



**Dr. MGR-JANAKI COLLEGE
OF ARTS & SCIENCE FOR WOMEN**

SATHYABAMA MGR MALIGAI
11 & 13, Durgabai Deshmukh Road, RA Puram, Chennai - 28

An ISO 9001:2015 CERTIFIED INSTITUTION
Affiliated to the University of Madras



DR.MGR JANAKI COLLEGE OF ARTS AND SCIENCE FOR WOMEN

**DEPARTMENT OF BIOINFORMATICS
AND CLINICAL TRIAL MANAGEMENT
(NON- MEDICAL)**



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Curriculum and Syllabus for M.Sc. Bioinformatics – Clinical Trial Management (NON-MEDICAL)

(With effect from the Academic Year 2023-24)

Note: The Board of Studies in Bioinformatics (PG) designed the syllabus as per Common Model Syllabus provided by TANSCHÉ based on Learning Outcome based Curriculum Framework (LOCF) as prescribed by the UGC.

TANSCHÉ REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR POSTGRADUATE EDUCATION	
Programme	M.Sc. BIO-INFORMATICS - CLINICAL TRIAL MANAGEMENT (NON-MEDICAL)
Programme Code	
Duration	2 years for PG
Programme Outcomes (Pos)	<p>PO1: Problem Solving Skill Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context.</p> <p>PO2: Decision Making Skill Foster analytical and critical thinking abilities for data-based decision-making.</p> <p>PO3: Ethical Value Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities.</p> <p>PO4: Communication Skill Ability to develop communication, managerial and interpersonal skills.</p> <p>PO5: Individual and Team Leadership Skill Capability to lead themselves and the team to achieve organizational goals.</p> <p>PO6: Employability Skill Inculcate contemporary business practices to enhance employability skills in the competitive environment.</p> <p>PO7: Entrepreneurial Skill Equip with skills and competencies to become an entrepreneur.</p> <p>PO8: Contribution to Society Succeed in career endeavors and contribute significantly to society.</p>



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	<p>PO 9 Multicultural competence Possess knowledge of the values and beliefs of multiple cultures and a global perspective.</p> <p>PO 10: Moral and ethical awareness/reasoning Ability to embrace moral/ethical values in conducting one’s life.</p>
<p align="center">Programme Specific Outcomes (PSOs)</p>	<p>PSO1 – Placement To prepare the students who will demonstrate respectful engagement with others’ ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.</p> <p>PSO 2 - Entrepreneur To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.</p> <p>PSO3 – Research and Development Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.</p> <p>PSO4 – Contribution to Business World To produce employable, ethical and innovative professionals to sustain in the dynamic business world.</p> <p>PSO 5 – Contribution to the Society To contribute to the development of the society by collaborating with stakeholders for mutual benefit.</p>



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Semester-I	Credit	Hours	Semester-II	Credit	Hours	Semester-III	Credit	Hours	Semester-IV	Credit	Hours
1.1. Core-I	5	7	2.1. Core-IV	5	6	3.1. Core-VII	5	6	4.1. Core-XI	5	6
1.2 Core-II	5	7	2.2 Core-V	5	6	3.2 Core-VII	5	6	4.2 Core-XII	5	6
1.3 Core – III	4	6	2.3 Core – VI	4	6	3.3 Core – IX	5	6	4.3 Project with viva voce	7	10
1.4 Discipline Centric Elective - I	3	5	2.4 Discipline Centric Elective – III	3	4	3.4 Core – X	4	6	4.4 Elective - VI (Industry / Entrepreneurship) 20% Theory 80% Practical	3	4
1.5 Generic Elective - II:	3	5	2.5 Generic Elective - IV:	3	4	3.5 Discipline Centric Elective - V	3	3	4.5 Skill Enhancement course / Professional Competency Skill	2	4
			2.6 SEC-I	2	4	3.6 SEC-II	2	3	4.6 Extension Activity	1	
						3.7 Internship/ Industrial Activity	2	-			
	20	30		22	30		26	30		23	30
Total Credit Points -91											



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**Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum
Framework (LOCF) Guideline Based Credits and Hours Distribution System**

for all Post – Graduate Courses including Lab Hours

First Year – Semester – I

Part	List of Courses	Credits	No. of Hours
	Core – I	5	7
	Core – II	5	7
	Core – III	4	6
	Elective – I	3	5
	Elective – II	3	5
		20	30

Semester-II

Part	List of Courses	Credits	No. of Hours
	Core – IV	5	6
	Core – V	5	6
	Core – VI	4	6
	Elective – III	3	4
	Elective – IV	3	4
	Skill Enhancement Course [SEC] – I	2	4
		22	30

