QUALIFICATION FILE

Multiomics Data Analyst

☒ **Short-Term Training (STT)** ☐ **Long-Term Training (LTT)** ☐ **Apprenticeship**

☐ **Upskilling** ☐ **Dual/Flexi Qualification** ☐ **For ToT** ☐ **For ToA**

☐ **General** ☐ **Multi-skill (MS)** ☒ **Cross Sectoral (CS)** ☒ **Future Skills** ☐ **OEM**

NCrF/NSQF Level: 5.5

Submitted By:

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Section 1: Basic Details

1.	**Qualification Name**		**Multiomics Data Analyst**
2.	**Sector/s**		**IT-ITeS**
3.	**Type of Qualification:** ☒ **New** ☐ **Revised** ☐ **Has Electives/Options** ☐**OEM**	**NQR Code & version of existing/previous qualification:** *NA*	**Qualification Name of existing/previous version:** NA
4.	a. **OEM Name** b. **Qualification Name** (*Wherever applicable*)	NA	
5.	**National Qualification Register (NQR) Code &Version**	QG-5.5-IT-02181-2024-V1-NIELIT	**6. NCrF/NSQF Level:** *5.5*
7.	**Award (Certificate/Diploma/Advance Diploma/ Any Other** (*Wherever applicable specify multiple entry/exits also & provide details in annexure*)	Certificate	
8.	**Brief Description of the Qualification**	**Nature**: ❖ This Short-term Certificate Course is targeted for creating qualified professionals in the field of Multiomics Data, which will help in employment or Entrepreneurship development of the qualifier in the areas of Health Informatics/ Medical Informatics/ Life Sciences, etc. The individual performs research and designing/reshaping of algorithmic models for identification, troubleshooting, and implementation of improvements to existing pipelines. The person also provides lead scientific, technical and knowledge support for revealing hidden patterns and information in biological big data. S/he is a key contributor in building the drug discovery platform for the future. **Purpose:** The purpose of this qualification is to train the students of Life Sciences with advanced-level Bioinformatics and Multiomics Data to upskill them and increase their employability in the field of Life Sciences and allied disciplines. Employability is described in Annexure-B.	

9.	**Eligibility Criteria for Entry for Student/Trainee/Learner/Employee**	**a. Entry Qualification & Relevant Experience:**

S. No.	Academic/Skill Qualification (with Specialization - if applicable)	Required Experience (with Specialization - if applicable)
1.	Completed 3 Years of UG in Biology (Zoology, Botany, Biological Science or related branches)	NA
2.	* Pursuing 3rd years of UG in Biology (Zoology, Botany, Biological Science or related branches)	NA
3.	Previous relevant Qualification of NSQF Level 5	1.5 year relevant experience

*Subject to being offered as 6 Months internship/project, Basic knowledge of computer handling and having knowledge of data crunching.

b. Age: 16 Years

10	**Credits Assigned to this Qualification, Subject to Assessment** *(as per National Credit Framework (NCrF))*	22 Credit
		11. Common Cost Norm Category (I/II/III) *(wherever applicable)*: Category II
12	**Any Licensing requirements for Undertaking Training on This Qualification** *(wherever applicable)*	NA
13	**Training Duration by Modes of Training Delivery** *(Specify **Total Duration** as per selected training delivery modes and as per requirement of the qualification)*	☒Offline ☒Online ☒Blended

Training Delivery Modes	Theory (Hours)	Practical (Hours)	OJT$ Mandatory (Hours)	ES (Hours)	Total *(Hours)
Offline	240	270	60	90	660
Online	240	270	60	90	660
Blended	Online 240	Offline 270	Offline 60	Online 90	660

Training shall be conducted in any of the 3 modes depending on the regional need.

14	**Aligned to NCO/ISCO Code/s** *(if no code is available mention the same)*	*NCO Code* 3141.9900 : Life Science Technicians (Excluding Medical), Other 2356.9900 : Information Technology Trainers, Other 2120.050 : Associate-Analytics
15	**Progression path after attaining the qualification** *(Please show Professional and Academic progression)*	*Academic:* **Horizontal:** • Postgraduate studies in Bioinformatics • Higher level Life Science research, i.e., Molecular Biology and Cell Biology • Level 6 in IT/Bio-IT. **Vertical:** • Doctoral studies in Bioinformatics • Level 7 Courses in Advanced-level Bioinformatics • Higher level courses in R Programming for Biological Data Analysis. *Professional:* Multiomics Data Analyst -> Analyst/programmer -> Database/program developer in industries -> Lead Scientist/Bioinformatician in Biotechnology/ Molecular Biology/ Drug Discovery/ Pharmaceutical R & D lab
16	**Other Indian languages in which the Qualification & Model Curriculum are being submitted**	**Only English.**
17	**Is similar Qualification(s) available on NQR-if yes, justification for this qualification**	☐ **Yes** ☒ **No URLs of similar Qualifications:**

