



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

1.1.2 Revision & New Courses Introduced in 2022- 2023

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

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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

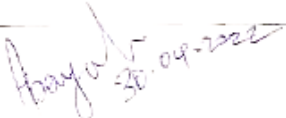
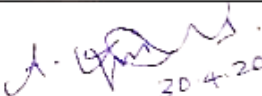
Board of studies meeting begins with welcome address by the Chairperson. Following discussions were held for approval;

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
(DEEMED TO BE UNIVERSITY)
Jeppiaar Nagar, Rajiv Gandhi Salai
Chennai-600 119

SMBA5101	Clinical Biochemistry	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVE:

- To enable the students to understand the various mechanisms adopted by the human body for the regulation of metabolic cycles and to learn the inter-relationship between various metabolic pathways and their clinical correlations

Unit- I COMPONENTS OF BLOOD

12 Hrs

Composition and function of blood, Plasma and blood corpuscles, Structure and function of haemoglobin, abnormal haemoglobins, Blood coagulation – mechanism and regulation, Blood groups, Blood smearing, Blood staining, Peripheral blood mononuclear cells (PBMC) – isolation and clinical significance, Water and electrolyte, Regulation of water and electrolyte balance, Hydrogen ion homeostasis and acid-base balance.

Unit- II CARBOHYDRATES

12 Hrs

Carbohydrate Classifications, Physic-chemical properties, Biological importance of carbohydrates. Properties of Monosaccharide, Disaccharides and Polysaccharides. Structure and role of proteoglycans, glycoproteins and glycolipids. Clinical complications of Carbohydrate metabolisms, Diabetes mellitus Type I and Type II. Glycolysis, Cori cycle, Citric acid cycle, Glucogenesis, Gluconeogenesis, Glycogen storage diseases. Sugar derivatives of biomedical importance and Inter conversion of Hexoses.

Unit- III PROTEINS

12 Hrs

Classification of Protein, Structure and properties of amino acids, biologically important peptides - hormones, antibiotics, and growth factors. Metabolism of Proteins and amino acids, Inborn errors of metabolism, Decarboxylation, Transamination, Deamination, and urea cycle. Nucleic acids- Biosynthesis and degradation of purines and pyrimidines and their clinical role.

Unit- IV LIPIDS

12 Hrs

Biological importance and Chemical properties of fatty acids. Metabolism of Lipids, Biosynthesis of saturated and unsaturated fatty acids, Clinical significance of fatty acids, β -Oxidation of fatty acid, Biosynthesis of glycerides, phospholipids and cholesterol, Clinical significance of Triglycerides. Regulation of lipid metabolism and ketone bodies. Disorders of lipid metabolism, lipoproteins and their significance – Low Density Lipoprotein (LDL), Very Low Density Lipoprotein (VLDL), High Density Lipoprotein (HDL) and Total Cholesterol levels.

Unit- V VITAMINS AND HORMONES

12 Hrs

Structure and Biochemical properties of water soluble and fat-soluble vitamins and their coenzyme activity. Hormones: Mechanism of hormone action and its regulation, Hormones of Pancreas, Pituitary, Adrenal, Thyroid and Sex hormones. Bioenergetics: Electron transport chain, Oxidative Phosphorylation and synthesis of ATP.

Max. 60 Hours

REFERENCES:

- Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2000): 25th Ed. Harpers Biochemistry, Macmillan Worth Publishers.
- Nelson D.L. and Cox, M.M. (2000) : 3rd Ed. Lehninger's Principles of Biochemistry, Macmillan Worth Publishers.
- Devlin, T.M. (1997): 4th Ed. Text book of Biochemistry with Clinical Correlations, Wiley Liss Inc.
- Stryer, L. (1998): 4th Ed. Biochemistry, W.H. Freeman and Co.
- Voet, D. Voet, J..G and Prat, C.W., (1999) : Fundamentals of Biochemistry.

SMBA6101	Clinical Biochemistry lab Practical-I	L	T	P	Credits	Total Marks
		0	2	2	2	100

COURSE OBJECTIVE:

To make the students to understand a broad range of experimental techniques in clinical Biochemistry and to enable them to demonstrate their ability to use the techniques in conducting scientific experiments and observations.

Estimations of clinically relevant analytes Glucose

1. Estimation of plasma glucose; 2. Glucose tolerance test; 3. Stability check of glucose standards

Estimations of clinically relevant lipids

1. Estimation of serum total protein
2. Estimation of serum cholesterol
3. Estimation of serum triglycerides
4. Estimation of HDL cholesterol
5. Estimation of LDL cholesterol
6. Estimation of serum bilirubin
7. Estimation of serum albumin
8. Estimation of serum transaminases
9. Estimation of serum alkaline phosphatase

Renal Function Tests

1. Estimation of serum alkaline phosphatase
2. Estimation of serum urea
3. Estimation of urea in Urine samples.
4. Estimation of serum creatinine
5. Estimation of creatinine in Urine samples.
6. Determination of serum uric acid

Minerals and Electrolytes

1. Analysis of calculi
2. Estimation of serum calcium
3. Estimation of serum phosphorus
4. Estimation of serum iron

Blood Components

1. RBC, WBC, Platelet count
2. Blood group identification
3. Blood smearing

TEXT / REFERENCE BOOKS:

1. Practical Clinical Biochemistry methods and interpretations 4th Edition (English, Ranjna Chawla).
2. Varleys Practical Clinical Biochemistry 6th Edition (English, Hardcover, Alan H. Gowenlock).
3. Practical Biochemistry 5th Edition (English, Paperback, R. C. Gupta).
4. Manual of Practical Biochemistry for MBBS 2nd Edition (S. K. Gupta, Veena Singh Ghalaut, Anju Jain).