Second Year – Semester – III

Part	List of Courses	Credits	No. of Hours
	Core – VII	5	6
	Core – VIII	5	6
	Core – IX	5	6
	Core (Industry Module) – X	4	6
	Elective – V	3	3
	Skill Enhancement Course – II	2	3
	Internship / Industrial Activity [Credits]	2	-
		26	30

Semester-IV

Part	List of Courses	Credits	No. of Hours
	Core – XI	5	6
	Core – XII	5	6
	Project with VIVA VOCE	7	10
	Elective – VI (Industry Entrepreneurship)	3	4
	Skill Enhancement Course – III / Professional Competency Skill	2	4
	Extension Activity	1	-
		23	30

Total 91 Credits for PG Course



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**First Year
Semester – I**

List of Courses	Credits	No. of Hours
421C1A: Core – I - STRUCTURE, SYNTHESIS, REGULATION & CELLULAR FUNCTIONS OF MACROMOLECULES	5	7
421C1B: Core – II - PRINCIPLES OF BIOTECHNOLOGY	5	7
421C1C: Core – III - APPLICATION OF PROGRAMMING FOR BIOLOGY-I (PRACTICALS)	4	6
421E1A: Elective – I - MATHEMATICAL & STATISTICAL METHODS FOR BIOLOGISTS (OR)	3	5
421E1B: Elective-I - PRINCIPLES OF COMPUTATIONAL BIOLOGY AND BIOLOGICAL DATABASES		
421E1C: Elective – II - CELL BIOLOGY	3	5
	20	30

Semester-II

List of Courses	Credits	No. of Hours
421C2A: Core – IV - BASIC PRINCIPLES OF CLINICAL TRIALS	5	6
421C2B: Core – V - GENOMICS AND PROTEOMICS	5	6
421C2C: Core – VI - PRACTICALS RELATED TO PAPERS I & II	4	6
421E2A: Elective – III - APPLICATION OF PROGRAMMING FOR BIOLOGY– II	3	4
421E2B: Elective – IV - PHARMACOGENOMICS	3	4
421S2A: Skill Enhancement Course [SEC] – I BIOINFORMATICS AND DRUG DESIGN	2	4
	22	30

Second Year – Semester – III

List of Courses	Credits	No. of Hours
521C3A: Core – VII - MOLECULAR MODELING, METHODS AND APPLICATIONS	5	6
521C3B: Core – VIII - CHEMINFORMATICS	5	6
521C3C: Core – IX - DATA MANAGEMENT AND REGULATORY REQUIREMENTS OF CLINICAL TRIAL	5	6
521C3D: Core (Industry Module) – X TOOLS AND THEIR APPLICATION IN BIOINFORMATICS (PRACTICALS)	4	6
521E3A: Elective – V - MEDICAL INFORMATICS	3	3
521S3A: Skill Enhancement Course – II POTENTIAL APPLICATIONS AND COMMERCIAL ASPECTS OF BIOINFORMATICS	2	3
521S3B: Internship / Industrial Activity [Credits]	2	-
	26	30



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Semester-IV

List of Courses	Credits	No. of Hours
521C4A: Core – XI - ADVANCED TOPICS IN BIOINFORMATICS	5	6
521C4B: Core – XII - TOOLS AND THEIR APPLICATIONS IN BIOINFORMATICS (PRACTICALS)	5	6
521C4C: Project with VIVA VOCE	7	10
521E4A: Elective – VI - SYSTEMS BIOLOGY: METHODS AND APPLICATIONS (OR) 521E4B: Elective-VI - MICROARRAY TECHNOLOGIES AND ITS APPLICATIONS	3	4
521S4A: Skill Enhancement Course – III / Professional Competency Skill - Coaching classes for Joint CSIR-UGC NET for Junior Research Fellowship (JRF) and for Lectureship (LS) and Biotechnology Eligibility Test (BET) for DBT-JRF.	2	4
521V4A: Extension Activity	1	-
	23	30

Total 91 Credits for PG Courses



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LEARNING OUTCOME:

Programme Name		M.Sc BIOINFORMATICS AND CLINICAL TRIAL MANAGEMENT	
Shift		I	
Course Name	Course Code	Course Outcome	
SEMESTER I			
Structure, Synthesis, Regulation & Cellular Functions Of Macromolecules	421C1A	<ol style="list-style-type: none">1. Understand the Basic structure and functions of important biomolecules2. Gain knowledge on the process of DNA replication, RNA synthesis and translation processes at the eukaryotic levels3. Understand the importance of the genetic material and the consequence of mutation.4. Understand the eukaryotic mechanism5. Comparing the prokaryotic and Eukaryotic process.	https://egovernance.unom.ac.in/syllabuspg2324/pdf/421C1A.pdf?1702841968
Principles Of Biotechnology	421C1B	<ol style="list-style-type: none">1. Students gain knowledge about the genetic engineering process and its applications2. Students Gain insight about nanotechnology, Antisense technology, hybridoma and DNA fingerprinting techniques.3. Understanding of PCR, its modifications and current applications in various fields.4. Gain insight about Nanotechnology, nanoparticles and its applications in various fields5. Understanding bioethics and societal concerns about GMOs.	https://egovernance.unom.ac.in/syllabuspg2324/pdf/421C1B.pdf?278103374
Application Of Programming For Biology-I	421C1C	<ol style="list-style-type: none">1 Learn the basics of programming.2. Relate the necessity for programming in biology3. Handling biological concepts with C++ and Java and Unix scripts4. Skills to Create, update, retrieve and Manage data, Handle files and databases5. Clear understanding and usage of SQL Language	https://egovernance.unom.ac.in/syllabuspg2324/pdf/421C1C.pdf?1740269747



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Principles Of Computational Biology And Biological Databases	421E1B	<ol style="list-style-type: none">1. Better understanding of the bioinformatics concepts2. Emphasis the application of bioinformatics and biological databases3. Perform a complete analysis of the genes and protein4. Problem solving in real research problems5. Understand the evolutionary concepts related to biological query	https://egovernance.unom.ac.in/syllabuspg2324/pdf/421E1A.pdf?586249509
Mathematical & Statistical Methods For Biologists	421E1A	<ol style="list-style-type: none">1. Students have an enhanced knowledge and understanding of mathematical modeling and statistical methods in the analysis of biological systems2. Students assess biological inferences that rest on mathematical and statistical arguments3. Students analyze data from experiments and draw sound conclusions about the underlying processes using their understanding of mathematics and statistics.	https://egovernance.unom.ac.in/syllabuspg2324/pdf/421E1B.pdf?181245725
Cell Biology	421E1C	<ol style="list-style-type: none">1. Understand the basics and insights of cell and its components2. Understand the structure, properties and functions of various cells and biological molecules3. Understand the pathways, interaction and regulation between the cells and the biological molecules	https://egovernance.unom.ac.in/syllabuspg2324/pdf/421E1C.pdf?1885889590
SEMESTER II			
Basic Principles Of Clinical Trials	421C2A	<ol style="list-style-type: none">1. Explain the regulatory requirements for conducting clinical trial2. Describe in detail about various types of clinical trial designs3. Explain the responsibilities of key players involved in clinical trials4. Describe the documentary requirements for Clinical trials5. Explain Adverse drug reaction and its management	https://egovernance.unom.ac.in/syllabuspg2324/pdf/421C2A.pdf?1410545830



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Genomics And Proteomics	421C2B	<ol style="list-style-type: none">1.Acquire knowledge and understanding of the fundamentals of genomics and proteomics.2. Understand the latest techniques in NGS3. Gain the knowledge in metabolomics and the applications in various applied areas of biology4. Gain insight into Structural genomics, Mass spectrometry and its applications5. Gains knowledge concerning genomics & proteomics and their applications.	https://egovernance.unom.ac.in/syllabuspg2324/pdf/421C2B.pdf?2095300584
Practicals Related To Papers I & Ii	421C2C	<ol style="list-style-type: none">1. Students will demonstrate a core knowledge base in the theory and practice of Biochemistry and Molecular Biology2. Students will function successfully in the laboratory and use safe laboratory practices.3. Develop observational skills4. Demonstrate understanding of their theoretical basis5. Perform experiment design and analyze the results	https://egovernance.unom.ac.in/syllabuspg2324/pdf/421C2C.pdf?1120654935
Application Of Programming For Biology– Ii	421E2A	<ol style="list-style-type: none">1. Relate the necessity for programming in biology2. Handling biological concepts with Python and R scripts3. Apply programming to analyse genomic sequences4. Gain efficient programming skills5. Perform genomic data analysis	https://egovernance.unom.ac.in/syllabuspg2324/pdf/421E2A.pdf?1482469745
Pharmacogenomics	421E2B	<ol style="list-style-type: none">1. Understanding of the principles of human genetics and genomics2. Apply to improving the problems in drug therapy optimization and patient care.3. Providing basic understanding of the discipline of pharmacogenomics.4. Understanding the genetic basis of variability in drug response.5. Evaluate the drug efficacy and toxicity, adverse drug reactions and drug-d interaction	https://egovernance.unom.ac.in/syllabuspg2324/pdf/421E2B.pdf?1892732906