18	**Is the Job Role Amenable to Persons with Disability**	☒ **Yes** ☐ **No**
		
		If "Yes", specify the applicable type of Disability:
		
		Locomotor Disability
		   i. Leprosy Cured Person
		   ii. Dwarfism
		   iii. Acid Attack Victims

19	**How Participation of Women will be Encouraged**	Through funding from the Government under various schemes and projects.
20	**Are Greening/ Environment Sustainability Aspects Covered** *(Specify the NOS/Module which covers it)*	☐ **Yes** ☒ **No**

21	Is Qualification Suitable to be Offered in Schools/Colleges	Schools ☐ Yes ☒ No Colleges ☒ Yes ☐ No		
22	**Name and Contact Details of Submitting / Awarding Body SPOC** *(In the case of CS or MS, provide details of both Lead AB & Supporting ABs)*	From NIELIT: Name: Dr. Saurov Mahanta (Senior Technical Officer) Email: saurov@nielit.gov.in Contact No: 9435047023 Website: https://www.nielit.gov.in/guwahati		
23	**Final Approval Date by NSQC: 15.03.2024**	**24. Validity Duration: 3Years**		**25. Next Review Date: 15.03.2027**

Section 2: Module Summary

NOSs of Qualifications
1. Use of R Programming in Biological Data Analysis.
2. Application of Omics in Big Data Analytics.
3. Mathematical Modeling of Biological Networks using Systems Biology Framework.
4. Healthcare Informatics for Medical Data Management
5. Data Security Law

Mandatory Module/ NOSs of Qualifications

Th.-Theory   Pr.-Practical OJT-On the Job Man.-Mandatory   Training Rec.-Recommended Proj.-Project

S. No	NOS/Module Name	NOS/Module Code & Version (if applicable)	Core/ Non-Core	NCrF/ NSQF Level	Credits as per NCrF	Training Duration (Hours)				Assessment Marks			weightage (%) *(if applicable)*
						Th.	Pr.	OJT-Man.	Total	Th.	Pr.	Total	
1.	Use of R Programming in Biological Data Analysis	Code: NIE/SSC/N 1805 Version-1.0	Core	5.5	5	60	90	0	**150**	56	25	**81**	16.2
2.	Application of Omics in Big Data Analytics	Code: NIE/SSC/N 1806 Version-1.0	Core	5.5	4	60	60	0	**120**	44	20	**64**	12.8

3.	Mathematical Modeling of Biological Networks using Systems Biology Framework	Code: NIE/SSC/N 1807 Version-1.0	Core	5.5	4	60	60	0	**120**	50	23	**73**	14.6
4.	Healthcare Informatics for Medical Data Management	Code: NIE/SSC/N 1808 Version-1.0	Core	5.5	2	30	30	0	**60**	25	11	**36**	7.2
5.	Data Security Law	Code: NIE/SSC/N 1804 Version-1.0	Core	5.5	2	30	30	0	**60**	25	11	**36**	7.2
6.	Implementation of R programming, Omics, data analysis in healthcare informatics (*Project/OJT)		Core	5.5	2	0	0	60	**60**	0	0	**160**	32
7.	Employability Skills	Code: DGT/VSQ/ N0103 Version-1.0	Core	5.5	3	0	0	0	**90**	0	0	**50**	10
Duration (in Hours) / Total Marks					**22**	**240**	**270**	**60**	**660**	**200**	**90**	**500**	**100**

Assessment Components	NOS Included	Duration (in min)	Marks
Theory 1: Multiomics Data Analyst Paper-1	NOS-1, NOS-2,	90	100
Theory 2: Multiomics Data Analyst Paper-2	NOS-3, NOS-4, NOS-5	90	100
Practical-1: Multiomics Data Analyst Paper-3	NOS-1, NOS-2, NOS-3, NOS-4, NOS-5	120	90
Major Project/ Dissertation	NOS-1 to NOS-6	120	100
Implementation of R programming, Omics, data analysis in healthcare informatics (Project/OJT)	NOS-6	60	60
Employability Skills	NOS-7	60	50
Total:			**500**

* Along with the report on OJT, an additional dissertation has to be submitted by the trainee

