



PROGRAM SPECIFICATION PROFORMA

**INTERNATIONAL ISLAMIC UNIVERSITY
ISLAMABAD**

Program Name: BS in Bioinformatics

Qualification Level: Bachelor Studies (BS)

Department: Department of Bioinformatics

Faculty: Faculty of Computing and Information Technology

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A. Program Identification and General Information

1. Program Name:		
BS in Bioinformatics		
2. Department/Faculty Offering the Program:		
Department of Bioinformatics / Faculty of Computing and Information Technology		
3. Reasons for Establishing the Program (New Program Proposals):N/A (Economic, social, cultural, and technological reasons, and national needs and development, etc.)		
NA		
4. Total Credit Hours for Completing the Program:		
One Hundred and Thirty Three (133)		
5. Admission Eligibility Criteria:		
<p>The requirement for admission in the Bachelor of Bioinformatics is: the candidate has secured at least 50% marks in the Intermediate (HSSC) examination or equivalent with at least one of the following condition(s):</p> <ol style="list-style-type: none"> 1. Intermediate with Mathematics (Pre-Engineering / Computer Science (ICS) / Equivalent) OR 2. Intermediate with Pre-Medical background (with additional Mathematics) OR are required to pass the deficiency courses of Mathematics of 6 credit hours within one year of their regular studies as per the National Computing Education Accreditation Council (NCEAC) vide notification No. NCEAE/HEC/General/3-20, dated 20th March 2020 OR 3. Equivalent foreign qualification with Pre-Medical / Mathematics certified by Inter Board Committee of Chairmen (IBCC) 		
6. Professional Occupations/Jobs:		
<ol style="list-style-type: none"> 1. Academic Positions 2. Bioinformatics Analyst 3. Computational Biologist 4. Genomics Data Scientist 5. Bioinformatics Software Developer 6. Biostatistician 7. Proteomics Specialist 8. Research Scientist 9. Systems Biologist 10. Pharmacogenomics Specialist 11. Molecular Modeler 12. Clinical Bioinformatician 13. Data Curator 14. Biotech Product Specialist 15. Technical Support Specialist 		
7. Major Tracks/Pathways (if any):		
Major track/pathway	Credit hours (For each track)	Professional Occupations/Jobs (For each track)
1. N/A		
8. Intermediate Exit Points/Awarded Degree (if any):		
Intermediate exit points/awarded degree	Credit hours	
1. N/A		

B. Mission, Goals, and Learning Outcomes

1. Program Mission:
<p>The BS in Bioinformatics program at the International Islamic University to provide students with a comprehensive education integrating biological sciences with computational and analytical methods to equip students with the skills to analyze complex biological data, develop innovative solutions, and contribute to advancement in healthcare and life sciences, all while emphasizing research, ethical practices, and alignment with Islamic values to prepare graduates for meaningful contributions to science and society.</p>

2. Program Educational Objectives:					
S No.		Statement			
Within few years after graduation the graduate should					
PEO 1		Graduates will apply bioinformatics knowledge and skills to solve complex biological problems in research and industry.			
PEO 2		Graduates will engage in continuous learning and professional development to keep pace with advancements in bioinformatics and related fields.			
PEO 3		Graduates will demonstrate professional and ethical conduct in bioinformatics practice and contribute effectively to multidisciplinary teams.			
PEO 4		Adheres to the Islamic ideology while embracing the ever changing societal and technical environment.			
3. Relationship between Program Mission and Goals and the Mission and Goals of the Institution/College.					
IIUT's Mission: To transform the society by promoting education, training, research, technology, and collaboration for reconstruction of human thought in all its forms on the foundations of Islam.		Program Mission: The BS in Bioinformatics program at the International Islamic University to provide students with a comprehensive education integrating biological sciences with computational and analytical methods to equip students with the skills to analyze complex biological data, develop innovative solutions, and contribute to advancement in healthcare and life sciences, all while emphasizing research, ethical practices, and alignment with Islamic values to prepare graduates for meaningful contributions to science and society.			
IIUI Goals		PEO 1	PEO 2	PEO 3	PEO 4
Advance Islamic Scholarship and Ethical Education			✓	✓	✓
Achieve Excellence in Research and Innovation		✓	✓		✓
Cultivate a Diverse and Inclusive Campus Environment			✓	✓	✓
Ensure Financial Sustainability and Effective Resource Management		✓	✓	✓	
Lead in Digital Transformation and Technological Innovation		✓	✓		✓
Enhance Governance and Strengthen Institutional Integrity			✓	✓	✓
4. Program Learning Outcomes (PLOs)					
PLO		Description			
At the time of graduation the graduate should effectively					
PLO1		Knowledge and Understanding: Demonstrate a comprehensive understanding of bioinformatics principles, computational methods, and data analysis techniques.			
PLO 2		Problem Solving: Apply bioinformatics tools and methodologies to address and solve biological and computational problems.			
PLO 3		Design & Development: Design, develop, and implement bioinformatics applications and solutions, ensuring they meet functional and user requirements.			
PLO 4		Research & Innovation: Conduct research in bioinformatics, contribute to scientific advancements, and innovate within the field.			
PLO 5		Ethical & Professional Practice: Uphold ethical standards and professional practices in bioinformatics, including responsible research conduct and data management.			
PLO 6		Communication Skills: Effectively communicate bioinformatics concepts, research findings, and technical information to various audiences.			
PLO 7		Teamwork & Collaboration: Collaborate effectively with team members in multidisciplinary environments and contribute to successful project outcomes.			