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SEMESTER III		
Molecular Modeling, Methods and Applications	MH23A	<ol style="list-style-type: none"> 1. Gain insight on the molecular dynamics and Monte Carlo simulation methods. 2. Understand energy simulation methods and its importance in drug action 3. On successful completion of the course, the student will be able to perform protein structure prediction 4. Apply molecular modeling and molecular dynamics methods to study structure from sequence 5. Gain insights on protein-ligand docking and knowledge-based scoring functions
Cheminformatics	MH23B	<ol style="list-style-type: none"> 1. Understanding of fundamentals of cheminformatics and its applications 2. Understands the concepts in cheminformatics 3. Student is expected to achieve a good grasp of the concepts and applications of cheminformatics. 4. Analyze the areas of Interface of chemistry, informatics and biology. 5. Apply the concepts and learn the use of Cheminformatics tools
Data Management And Regulatory Requirements Of Clinical Trial	MH23C	<ol style="list-style-type: none"> 1. Students will gain knowledge about various regulatory bodies governing clinical trial, GCP and GLP guidelines 2. Investigate new drug process and handling of clinical trial data 3. Understand Ethical and safety considerations 4. Evaluate animal toxicity procedures 5. Applying guidelines in animal studies
Tools And Their Application In Bioinformatics (Practicals)		<ol style="list-style-type: none"> 1. On Successful completion of the course, the student will be able to 2. Understand the importance of structural studies in bioinformatics 3. Gain an insight about the forces that determines the structure of biological macromolecules 4. Apply the knowledge gained to interpret the properties of biological macromolecules 5. Apply molecular docking and analyze the interactions

<https://egovernance.unom.ac.in/ugsyllabus/pg/MBI-SY.pdf?t=542636724>



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Medical Informatics	MH43A	<ol style="list-style-type: none"> 1. Students understand the health informatics concepts. 2. Gains an insight on the health care findings with data visualizations 3. Identifies standards for exchange of health information. 4. Analyze technologies for the management of health information. 5. Effective use of biomedical data, information, and knowledge. 	
Potential Applications And Commercial Aspects Of Bioinformatics	MH33A	<ol style="list-style-type: none"> 1. To get introduced to the basic concepts of Bioinformatics 2. To understand the basics of sequence alignment and analysis. 3. To gain knowledge about various concepts employed in drug discovery. 4. To analyze the biological data. 5. Evaluating the applications towards personalized medicine. 	
SEMESTER IV			
Advanced Topics In Bioinformatics		<ol style="list-style-type: none"> 1. Understand the application of information technology to immunology 2. Study informatics-based approaches for prediction of epitopes and immunodiagnostic tools. 3. Students will be able to analyze the raw reads of sequences 4. Learns information about the methods used in immunological bioinformatics 5. Apply genomic and proteomic datasets in research. 	https://egovernance.unom.ac.in/ugsyl/labus/pg/MBI-SY.pdf?t=542636724
Systems Biology: Methods And Applications		<ol style="list-style-type: none"> 1. Understand the concepts and insights of systems biology 2. Analyze and model various biological models 3. Apply practical handling in systems biology online tools 4. Analyze the biological aspects efficiently 5. Designing a new organism through modeling network concepts 	



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Microarray Technologies And Its Applications		<ol style="list-style-type: none">1. Students understand the mechanism in microarray technology2. Students understand the steps involved in microarray technology3. Helps in understanding the various applications of this technology4. Helps in personalizing the treatment of different disease5. The interpretation of a typical microarray is possible.	
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ASSESSMENT PATTERN

CORE PAPERS, ELECTIVE PAPERS AND EXTRA DISCIPLINARY PAPERS

INTERNAL ASSESSMENT: 25 Marks

EXTERNAL ASSESSMENT: 75 Marks

TOTAL: 100 Marks

METHOD OF EVALUATION

Internal Assessment			End semester exams	Total
Test 1	Test 2	Other components (Seminars/quiz/assignments)		
10	10	5	75	100

INTERNAL ASSESSMENT PATTERN

Attendance (5 Marks)			Seminar (5 Marks)	Assignment (5 Marks)	Test (10 Marks)	Total 25
90-100	80-90	70-80				

EXTERNAL ASSESSMENT

End Semester External University Examination: 75 MARKS Duration 3 Hours

- Part -A-(10X1=10) Answer any 10 out of 12 Questions 1-12
- Part -B-(5X5=25) Answer any 5 out of 7 Questions 13-19
- Part -C-(4X10=40) Answer any 4 out of 6 Questions 20-25

QUESTION PAPER PATTERN

Subject Name	Marks	Total
Core, Elective, Extra Disciplinary, Soft skills,	PART- A: 10 out of 12 = 10 x 1 = 10 marks	75
	PART- B: 5 out of 7 = 5 x 5 = 25 marks	
	PART- C: 3 out of 5 = 4 x 10 = 40 marks	