***Assessment strategy shall be as per NIELIT Norms prevailing at times.

Assessment - Minimum Qualifying Percentage

Minimum Pass Percentage – Aggregate at qualification level: 50 % *(Every Trainee should score specified minimum aggregate passing percentage at qualification level to successfully clear the assessment.)*

Minimum Pass Percentage – NOS/Module-wise: 50% *(Every Trainee should score a specified minimum passing percentage in each assessment component mentioned)*

Section 3: Training Related

1.	**Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)*	M.Sc./M.Tech/B.Tech in Bioinformatics or Biotechnology
2.	**Master Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)*	M.Sc./ M.Tech / B.Tech in Bioinformatics or Biotechnology with Minimum 2 years of experience in Bioinformatics teaching and research in NGS data analysis. Technical skills should be as follows: Hands-on experience in Bioinformatics tools and applications. Should be experienced in NGS data analysis pipelines Should be proficient in working with Linux OS. Should have basic knowledge of computer programming. Industrial level hands-on experience through various projects.
3.	**Tools and Equipment Required for Training**	☒Yes ☐No Details available in Annexure-II
4.	**In Case of a Revised Qualification, Details of Any Upskilling Required for Trainer**	Trainers not having the above-mentioned qualification but having the qualification mentioned for a trainer can undergo training of trainers and certification for this qualification.

Section 4: Assessment Related

1.	**Assessor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)*	B.Tech or Equivalent as per NCrF with 10+ years of experience

2.	**Proctor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)*	Online Theory Exam: The theory exam is conducted in online remote proctored mode. The assessor carries out theory online assessments through the remote proctoring methodology. Theory examination would be conducted online and the paper comprises MCQ. Conduct of assessment is through trained proctors. Once the test begins, remote proctors have full access to the candidate's video feeds and computer screens. Proctors authenticate the candidate based on registration details, pre-test image captured and I- card in possession of the candidate. Proctors can chat with candidates or give warnings to candidates. Proctors can also take screenshots, terminate a specific user's test session, or re-authenticate candidates based on video feeds.
3.	**Lead Assessor's/Proctor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)*	An External Examiner/ Observer (Subject matter expert) are deployed including NIELIT scientific officers who are subject experts for evaluation of Practical examination/ internal assessment / Project / Presentation/ assignment and Major Project (if applicable). Qualification is generally M.Sc./M.Tech/B.Tech in Bioinformatics or Biotechnology.
4.	**Assessment Mode** *(Specify the assessment mode)*	Online for Theory Online/ Offline/ Blended for other assessment components depending on the region where the assessment is conducted
5.	**Tools and Equipment Required for Assessment**	☒ Same as for training ☒ Yes ☐ No

Section 5: Evidence of the need for the Qualification

1.	**Latest Skill Gap Study (not older than 2 years) (Yes/No):** Yes, Available in Annexure-B
2.	**Latest Market Research Reports or any other source (not older than 2 years) (Yes/No):** Yes, Available at Annexure-B
3.	**Government /Industry initiatives/ requirement (Yes/No):** Yes, Available at Annexure-B
4.	**Number of Industry validation provided:** 11
5.	**Estimated nos. of persons to be trained and employed:** 60 persons per year shall be trained in two batches.
6.	**Evidence of Concurrence/Consultation with Line Ministry/State Departments:** No. NIELIT is recognized as AB and AA under Government Category. NIELIT is an HRD arm of MeitY, therefore, the Line Ministry Concurrence is not required.

Section 6: Annexure & Supporting Documents Check List

Specify Annexure Name / Supporting document file name

1	**Annexure:** NCrF/NSQF level justification based on NCrF level/NSQF descriptors *(Mandatory)*	***Available at Annexure-I***
2	**Annexure:** List of tools and equipment relevant for qualification *(Mandatory, except in case of the online course)*	***Available at Annexure-II***
3	**Annexure:** Detailed Assessment Criteria *(Mandatory)*	***Available at Annexure-VI***
4	**Annexure:** Assessment Strategy *(Mandatory)*	***Available at Annexure-VII***
5	**Annexure:** Blended Learning *(Mandatory, in case selected Mode of delivery is "Blended Learning")*	***Available at Annexure-V***
6	**Annexure:** Multiple Entry-Exit Details *(Mandatory, in case qualification has multiple Entry-Exit)*	***NA***
7	**Annexure:** Acronym and Glossary *(Optional)*	***Available at Annexure-X***
8	**Supporting Document:** Model Curriculum *(Mandatory – Public view)*	***Available at Annexure-A***

9	**Supporting Document:** Career Progression *(Mandatory - Public view)*	*Available at Annexure-VIII*
10	**Supporting Document:** Occupational Map *(Mandatory)*	*Available at Annexure-E*
11	**Supporting Document:** Assessment SOP *(Mandatory)*	*Annexure-C: Examination SoP*
12	**Any other document you wish to submit:**	*Annexure-D: Trainer's qualification*

