Programme Overview	
Programme Title: Bioinformatics Essentials: Powering the Future of Biology	
Credit Value: 10 UCU (2 weeks)	**Programme Level:** 5 (UG Year 2)
Period: Summer (2 weeks)	**Programme Dates:** Block B: 12 July – 26 July 2025

Programme Description	
Programme Description	Dive into Bioinformatics at UEA's Summer School. This immersive 10-day course introduces you to the essential tools and techniques in bioinformatics, equipping you with the skills for the future. Covering programming, data wrangling, visualisation, and statistical modelling, experts lead each interactive session and build practical skills and a comprehensive understanding of bioinformatics workflows. Topics covered during the programme are as follows: **Intro & R Basics** We will start with an overview of bioinformatics, covering its scope, potential challenges, and real-world applications. This will be followed by an introduction to R programming essentials, including data import, data cleaning, and basic analysis for biological datasets. **Data Wrangling & Big Data** Tackle data manipulation techniques using tools like dplyr and tidyr to handle biological datasets efficiently. We will also learn strategies to manage and process large-scale biological datasets for downstream analysis. **Stats & Visualisation** Gain a foundational understanding of statistical modeling, from hypothesis testing to applying linear models in bioinformatics. Visualise data effectively with ggplot2, creating clear and impactful plots for scientific communication. **Command Line & SNP Filtering** Master Bash scripting basics to automate tasks, manage files, and work with diverse file formats commonly encountered in bioinformatics. Apply tools like PLINK and VCFtools for quality control and filtering of SNP datasets.

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Bioinformatics Essentials: Powering the Future of Biology

	Population Structure Understand population genetics concepts like PCA, FST, and their applications in analysing genetic structure. Explore admixture methods to infer relationships and ancestry within and between populations. **Genomics & Phylogenetics** Study landscape genomics to examine genetic variation across geographical and environmental contexts. Learn to construct phylogenetic trees for evolutionary analysis. **Environments & Version Control** Develop reproducible workflows using tools like Conda and Docker to manage software dependencies and computational environments. Get hands-on with Git to track changes, collaborate effectively, and maintain version control in bioinformatics projects. **RNAseq Analysis** Understand the RNA sequencing pipeline, from aligning reads to identifying differentially expressed genes. We will learn to use tools like DESeq2 and edgeR to quantify gene expression and uncover biological insights. **Enrichment & Annotation** Perform functional enrichment analysis to identify key pathways and biological processes from genomic or transcriptomic data. Use gene annotation tools to add biological context and depth to your findings. **Documentation & Functions** Learn to create clear, well-structured documentation for bioinformatics workflows using Quarto and Markdown. Build custom R functions to streamline repetitive tasks and enhance the efficiency of your analyses.
Programme Assessment	The programme is assessed using a combination of formative and summative work. **Formative assessment:** A presentation plan. Working in a group, you will be asked to formulate a plan for the presentation you will be required to deliver for your summative assignment. **Summative assessment:** Project presentation. With your group you will be asked to deliver a presentation (maximum of 10 minutes) in class. The presentation may include PowerPoint point slides, images and videos, and encourages you to be creative and critically reflective on what you have learned during the programme. Each presentation will be followed by questions from a panel. Credit is awarded on a **pass/fail** basis.

Timetable

This is an example timetable for a 2-week programme. Final timetable details will be confirmed closer to the programme start date. Each programme will consist of 40 taught hours across the 2-week timetable.

	Morning	Afternoon	Evening
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday	