



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

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

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SCHOOL OF BIO AND CHEMICAL ENGINEERING

Department of Bioinformatics

1.2.1 Newly Introduced Courses in 2022 -2023

S. No.	Course name	Page no
B.Sc. Bioinformatics and Data science		
1	Big Data in Healthcare	2
2	Health Informatics	4



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SBIA3007	BIGDATA IN HEALTHCARE	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

The course is designed to make the students realize the role and importance of big data in genomics and its implications for research in biology and medicine.

UNIT I Introduction

9hrs

Big Data - Big Data in Medicine? - The Three Vs of Big Data - Can Medicine Learn from Other Industries? - Big Data Framework in Medicine - Fields of Action in Medicine - It is Time for Big Data - The Example of Google Flu Trends - Big Data Adoption Model in Medicine - Big Data in the Context of Health - The Difference to Classic Clinical Analysis (Old Wine in New Bottles?) - Are Hospitals Prepared for Big Data? - Personalized Medicine and Big Data - The (Genetic) Human in Numbers - Big Data, "Personalized Medicine" and IT

UNIT II Data Management and Data Mining Approaches

9hrs

Data Management and Data Mining Approaches - Introduction Challenges of Managing and Mining Big Biomedical Data - Data Management Framework - Data Management Platforms - Data Mining in Translational Medicine - Data Mining Techniques and Methods - Big Data and Data Mining - Applications of Data Mining in Translational Medicine

UNIT III Information Management for Systems Medicine

9hrs

New Data Volumes - The Digitalization of the Knowledge Cycle - Consolidation of the Digital Medical Care and Research Systems - Integration and Differentiation - Good and Bad Data = Digital Expert Systems - Human Beings are More Than the Sum of Their Data - Medicine of the Person is Made More Difficult

UNIT IV Medical Big Data

9hrs

Medical Big Data - Data Protection - Expectations - Legal Biological Principles - Data Sources - Health-Specific Use of Data - Risks - Data Protection Mechanisms - Data Economy in Particular - Transparency

UNIT V Big Data and Business

9hrs

Big Data in Healthcare from a Business perspective - Data as a Basis for Decisions - Strategy and Data - Big Data as a Part of Digitalization - Consulting as a Decision Support = The Path to an Informed Decision - The Transformation of Big Data to Smart Data - New Technologies in the Area of Big Data – Benefits to the patient.

Course Outcomes

- CO1 –To understand the concept and nature of bigdata.
- CO2 –To understand the basics of data management and mining approaches of genomic big data.
- CO3 –To appreciate the role of bigdata in genomic medicine.
- CO4 –Ethical use of medical bigdata.
- CO5 –Use of genomic bigdata in entrepreneurship.
- CO6 –Appreciate the enormous data available and the means to handle the data



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Text /Reference books

1. Big Data in Medical Science and Healthcare Management : Diagnosis, Therapy, Side Effects, edited by Peter Langkafel, De Gruyter, Inc., 2015.
2. Translational Medicine : Tools and Techniques, edited by Aamir Shahzad, Elsevier Science & Technology, 2015.



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SBIA3010	Health Informatics	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To Introduce the students the problems and challenges that confront the field of health informatics.
- To Introduce the students about the research avenues and salient features in the practice of health informatics.
- To Provide the students with the basic skills and knowledge in health informatics to apply in a career related to health care.
- To Lead students in the discussion around ethical and diversity issues in health informatics.
- To Provide additional direction to those interested towards the study in the field.

UNIT I Introduction & Overview: Health Information Technology & Health Informatics 9 Hrs.

Define information management, information technology and informatics - Various ways in which HIT has evolved to improve quality or enhance patient safety - Informatics drivers and trends - Standards development organizations: Health Level 7 (HL-7), Healthcare Information Technology Standards Panel (HITSP), and Office of the National Coordinator for Health Information Technology (ONC) Health IT Standards Committee-Health informatics – Needs, objectives and limitations - Medical Terminology for Health Informatics Professionals.