Annexure-I: Evidence of Level

NCrF/NSQF Level Descriptors	Key requirements of the job role/ outcome of the qualification	How the job role/ outcomes relate to the NCrF/NSQF level descriptor	NCrF/NSQF Level
Professional Theoretical Knowledge/Process	1. Handling and construction of biological data as per specifications by defining data type & sources and acquire the data 2. Define the dataset and perform data pre-processing operations as per specification 3. Perform exploratory research on data analysis and summarizing and optimizing the data set 4. Use applications of Biology, augment the concept of OMICs data analytics for visualization and evaluation 5. Develop scientific competence and contribute in research publication	Multiomics Data Analyst follows standard operating procedures while working on biological data and identifying sources for data mining as per the requirements, define the datasets and performing data pre-processing operations such as identifying and fixing missing/incorrect values, validating data using appropriate tools. The individual applies the concepts of Biology and OMICs data analytics for visualization of analysed results and evaluation of algorithms. Monitors construction and curation of databases, extracting data/data	5.5

		mining and preparing data for analysis. All the above performances require well-developed skill with clear choice of procedures in all the projects assigned to Multiomics Data Analyst, hence are categorized as a well-developed skilled job role where the Multiomics Data Analyst have clear choice of procedures in familiar context.	
Professional and Technical Skills/ Expertise/ Professional Knowledge	After acquiring professional knowledge, the candidate will have a good understanding of OMICs and big data analytics with program developing capabilities including the proficiency in using sophisticated software packages.	Factual and theoretical knowledge in broad contexts within a field of work or study enables the candidate to work in a multidisciplinary environment as per the demands.	5.5
Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	Besides the main stream Bioinformatics skills, the candidates can develop skills to 1. Handle big data, particularly the Next Generation Sequencing (NGS) data for biological relevance 2. Usage of data analytical tools and softwares. 3. Perform exploratory data analysis as per specifications by defining, summarizing and optimizing the data set. 4. Develop critical thinking, decision-making skills. 5. Improve communication skills.	A range of cognitive programming and practical skills are required to generate solutions to specific problems in the field of Life Sciences and allied disciplines in industries worldwide. Hence, to perform such tasks, a Multiomics Data Analyst utilizes a range of cognitive and practical skills like, Analytical Skills, Critical Skills, Problem Solving and Decision Making to accomplish the tasks and solve problems by selecting and applying basic methods, tools, material and information.	5.5
Broad Learning Outcomes/Core Skill	Candidates can have thorough practical concepts and theories from OMICs data analytics of life science fields such Botany, Zoology, Human Biology and Microbiology etc., and link these concepts to create unique programs for high performance computing. Besides Biology, through this course, the candidate will culminate 1. analytical skills equivalent to a data	The job holder is expected to develop excellent logical and mathematical skills as well as understanding of sociopolitical and natural environments with organizing information, communication, and presentation	5.5

	scientist. 2. problem solving ability through mathematical models 3. handling and management of medical data	skill.	
Responsibility	The Multiomics Data Analyst is responsible for importing and preprocessing a wide range of biological data, including metabolomics, structural bioinformatics, genomics, proteomics, drug discovery, and various other biological datasets. They conduct exploratory analysis, drawing insights from relevant biological literature to support biologists. This role also involves researching and refining algorithmic models, troubleshooting, and enhancing existing pipelines. In industries or academia, their role may be either one of the following: 1. Multiomics Data Analyst 2. Project Associate 3. Scientist or data analyst in Bioinformatics/Biotechnology/Molecular Biology/Drug Discovery/Pharmaceutical industries/R&D labs, whose role would be to assist the on-going project or to perform independent translational research to accelerate the outcomes in OMICs and big data analytics.	1. The job holder is expected to complete assigned tasks and IPR of organization & customers. 2. He/she is expected to undertake on-the-job learning and participate in training and development, interventions and assessments. 3. The individual working in such a job role has complete responsibility for delivering quality of his own work & some responsibility for others works too and can be placed at level 5 And contribute in achieving the industry's profit margin.	5.5

Annexure-II: Tools and Equipment (Lab Set-Up)

List of Tools and Equipment

Batch Size: 30

Description	Quantity	Specifications

1	Classroom	1	30 m^2
2	Student Chair	30	–
3	Student Table	30	–
4	LCD Projector	1	–
5	White Board	1	–
6	Desktop Computers with accessories	30	Preferably installed with Linux OS. 9th Generation Intel Core i9 processors with compatible integrated UHD graphics processing unit. Solid state drive of 256 GB storage and 16 GB RAM.

