to computational biology	2
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SMBA7005	Introduction to computational biology	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVE:

To provide knowledge on the life science and biological data to address significant scientific questions, as well as to acquire expertise in bioinformatics tools for the analysis of biological data. The students will acquire insight into the analysis of extensive biological data sets and the efficient functioning of commonly used bioinformatics tools.

UNIT: I Bioinformatics and biological databases

12 Hrs

Introduction - DNA replication, transcription, and translation -Genome organization. Introduction to DNA and protein databases - file formats - data retrieval (NCBI, EMBL, DDBJ and PDB). Major biological databases related to DNA, RNA, proteins & metabolic pathways. Database search engines. Large scale genome sequencing strategies – assembly and annotation. Sequence analysis – Analysis of Tools for Sequence Data Banks.

UNIT: II Computational algorithms for sequence alignment

12 Hrs

Sequence Alignment - Local and global alignment - Sequence similarity - Sequence identity – Gaps - Scoring matrices - pairwise and multiple alignments. Pairwise alignment – Needleman and Wunsch algorithm - Smith Waterman. Multiple alignment – CLUSTAL. Similarity Searching – BLAST & its application - BLAST variants.

UNIT: III Gene and protein prediction

12 Hrs

Gene prediction in prokaryotes and eukaryotes. Phylogenetics – Basics – terminologies - Gene vs species phylogeny - Forms of tree representation – tree construction. Protein structure alignment - secondary structure prediction - structure building - Homology modelling - Visualization (Rasmol, Pymol, Swiss PDB viewer, Chimera and Discovery studio). Protein tertiary structure prediction.

UNIT: IV Drug designing and molecular docking

12 Hrs

Drug discovery - cheminformatics tools. In-silico drug designing. Structure-based drug design – target identification and validation. Ligand-based drug designing and docking Introduction, Ligand-based drug design – lead designing – QSAR. Tools for CADD. ADMET properties. Lipinski's rule of five. Molecular docking – introduction - tools and docking programs: AutoDock, Dock, HEX. Virtual screening.

UNIT: V Applications of bioinformatics

12 Hrs

Structural, functional and comparative genomics. Microarray – technique – design – analysis. Metagenomics – introduction – tools – microbial diversity. Metabolomics. Proteomics. Pharmaceutical applications – drug discovery – personalised medicine – gene therapy.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the basic principles and concepts of bioinformatics.

CO2 - Use the existing databases effectively to extract data.

CO3 - Be capable of critical thinking and research methods in bioinformatics.

CO4 - learn new age concepts of omics and their analysis easily.

CO5 – construct a phylogenetic tree.

TEXT / REFERENCE BOOKS:

1. Jin Xiong, Essentials Bioinformatics, Cambridge University Press, 3rd Edition, 2006.
2. Attwood and ParrySmith, Introduction to Bioinformatics, Pearson Education, 3rd Edition,
3. D.W.Mount : Bioinformatics ;2nd Ed ; Cold Spring harbor Laboratory Press;2004

SMBA8005	Transgenics	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVE:

- The main objective of this course is to familiarize students with the fundamental principles of transgenics including techniques, their applications, and limitations. This course will provide the students an understanding of basic principles and recent advancements in the field of genetic engineering.

Unit: 1

12hrs

Introduction to molecular genetics - physical nature of DNA - central dogma – molecular mechanisms of DNA replication, recombination and gene expression – Mutations – DNA repair – organization of chromosomes – expression and transmission of genetic information – structural and functional organization of plasmids – plasmid replication – stringent and relaxed plasmids.

Unit: 2

12hrs

Recombinant DNA technology – history – overview – molecular cloning strategies – cohesive and blunt end cloning – types of vectors – DNA restriction – DNA ligation – DNA extraction and purification – nucleic acid hybridization – gene recombination – gene transfer methods – mutagenesis – phage display techniques – chimeric protein production – reporter genes – Northern blot – real time PCR – ELISA.

Unit: 3

12hrs

Genetically modified organisms – concepts – Expression and purification of recombinant proteins in microorganisms and animal cell lines - ‘natural’ vs ‘unnatural’ – biosafety – social and ethical implications – regulatory frameworks – IPR for genetically modified crops and animals.

Unit: 4

12hrs

Transgenic technology in plants and animals - gene expression and gene silencing in plants and animals – random insertional mutagenesis – gene targeting – methodologies – screening and selection – marker free transgenics – molecular farming.