UNIT II Clinical Decision Support Systems (CDSS) And Workflow 9 Hrs.

Fundamental requirements of an effective Clinical Decision Support System-principles of health care data exchange and health care data standards relate to patient care, productivity and data analysis- common controlled vocabularies in use today: ICD, CPT, NDC, RxNorm, LOINC and SNOMED CT-advantages and disadvantages (unintended consequences) of Clinical Decision Support Systems (CDSS) in terms of cognitive support.

UNIT III Healthcare Database Management System 9 Hrs.

Health information systems – design, architecture and interoperability - Electronic health records (EHRs) - Electronic medical record (EMR) with electronic health record (EHR)- emergence of Personal Health Records and their implications for patients, health care providers and Decision Aids and health systems- EHR access agreement.

UNIT IV Computer Applications In Health Care And Biomedicine 9 Hrs.

The language of biomedical informatics: data, information & knowledge; standards and vocabularies - Evidence based practice (EVP) and clinical practice guidelines (CPG) - Evaluation methods for health informatics - Machine learning for extraction of medical knowledge - MATLAB programming for health informatics.

UNIT V Case Studies And Ethical Issues 9 Hrs.

Modelling, simulation and visualisation in health informatics - Ethical Issues in Health Informatics - Fundamentals of data science in medicine - Genomic and Systems Medicine - Advanced data analysis in medicine - Data driven decision making and evaluation in medicine - Legal Aspects of Health Information Systems - E-Healthcare & Ethics - E-Medicine Business Models - Case Studies in Health Information Management.

Max. 45 Hrs.



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COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Develop knowledge about problems and challenges that health addressed by informatics and apply the knowledge to the research and practice in health informatics.

CO2 - Demonstrate basic skills and knowledge in health informatics for application in future health-related careers.

CO3 - Demonstrate ability to ask, search for information and answer health-related questions.

CO4 - To identify genomic variants associated with a disease phenotype and communicate this association.

CO5 - Perform visualization and simple analysis of a data set to assess difficulty of predicting disease (cardiovascular and other) risk in a synthetic patient dataset.

CO6 - Apply communication skills through an interview with an informatics professional and development of a written summary and analyse ethical and diversity issues in health informatics.

TEXT / REFERENCE BOOKS

1. Hoyt, RE and Yoshihashi, A, Eds. (2014). Health Informatics: Practical Guide for Healthcare and Information Technology Professionals, 6th Edition. Pensacola, FL, Lulu.com.
2. Wager KA, Lee FW, Glaser JP. Health Care Information Systems: A Practical Approach for Health Care Management. San Francisco, California: Jossey-Bass 2009.
3. Shortliffe EH, Cimino JJ. Biomedical Informatics: Computer Applications in Health Care and Biomedicine, 4th Edition. New York, New York: Springer Science +Business Media, LLC 2014.



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SCHOOL OF BIO AND CHEMICAL ENGINEERING

Department of Bioinformatics

MINUTES OF MEETING

Subject: Board of Studies- Department of Bioinformatics

Venue: Molecular Modelling Lab

Date: 13/06/2022

Agenda:

- Syllabus Revision
- New curriculum

The following members were present

Chairperson

Dr. Jemmy Christy, HOD, Dept of Bioinformatics, Sathyabama Institute of Science and Technology

Department Members

1. **Dr. D. Alex Anand**, Associate Professor
2. **Dr. Swetha Sunkar**, Associate Professor

Internal Members

1. **Dr.Elizabeth Junious,Assistant Professor, Hindustan Institute of Technology & Science**

A Meeting of the Board of Studies for the Department of Bioinformatics with external member was held on 13-06-22 at 1.30 p.m. to discuss about the revision in B.Sc Bioinformatics and Data science and M.Sc Bioinformatics and Data science curriculum.