Annexure-III: Industry Validations Summary

Provide the summary information of all the industry validations in table. This is not required for OEM qualifications.

S No.	Organization Name	Representative Name	Designation	Contact Address	Contact Phone No	E-mail ID	LinkedIn Profile (if available)
1	Assam Agricultural University	Dr. Probodh Borah	Professor & Head	Department of Animal Biotechnology, College of Veterinary Science, Assam Agricultural University, Khanapara,	9435116191	probodh.borah@aau.ac.in	https://www.linkedin.com/in/probodh-borah-38073b74/

			Guwahati, Assam 781022			
2	AGT Biosciences (OPC) Private Limited	Dr. Akan Das	Managing Director	Late Madhab Kalita Premises, Near Circle Office Sarpara, Kamrup, Assam 781122	8011726712	dasakan@gmail.com	https://www.linkedin.com/in/akan-das-42821a101/
3	Gauhati University	Dr. Subhash Medhi	Assistant Professor	Department of Bioengineering and Technolgy, Gauhati University, Jalukbari, Guwahati, Assam 781014	7002485869	subhashmedhi@gauhati.ac.in	https://www.linkedin.com/in/subhash-medhi-7905a448/
4	Indian Institute of Technology Guwahati	Dr. Ranjan Tamuli	Professor	Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam 781039	9435342715	ranjantamuli@iitg.ac.in	https://www.linkedin.com/in/ranjan-tamuli-27a9381b4/
5	Indian Institute of Technology Roorkee	Dr. Deepak Sharma	Assistant Professor	Department of Biotechnology, Indian Institute of Technology Roorkee, Uttarakhand 247667	9582700727	deepak.aiims@gmail.com	https://www.linkedin.com/in/deepak-sharma-b8221a256/
6	Jawaharlal Nehru University	Dr. Mukesh Jain	Professor	School of Computational and Integrative Sciences, Jawaharlal Nehru University, New Delhi	9871711699	mjain@jnu.ac.in	https://www.linkedin.com/in/mukesh-jain-62b4b5202/

				110067			
7	Maulana Abdul Kalam Azad University of Technology	Dr. Tufan Naiya	Assistant Professor	Maulana Abdul Kalam Azad University of Technology, West Bengal, Haringhata, Nadia 741249	9830045343	tufan.naiya@makautwb.ac.in	Not Available
8	Mr. Biologist	Mr. Bashavlauchan Chetia	Administrative Officer	Ground Floor, D-Building, MIT-WPU, Paud Road, Kothrud, Pune 411038	7768061282	info@askmrbiologist.com	https://www.linkedin.com/in/bashavlauchan-chetia-33337b253/
9	National Institute of Technology Arunachal Pradesh	Dr. Pallabi Kalita Hui	Assistant Professor	National Institute of Technology Arunachal Pradesh, Jote, Arunachal Pradesh 791113	8974498213	pallabikalita@nitap.ac.in	https://www.linkedin.com/in/pallabi-kalita-hui-98b10746/
10	Rajiv Gandhi University	Dr. Hui Tag	Professor	Department of Botany, Rajiv Gandhi University, Rono Hills, Doimukh 791112, Arunachal Pradesh	8131871644	hui.tag@rgu.ac.in	https://www.linkedin.com/in/dr-hui-tag-04718a49/
11	University of Science and Technology Meghalaya	Dr. Yugal Kishore Mohanta	Assistant Professor	Department of Applied Biology, School of Biological Sciences, University of Science and Technology Meghalaya, 9th Mile, Techno City, Baridua, Ri Bhoi, Meghalaya	9439093024	yugalkmohanta@ustm.ac.in	https://www.linkedin.com/in/dr-yugal-kishore-mohanta-52981146/

				793101			

Annexure-IV: Training & Employment Details

Training and Employment Projections:

Year	Total Candidates		Women		People with Disability	
	Estimated Training #	Estimated Employment Opportunities	Estimated Training #	Estimated Employment Opportunities	Estimated Training #	Estimated Employment Opportunities
2023-24	30	10	30	10	-	-
2024-25	60	20	60	20	-	-
2025-26	60	20	60	20	-	-

Annexure-V: Blended Learning

Blended Learning Estimated Ratio & Recommended Tools:

S. No.	Select the Components of the Qualification	List Recommended Tools – for all Selected Components	Offline: Online Ratio *
1	☐Theory/ Lectures - Imparting theoretical and conceptual knowledge	Online interaction platforms like JitSi Meet, Bharat VC, Google Meet, MS Teams, etc.	60:40
2	☐Imparting Soft Skills, Life Skills, and Employability Skills /Mentorship to Learners	Online interaction platforms like JitSi Meet, Bharat VC, Google Meet, MS Teams, etc.	60:40
3	☐Showing Practical Demonstrations to the learners	Online interaction platforms like JitSi Meet, Bharat VC, Google Meet, MS Teams, etc.	60:40
4	☐Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training	NA	100:0
5	☐Tutorials/ Assignments/ Drill/ Practice	Online interaction platforms like JitSi Meet, Bharat VC, Google Meet, MS Teams, etc.	50:50
6	☐Proctored Monitoring/ Assessment/ Evaluation/ Examinations	NIELIT Remote Proctored Software	Online: 100% Theory Offline: 100% Practical
7	☐On Job Training (OJT)/ Project Work Internship/ Apprenticeship Training	Simulated Platform	Either 100% online on virtual environment Or 100% offline in the Industry.

If the courses are conducted in the offline mode, the ratio of online and offline classes may vary by a maximum of 25%.

Annexure-VI: Detailed Assessment Criteria

Detailed assessment criteria for each NOS/Module are as follows:

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory Marks	Practical Marks	Project Marks
NOS1: Use of R Programming in Biological Data Analysis Code: NIE/SSC/N1805	1. Introduction to R: · Install R and select IDE. · Apply basic R programming for data analysis. 2. Data Import and Preprocessing: · Import diverse biological data formats. · Clean and preprocess data effectively. 3. Exploratory Data Analysis (EDA): · Generate descriptive stats and visualizations. · Perform univariate and multivariate analysis. 4. Statistical Analysis: · Conduct hypothesis tests and regression analysis. · Interpret statistical results accurately. 5. Bioinformatics Applications: · Utilize Bioconductor for sequence analysis. · Analyze genomic data and visualize findings. 6. Data Visualization: · Create publication-quality plots using ggplot2. · Visualize biological pathways and networks. 7. Advanced Bioinformatics with R: · Perform functional enrichment and pathway analysis. · Apply systems biology approaches effectively. 8. Emerging Trends: · Analyze single-cell RNA sequencing data. · Integrate and analyze multi-omics data. · Stay updated on new methodologies and tools.	56	25	0

NOS 2: Application of Omics in Big Data Analytics
 	
Code: NIE/SSC/N1806
	1. Introduction to Omics Data:
	  - Define and differentiate types of omics data.
	  - Identify challenges and opportunities in handling large-scale omics datasets.
	2. Data Acquisition and Storage:
	  - Utilize high-throughput technologies for data generation.
	  - Implement big data storage solutions for omics datasets.
	3. Preprocessing and Quality Control:
	  - Apply cleaning and filtering techniques.
	  - Implement quality control measures to ensure data accuracy.
	4. Integration of Multi-Omics Data:
	  - Integrate data from genomics, transcriptomics, proteomics, and metabolomics.
	  - Address challenges in harmonizing heterogeneous omics datasets.
	5. Statistical Analysis and Machine Learning:
	  - Apply statistical methods for identifying differentially expressed genes, proteins, or metabolites.
	  - Implement machine learning algorithms for omics data classification and prediction.
	6. Network Analysis:
	  - Construct and analyze biological networks.
	  - Identify key nodes and pathways from omics data.
	7. Visualization Techniques:
	  - Utilize data visualization tools for exploring large-scale omics datasets.
	  - Implement interactive visualization for gaining insights into complex biological systems.
	8. Big Data Analytics Platforms:
	  - Evaluate and compare platforms and tools for big data analytics in omics.
	  - Select appropriate omics data analysis platforms for specific needs.
	9. Precision Medicine and Personalized Omics:
	  - Apply omics big data in personalized medicine applications.
	  - Address challenges and ethical considerations in implementing personalized omics approaches.
	10. Emerging Technologies and Trends:
	  - Explore the impact of single-cell omics on big data analytics.
	  - Stay updated on future directions and innovations in omics data analysis.
		44	20	0

NOS 3: Mathematical Modeling of Biological Networks using Systems Biology Framework
 	