Unit: 5

12hrs

Transgenic technology in plant systems - crop yield – nutritional quality – quantity – transgenic farm animals – poultry birds – fishes – vaccine development – growth hormones – commercial products – transgenic mammals for gene therapy.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand the basic principles and concepts of transgenics.
- CO2 - Learn the r-DNA technology techniques and their application in the field of biotechnology.
- CO3 - Expertise in the transgenic technology in animals and plants.
- CO4 - Develop genetic engineering experiments.

TEXT / REFERENCE BOOKS:

1. Recombinant DNA, Watson et al ; 5th Ed; 2006
2. Techniques for Engineering Genes ; Curell BR et al;2004
3. Techniques for Molecular Biology ; Tagu D & Moussard C; INRA; 2006
4. Gene Cloning and DNA Analysis ; 5th Ed ; Brown TA ; 2006
5. Recombinant DNA and Biotechnology ; 2nd Ed ; Kreuzer H and Massey A ;ASM;2006



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BOARD OF STUDIES

Minutes of Meeting (ODD SEM)

Date: 30th April 2022

Time: 11.00 AM

Chairperson : **Dr. Ramesh Kumar**

Attendees : **Ms. Sathya V**
Scientific Manager, Affigenix Biosolutions Pvt Ltd.

Dr. Edward

Head of the Department, Department of Biotechnology,
St. Joseph's College (Autonomous), Trichy

Dr. A. Dayanandan, Internal member

Dr. A. Madan Kumar, Internal member

Dr. S. Jackson Durairaj, Internal member

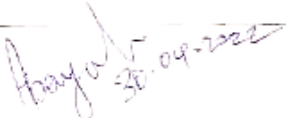
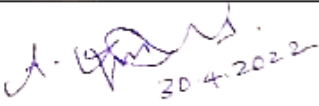
Board of studies meeting begins with welcome address by the Chairperson. Following discussions were held for approval;

Agenda Item: Review and approval of the course contents for the following courses of 'MSc Medical Biotechnology and Clinical Research' during the academic year 2022-2023.

- Revisions were made in the following courses: Clinical Biochemistry, Clinical Biochemistry lab practical-I, Microbial Techniques Lab Practical-II, Statistical lab analysis system lab practical.
- Discipline specific new elective course has been introduced.

Resolutions: The Board reached a consensus and accorded its endorsement to the curriculum and outline for the above courses. The revised syllabus will be implemented accordingly.

Based on the suggestions given by the members, BoS resolved to recommend the minutes to the Academic Council for further approval.

Members	Designation	Signature
Dr. Edward	Head (External member)	
Ms. Sathya V	Scientific Manager (Industry Expert)	
Dr. A. Dayanandan	Professor	 30.04.2022
Dr. A. Madankumar	Associate Professor	 30.4.2022
Dr. S. Jackson Durairaj	Associate Professor	S-JACKSON Durairaj 30-4-2022


Dr. Ramesh Kumar
(Head of the Department)

HEAD OF THE DEPARTMENT
DEPARTMENT OF BIOTECHNOLOGY
SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
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Jeppiaar Nagar, Rajiv Gandhi Salai
Chennai-600 119



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BOARD OF STUDIES

Minutes of Meeting (EVEN SEM)

Date: 26th November 2022

Time: 11.00 AM

Chairperson : **Dr. Ramesh Kumar**

Attendees : **Ms. Sathya V**
Scientific Manager, Affigenix Biosolutions Pvt Ltd

Dr. Edward

Head of the Department, Department of Biotechnology,
St. Joseph's College (Autonomous), Trichy

Dr. S. Johnson Retnaraj Samuel, Internal member

Dr. Y. Beryl Vedha, Internal member

Dr. M. Rajasekar, Internal member

The Chairperson welcomed the members. Following discussion were made;

Agenda Item: Review and approval of the course contents for the following courses of 'MSc Medical Biotechnology and Clinical Research' students during the academic year 2022-2023.

- Revisions were made in Molecular biology lab practical I.
- Discipline specific Elective (Introduction to Computational Biology) has been introduced.

Resolutions: The Board reached a consensus and accorded its endorsement to the curriculum and outline for the above courses. The revised syllabus will be implemented accordingly.

Based on the suggestions given by the members, BoS resolved to recommend the minutes to the Academic Council for further approval.

Members	Designation	Signature
Dr. Edward	Head (External member)	
Ms.Sathya V	Scientific Manager (Industry Expert)	
Dr. S. Johnson Retnaraj Samuel	Associate Professor	
Dr. Y. Beryl Vedha	Assistant Professor	
Dr. M. Rajasekar	Assistant Professor	


Dr.Ramesh Kumar
 (Head of the Department)

HEAD OF THE DEPARTMENT
 DEPARTMENT OF BIOTECHNOLOGY
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 Chennai-600 119