	PLO 8	Life-long Learning: Recognize the importance of lifelong learning and engage in continuous professional development.			
5. Mapping of PLOs to PEOs					
	PLO	PEO 1	PEO 2	PEO 3	PEO 4
	PLO 1	X			
	PLO 2	X			
	PLO 3	X			
	PLO 4	X	X		
	PLO 5			X	X
	PLO 6			X	X
	PLO 7			X	X
	PLO 8		X		
PEO		Mapped PLOs			
PEO 1: Graduates will apply bioinformatics knowledge and skills to solve complex biological problems in research and industry.		PL01: Knowledge and Understanding - Demonstrate a comprehensive understanding of bioinformatics principles, computational methods, and data analysis techniques. PL02: Problem Solving - Apply bioinformatics tools and methodologies to address and solve biological and computational problems. PL03: Design & Development - Design, develop, and implement bioinformatics applications and solutions, ensuring they meet functional and user requirements. PL04: Research & Innovation - Conduct research in bioinformatics, contribute to scientific advancements, and innovate within the field.			
PEO 2: Graduates will engage in continuous learning and professional development to keep pace with advancements in bioinformatics and related fields.		PL04: Research & Innovation - Engage in research that often requires continuous learning and adaptation to new knowledge, contributing to professional development. PL08: Life-long Learning - Recognize the importance of lifelong learning and engage in continuous professional development.			
PEO 3: Graduates will demonstrate professional and ethical conduct in bioinformatics practice and contribute effectively to multidisciplinary teams.		PL05: Ethical & Professional Practice - Uphold ethical standards and professional practices in bioinformatics, including responsible research conduct and data management. PL06: Communication Skills - Communicate bioinformatics concepts and findings clearly and effectively to diverse audiences, supporting ethical and professional interactions. PL07: Teamwork & Collaboration - Collaborate effectively with team members in multidisciplinary environments and contribute to successful project outcomes.			
PEO 4: Adheres to the Islamic ideology while embracing the ever-changing societal and technical environment.		PL05: Ethical & Professional Practice - Uphold ethical standards and professional practices in bioinformatics, including responsible research conduct and data management. PL06: Communication Skills - Effectively communicate bioinformatics concepts, research findings, and technical information to various audiences.			

C. Curriculum

1. Curriculum Structure (table to be filled as per HEC guidelines)

Category	Course Title	Cr. Hrs.	Pre-Requisites	No. of Courses	Total Cr. Hrs.
Computing Core <i>(An enrolled student is required to study and pass all the listed 14 courses from this group.)</i>	CS 111: Programming Fundamentals	4 (3-3)		14	46
	CS 212: Object Oriented Programming	4 (3-3)	CS 111 BI 223		
	CS 231: Database Systems	4 (3-3)			
	BI 453: Web Development	3(2-3)	CS 111		
	CS 221: Data Structures	4 (3-3)	BI 223		
	CS 352: Information Security	3(2-3)			
	AI 201: Artificial Intelligence	3(2-3)	CS 212		
	BI 432: Biological / Gene Networks	3(3-0)			
	BI 351: Software Engineering (Bioinformatics)	3(3-0)			
	CS 313: Advanced Programming (R)	3(2-3)	CS 212		
	CS 342: Operating System (Linux)	3(2-3)			
	CS 322: Analysis of Algorithms (Biological)	3(3-0)	CS 221		
	BI 483: Final Year Project I	2(0-6)	Can only be registered after passing a minimum of 90 credit hours and all offered core courses must be passed with minimum Grade Letter D		
Domain Core <i>(An enrolled student has to pass all the listed 6 courses)</i>	BI 484: Final Year Project II	4(0-12)	BI 483	06	18
	BI 112: Basic Chemistry	3(3-0)			
	BI 111: Basic Biology & Cell Biology	3(2-3)			
	BI 121: Introduction to Bioinformatics	3(2-3)	BI 111		
	BI 223: Biocomputing	3(2-3)	CS 111		
	BI 324: Protein Bioinformatics	3(2-3)	BI 121		
Domain Elective <i>(An enrolled student has to pass a minimum of 21 credit hours from the listed courses of this group. This is a not an exhaustive list of elective courses and the department may offer other courses as electives. Department may announce a pre-requisite course for any elective based on its contents)</i>	BI 331: Computational Biology	3(2-3)	BI 223	Only 07 courses to be taught	21
	BI 261: DNA Science: Introduction to Hereditary	3(2-3)	BI 111		
	BI 162: Genomics	3(3-0)			
	BI 452: Computer Aided Drug Designing	3(2-3)			
	BI 428: Ethical and Legal Issues in Bioinformatics	3(3-0)			
	BI 325: Bioinformatics Computing II	3(2-3)	BI 223		
	BI 313: Molecular Biology	3(3-0)			
	CG 416: Microbial Genetics	3(3-0)			
	BI 454: Special Topics in Bioinformatics	3(3-0)			
	BI 455: Systems Biology	3(2-3)			
	BI 356: Translational Bioinformatics	3(2-3)			
	BI 435: Biological Data Analysis	3(2-3)			
	BI 463: Genetic Engineering	3(3-0)			
	CG 331: Phylogenetics	3(3-0)			
	CG 443: Forensic Genetics	3(3-0)			
	BI 314: Cellular Metabolism	3(3-0)			
	BI 326: Applied Bioinformatics	3(2-3)	BI 121		
	BI 327: Structural Bioinformatics	3(3-0)			
	BI 415: Principles of Human Diseases	3(3-0)			
	BI 357: Immuno-informatics	3(3-0)			
	BI 438: Statistical Programming for Biological Data	3(2-3)	BI 122		