Code: NIE/SSC/N1807
	1. Introduction to Systems Biology:
	  - Describe systems biology and its applications.
	  - Explain the significance of mathematical modeling in studying biological networks.
	2. Types of Biological Networks:
	  - Identify and differentiate gene regulatory, protein-protein interaction, metabolic, and signaling networks.
	3. Mathematical Representation of Biological Components:
	  - Apply differential equations for modeling gene expression dynamics.
	  - Implement Boolean and logical modeling for binary interactions in networks.
	  - Utilize kinetic modeling for enzymatic reactions in metabolic networks.
	4. Parameter Estimation and Validation:
	  - Apply methods for estimating model parameters from experimental data.
	  - Implement validation techniques to assess model accuracy and reliability.
	5. Network Topology and Structure:
	  - Apply graph theory concepts to analyze biological networks.
	  - Explain the importance of network topology in understanding system behavior.
	6. Dynamic Behavior of Biological Networks:
	  - Conduct time-course simulations of network dynamics.
	  - Perform stability analysis of network states.
	7. Integration of Experimental Data into Models:
	  - Incorporate omics data (genomics, transcriptomics, proteomics) into network models.
	  - Apply data assimilation techniques for refining and updating models.
	8. Multiscale Modeling Approaches:
	  - Integrate models at different scales (molecular, cellular, tissue) for comprehensive understanding.
	  - Address challenges and opportunities in multiscale modeling.
	9. Applications of Systems Biology Models:
	  - Apply models for drug target identification and optimization.
	  - Utilize network modeling to understand disease mechanisms and in synthetic biology applications.
	10. Software Tools for Systems Biology Modeling:
	  - Evaluate popular modeling platforms such as COPASI and CellDesigner.
	  - Conduct a comparative analysis of software tools for different modeling tasks.
	  1.
		50	23	0

NOS 4: Healthcare Informatics for Medical Data Management
 	
Code: NIE/SSC/N1808
	1. Introduction to Healthcare Informatics:
	  - Define healthcare informatics and its scope.
	  - Explain the significance of medical data management in healthcare.
	2. Electronic Health Records (EHR) Systems:
	  - Describe the design and implementation of electronic health record systems.
	  - Discuss interoperability standards for seamless data exchange in EHR systems.
	3. Health Information Exchange (HIE):
	  - Explain the process of connecting disparate healthcare systems for information sharing.
	  - Address privacy and security considerations in health information exchange.
	4. Clinical Decision Support Systems (CDSS):
	  - Integrate informatics into clinical decision-making processes.
	  - Illustrate applications and benefits of CDSS in healthcare.
	5. Data Standards and Terminologies:
	  - Discuss the standardization of medical coding systems such as SNOMED CT and ICD-10.
	  - Highlight the importance of standardized data for interoperability and analysis.
	6. Healthcare Data Warehousing:
	  - Outline the process of aggregating and storing large volumes of healthcare data.
	  - Explain the use of data warehousing for analytics and reporting in healthcare.
	7. Big Data Analytics in Healthcare:
	  - Utilize big data technologies for analyzing large healthcare datasets.
	  - Apply predictive analytics for disease prevention and early detection.
	8. Machine Learning and AI in Healthcare Informatics:
	  - Identify applications of machine learning algorithms in medical data analysis.
	  - Implement AI-driven diagnostic tools and personalized medicine approaches.
	9. Mobile Health (mHealth) Applications:
	  - Discuss the use of mobile technologies for healthcare data collection and monitoring.
	  - Address security and privacy considerations in mHealth applications.
		25	11	0

NOS 5: Data Security Law Code: NIE/SSC/N1804	1. Introduction to Data Security Law -Overview of data security concepts and terminology, Historical evolution of data security laws, -Importance of data protection in modern society 2. Legal Frameworks for Data Security -Overview of major data protection laws (e.g., GDPR, CCPA, HIPAA), -Comparative analysis of international data security regulations, -Understanding jurisdictional differences and compliance challenges 3. Compliance Requirements and Legal Obligations -Principles and requirements of key data security laws, -Data subject rights and consent mechanisms, -Obligations for data controllers and processors 4. Managing Data Breaches and Security Incidents -Understanding data breaches and security incidents, -Legal obligations for responding to data breaches, -Developing incident response plans and protocols 5. Risk Management and Compliance Strategies Risk assessment methodologies and frameworks, -Implementing technical and organizational measures for data security, -Best practices for ensuring compliance with data security laws 6. Emerging Trends and Future Developments -Emerging technologies and their impact on data security, -Evolving regulatory landscape and anticipated changes in data security laws, -Future challenges and opportunities in data security law	25	11	0