SMBA6102	Microbial Techniques Lab Practical-II	L	T	P	Credits	Total Marks
		0	2	2	2	100

COURSE OBJECTIVE

- To make the students to understand a broad range of experimental techniques in microbiology and to enable them to demonstrate their ability to use the techniques in conducting scientific experiments and observations.

PRACTICALS:

- Techniques for Isolation microorganisms
 - Preservation of microorganisms
 - Bacterial staining techniques
- Microscopic examination of live bacterial population
- Biochemical Activities of Microorganisms: IMViC, Catalase, and Oxidase.
- Molecular characterization of microorganisms.
- Microbiological Analysis of Food products
- Microbiological Analysis of water
- Bacterial spore staining
- Acid-fast staining.
- Antibiotic Sensitivity Testing
- Species Identification of unknown bacterial cultures using Molecular Techniques
- Plating of clinical specimens on media for isolation, purification identification and quantitation
- Isolation and identification of pathogenic yeasts and moulds and recognition of common laboratory contaminants.
- Sterilization techniques.
- Preparation of media; Nutrient broth and Nutrient agar.

TEXT / REFERENCE BOOKS:

- Microbiology, Laboratory Manual by Capuccino and Sherman 6th Edition, Pearson Education, (2006).
- James G. Cappuccino and Natalie Sherman. 2004 (6th edition), Microbiology A Laboratory Manual- Pearson Education.
- Beister, L.1996. Microbiology in Pratice (6th edition) Adeland Wesley, Langman, New York.



Added Content

SMBA6301	Statistical Analysis System Lab- Practical	L	T	P	Credits	Total Marks
		0	2	2	2	100

COURSE OBJECTIVE:

- To understand the concepts of Statistical Analysis System

LIST OF EXPERIMENTS

Statistical Analysis System (SAS)

1. Understanding DATA Step Processing in SAS.
2. Creating a table using SAS program.
3. Producing Descriptive Statistics using SAS.
4. Producing HTML, PDF and XML Output using SAS
5. Survival Graph using GraphPad Prism tool.
6. Drawing following charts using statistical tools;
 1. Pie chart.
 2. Scatter plot.
 3. Bar diagram (Horizontal and Vertical).
7. Creating a pictogram using given data.
8. Tabulation rules.
9. Data Analysis using Microsoft Excel, SYSTAT and R software.
10. One-way and Two-way ANOVA using Microsoft office excel and Graph Pad prism tools
11. Student T test using Graph Pad prism tools

REFERENCE BOOKS:

1. Statistical Methods for Reliability Data. (1998) William Q. Meeker and Luis A. Escobar. Wiley.
2. Survival Analysis Using the SAS System: A Practical Guide. (1995) Paul D. Allison. SAS Institute Inc.



Added Content

SMBA8005	Tools in Transgenesis	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.



New Course

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 (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.

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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
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 Chennai-600 119

SMBA6201	Molecular Biology lab Practical-I	L	T	P	Credits	Total Marks
		0	2	2	2	100

COURSE OBJECTIVE:

- To learn the basic techniques in cell and molecular biology useful for finding the molecular mechanistic roles in biology.

LIST OF EXPERIMENTS

- Agarose Gel Electrophoresis.
- Estimation of DNA and RNA.
- Bacterial genomic DNA isolation.
- Extraction of DNA from Bovine Spleen.
- DNA Extraction from Agarose Gel.
- Bacterial Transformation.
- Phenol Extraction of rRNA (Rat liver).
- Protein sample preparation from bacterial, animal and plant cells.
- Spectrophotometric determination of protein concentration.
- SDS-PAGE.
- Western Blotting techniques.
- Immunofluorescence techniques.
- Total RNA isolation and cDNA conversion.
- Polymerase chain reaction (PCR)
- Real Time PCR (qPCR)
- Overview of Two-Dimensional Gel Electrophoresis.
- Peptide sequencing.

REFERENCE BOOKS:

- Green, M. R., & Sambrook, J. (2012). Molecular cloning: a laboratory manual.
- Sambrook, J., & Russell, D. W. (2001). Inverse PCR. Molecular Cloning; A Laboratory Manual, 8-81.
- Sambrook, J., Fritsch, E. F., & Maniatis, T. (1989). Molecular cloning (Vol. 1, No. 7.58). New York: Cold spring harbor laboratory press.



Added Content

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.

Max. 60 Hours

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, 1999.
3. D.W.Mount: Bioinformatics; 2nd Ed; Cold Spring harbor Laboratory Press; 2004.