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Minutes of the BOS meeting

- The Chairperson Dr. Jemmy Christy, welcomed the External and Internal members for the Board of Studies meeting held on 13 June 2022 at 1.30 PM.
- The curriculum was discussed which was appreciated by the members as the courses incorporated in B.Sc and M.Sc were much needed based on the current trend in research and industry.
- A detailed discussion on the course content was carried out to improvise further.
- Introduction and Review of Course Suggestions:
 - ◆ The meeting began with a brief introduction of the agenda and an overview of the suggested courses.
 - ◆ All attendees were in agreement that the proposed courses were relevant and would enhance the curriculum.
- Research Methodology as an Elective Paper:
 - ◆ It was unanimously agreed to include a course on Research Methodology as an elective paper.
 - ◆ The course will cover experimental design, data collection and analysis, literature review, hypothesis testing, and research ethics.
 - ◆ Emphasis will be placed on developing critical thinking and problem-solving skills in the research process.
- R Programming Lab with Exercises on Statistics in Biology:
 - ◆ The attendees agreed to include a lab-based course on R Programming with a focus on statistics in biology.
 - ◆ The course will cover basic programming concepts, data manipulation, visualization, and statistical analysis techniques using R.
 - ◆ Exercises will be designed to analyze biological datasets, perform statistical tests, and create data visualizations.



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- Incorporating More Student Activities:

- ◆ To increase student engagement and participation, it was decided to include various student activities throughout the courses.
- ◆ Examples of activities include group discussions, case studies, debates, presentations, and student-led projects.
- ◆ The aim is to encourage active learning, critical thinking, and collaboration among students.
- ◆ Recognizing the importance of teamwork and collaboration, it was decided to incorporate team-building activities into the curriculum.
- ◆ These activities will promote communication skills, leadership, and effective collaboration among students.

- Experiments Related to Cell Viability:

- ◆ It was suggested to include experiments related to cell viability, if feasible within the available resources and facilities.
- ◆ The attendees agreed that hands-on experiments in cell viability would provide valuable practical experience for the students.

- Introduction of Concepts Related to Metagenomics:

- ◆ The attendees agreed to introduce concepts related to Metagenomics in the curriculum.
 - ◆ This will cover the study of genetic material recovered directly from environmental samples, providing insights into microbial communities and their functions.
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- ◆ New elective course introduction - Students may also have the opportunity to explore specific areas of interest within health informatics through elective courses or specializations.
 - ◆ Suggested course are Health Informatics, Big data in healthcare



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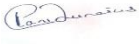
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- The chairperson also informed that complete revision of the syllabus will be carried out and new regulations will be followed from 2023 onwards for which the members were asked to give inputs in framing the syllabus and courses for UG and PG.
- She also suggested that there would be another meeting to discuss the courses for the forthcoming regulation

Meeting ended with vote of thanks.

Minutes approved.

Name of the members	Signature
Dr. C. Elizabeth Rani Juneius	
Dr. Jemmy Christy	
Dr. Alex Anand	
Dr. Swetha Sunkar	



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SCHOOL OF BIO AND CHEMICAL ENGINEERING

Department of Bioinformatics

MINUTES OF MEETING

Subject: Board of Studies- Department of Bioinformatics

Venue: Molecular Modelling Lab

Date: 28/01/2023

Agenda:

- New curriculum
- Introduction and review of AICTE and UGC norms for curriculum revision
- Discussion on necessary changes to comply with AICTE and UGC guidelines
- Proposal for revised B.Sc and M.Sc curriculum structure and content
- Assigning responsibilities and timelines for curriculum development

The following members were present

Chairperson

Dr. Jemmy Christy, HOD, Dept of Bioinformatics, Sathyabama Institute of Science and Technology

Department Members

3. **Dr. D. Alex Anand**, Associate Professor
4. **Dr. Swetha Sunkar**, Associate Professor

External Members

2. **Dr.Elizabeth Junious,Assistant Professor, Hindustan Institute of Technology & Science**

A Meeting of the Board of Studies for the Department of Bioinformatics with BOS members was held on 28-01-23 at 1.30 p.m. to discuss about the complete revision in B.Sc Bioinformatics and Data science and M.Sc Bioinformatics and Data science curriculum.