Implementation of R programming, Omics, data analysis in healthcare informatics (Project/OJT)	1. Proficiency in R programming language and its application in biological data analysis. 2. Competency in importing and preprocessing various biological data formats. 3. Ability to perform exploratory data analysis and generate meaningful insights using R. 4. Understanding of different types of omics data and the challenges associated with handling large-scale datasets. 5. Proficiency in data acquisition, storage, and preprocessing techniques for omics data. 6. Ability to integrate and analyze multi-omics data using statistical methods and machine learning algorithms. 7. Knowledge of systems biology principles and their applications in modeling biological systems. 8. Competency in modeling different types of biological networks and representing them mathematically. 9. Ability to validate and refine models using experimental data and parameter estimation techniques. 10. Understanding of healthcare informatics fundamentals and its importance in medical data management. 11. Proficiency in designing and implementing electronic health record systems and health information exchange protocols. 12. Knowledge of clinical decision support systems, healthcare data standards, and terminology coding systems.	-	-	60
Major Project/ Dissertation		-	-	100
Total		**200**	**90**	**160**
Employability Skills Code: DGT/VSQ/N0103			**50**	
Grand Total			**500**	

Annexure-VII: Assessment Strategy

• Assessment of the qualification evaluates candidates to ascertain that they can integrate knowledge, skills and values for carrying out relevant tasks as per the

• defined learning outcomes and assessment criteria.

• The underlying principle of assessment is fairness and transparency. The evidence of the outcomes and assessment criteria. competence acquired by the candidate • can be obtained by conducting Theory (Online), Practical assessment, Internal assessment, Project/Presentation/ Assignment, Major Project. The emphasis is on the

• practical demonstration of skills & knowledge gained by the candidate through the training. Each OUTCOME is assessed & marked separately. A candidate is

• required to pass all OUTCOMES individually based on the passing criteria.

About Examination Pattern:

1. The question papers for the theory and practical exams are set by the Examination wing (assessor) of NIELIT HQS.

2. The assessor assigns roll number

3. The assessor carries out theory online assessments through remote proctoring methodology. Theory examination would be conducted online and the paper comprise of MCQ. Conduct of assessment are through trained proctors. Once the test begins, remote proctors have full access to candidate's video feeds and computer screens. Proctors authenticate the candidate based on registration details, pre-test image captured and I- card in possession of the candidate. Proctors can chat with candidates or give warnings to candidates. Proctors can also take screenshots, terminate a specific user's test session, or re-authenticate candidates based on video feeds.

4. An External Examiner/ Observer may be deployed including NIELIT officials for evaluation of Practical examination/ internal assessment / Project/ Presentation/. Major Project (if applicable) would be evaluated preferably by external/ subject expert including NIELIT officials.

5. Pass percentage would be 50% marks in each component.

6. Candidates may apply for re-examination within the validity of registration (only in the assessment component in which the candidate failed).

7. For re-examination prescribed examination fee is required to be paid by the candidate only for the assessment component in which the candidate wants to reappear.

8. There would be no exemption for any paper/module for candidates having similar qualifications or skills.

9. The examination will be conducted in English language only.

• Quality assurance activities: A pool of questions is created by a subject matter expert and moderated by other SME. Test rules are set beforehand. Random set of questions which are according to syllabus appears which may differ from candidate to candidate. Confidentiality and impartiality are maintained during all the examination and evaluation processes.

Annexure-VIII: Career Progression:

Academic:

Horizontal:
- Postgraduate studies in Bioinformatics
- Higher level Life Science research, i.e., Molecular Biology and Cell Biology
- Level 6 in IT/Bio-IT.

Vertical:
- Doctoral studies in Bioinformatics
- Level 7 Courses in Advanced-level Bioinformatics
- Higher level courses in R Programming Biological Data Analysis

Professional:

Multiomics Data Analyst -> Analyst/programmer -> Database/program developer in industries -> Lead Scientist/Bioinformatician in Biotechnology/ Molecular Biology/ Drug Discovery/ Pharmaceutical R & D lab

Annexure-X: Acronym and Glossary

Acronym

Acronym	Description
AA	Assessment Agency
AB	Awarding Body
ISCO	International Standard Classification of Occupations
NCO	National Classification of Occupations
NCrF	National Credit Framework
NOS	National Occupational Standard(s)
NQR	National Qualification Register
NSQF	National Skills Qualifications Framework
c	On the Job Training

Glossary

Term	Description
National Occupational Standards (NOS)	NOS define the measurable performance outcomes required from an individual engaged in a particular task. They list down what an individual performing that task should know and also do.
Qualification	A formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards
Qualification File	A Qualification File is a template designed to capture necessary information of a Qualification from the perspective of NSQF compliance. The Qualification File will be normally submitted by the awarding body for the qualification.
Sector	A grouping of professional activities on the basis of their main economic function, product, service or technology.
Long Term Training	Long-term skilling means any vocational training program undertaken for a year and above. https://ncvet.gov.in/sites/default/files/NCVET.pdf