	BI 436: Modeling and Simulation	3(3-0)			
	BI 333: Introduction to Biological Data Mining	3(2-3)			
	BI 334: Introduction to Machine Learning	3(2-3)			
	BI 437: Natural Language Processing	3(2-3)			
	CG 428: Multi-Omics Data Integration	3(2-3)			
<u>Mathematics & Supporting Courses</u> (An enrolled student has to pass all the prescribed 4 courses from the course list)	MAT 223: Multivariable Calculus	3(3-0)		04	12
	MAT 211: Introduction to Linear Algebra	3(3-0)			
	BI 122: Biostatistics	3(3-0)			
	GEC 306: Technical & Business Writing	3(3-0)	GEC 102		
<u>Elective Supporting + University Required Courses</u> (An enrolled student has to pass UR 6 credit hours)	URC-201: Functional Arabic	3(3-0)		Only 02 course to be taught	06
	BI 429: RNA Bioinformatics	3(3-0)			
	BI 439: Quantum Computing in Bioinformatics	3(3-0)			
	BI 456: Agri-informatics	3(3-0)			
	URC 302: Understanding Quran	3(3-0)			
<u>General Education Requirement as per HEC UG Education Policy and IIUI General Education Requirements</u> (An enrolled student has to pass all the prescribed 12 courses in this group. Except GEC 102, GEC-103, GEC-206, all courses are to be studied only within the Faculty of Computing & Information Technology, due to different contents as per the HEC Curriculum 2023. The department has specially designed Course Specification Performa (CSP) for these courses which are different from the CSPs provided university-wide)	GEC 114: Application of Information and Communication Technologies	3(3-0)		12	30
	GEC 102: Functional English	3(3-0)			
	GEC 205: Expository Writing	3(3-0)	GEC 102		
	GEC 113: Quantitative Reasoning I (Discrete Structures)	3(3-0)			
	***GEC 215 / MAT 442: Quantitative Reasoning II (Analytical Geometry)	3(3-0)			
	GEC 103: Islamic Studies	2(2-0)			
	*GEC 104: Ethics (For Non-Muslims)				
	GEC 206: Ideology & Constitution of Pakistan	2(2-0)			
	**MAT 473: Natural Sciences (Numerical Methods)	3(2-3)			
	**GEC 112: Social Sciences (Introduction to Management)	2(2-0)			
	**MKT 403: Arts & Humanities (Digital Marketing)	2(2-0)			
	GEC 207: Civics & Community Engagement	2(2-0)			
	GEC 216: Entrepreneurship	2(2-0)			
	** As per the HEC UG Policy, Department of Bioinformatics can offer any relevant course in Natural Sciences, Social Sciences and Arts & Humanities Category from the following courses: ACT 301: Financial Accounting PPM 191: Introduction to Project Management EM 401: Engineering Economics FIN 201: Business Finance EM 708: Search Engine Optimization *** As per NCEAC Guidelines, Analytical Geometry has to be taught in Quantitative Reasoning II Course				
<u>Non-Credit Deficiency Courses</u> (These are non-credit hour courses i.e. these courses will not be counted to the Cumulative Grade Point Average but are mandatory to study and pass within the first year of their regular studies)	M-101: Pre-Calculus –I	3(3-0)	Only for Students who have not studied Mathematics at Intermediate Level	02	06
	M-102: Pre-Calculus-II	3(3-0)			