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Minutes of the BOS meeting

- The Chairperson Dr. Jemmy Christy, welcomed the members for the Board of Studies meeting held on 28-01-2023 at 1.30 PM.
- The curriculum was discussed which was appreciated by the members as the courses incorporated in B.Sc and M.Sc were much needed based on the current trend in research and industry.
- Introduction and Review of AICTE and UGC Norms for Curriculum Revision:
 - The meeting commenced with an introduction to the agenda and a thorough review of the AICTE and UGC norms for curriculum revision.
 - Attendees were provided with copies of the guidelines and given time to familiarize themselves with the requirements.
 - An interactive session followed the familiarization period, where attendees shared their initial thoughts, concerns, or suggestions regarding the AICTE and UGC norms.
 - Discussions centered around potential challenges and opportunities in aligning the curriculum with the regulatory requirements.
- Discussion on Necessary Changes to Comply with AICTE and UGC Guidelines:
 - A comprehensive discussion was held regarding the necessary changes to align the B.Sc and M.Sc curricula with the AICTE and UGC guidelines.
 - Attendees identified the key areas that require revision, such as updated industry-oriented topics, skill development, research focus, and interdisciplinary approaches.
 - Emphasis was placed on integrating emerging technologies, including data analytics, artificial intelligence, and Internet of Things, into the curriculum.
- Proposal for Revised B.Sc and M.Sc Curriculum Structure and Content:



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- Based on the discussions, a proposal for the revised B.Sc and M.Sc curriculum structure and content was presented.
- The proposal suggested a modular approach to provide flexibility for students to choose from a variety of electives and specialization tracks.
- It recommended the inclusion of practical training, internships, and industry collaborations to enhance industry readiness and practical skills.
- The importance of research projects and dissertations to foster research aptitude among students was highlighted.
- The credits for PG was set from 75 to 85 while UG course was 120 to 125.
- The members were advised to develop the curriculum inclusive of these categories

Table 2: Minimum Credit Requirements to Award Degree under Each Category

S. No.	Broad Category of Course	Minimum Credit Requirement	
		3-year UG	4-Year UG
1	Major (Core)	60	80
2	Minor Stream	24	32
3	Multidisciplinary	09	09

University Grants Commission

19

4	Ability Enhancement Courses (AEC)	08	08
5	Skill Enhancement Courses (SEC)	09	09
6	Value Added Courses common for all UG	06 - 08	06 – 08
7	Summer Internship	02 - 04	02 – 04
8	Research Project / Dissertation	-	12
	Total	120	160

Note:* Honours students not undertaking research will do 3 courses for 12 credits in lieu of a research project / Dissertation.

- The members were also informed to prepare the courses based on these points including the latest content that caters to the industry and research needs
- Assigning Responsibilities and Timelines for Curriculum Development:



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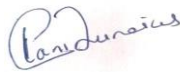
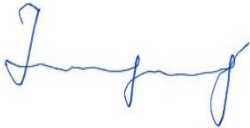
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- Responsibilities for curriculum development were assigned to respective faculty members and subject experts.
- Each faculty member was tasked with revising the syllabi for their respective courses to comply with AICTE and UGC guidelines.
- Timelines were established for syllabi revision, curriculum compilation, and submission for approval.
- The members were informed that there would be a BOS meeting with external members in June 2023 for their approval.

The meeting was adjourned, acknowledging the commitment and active participation of all attendees in revising the B.Sc and M.Sc curriculum to comply with UGC norms and ended with vote of thanks.

**Minutes
approved.**

Name of the members	Signature
Dr. C. Elizabeth Rani Juneius	
Dr. Jemmy Christy	
Dr. Alex Anand	
Dr. Swetha Sunkar	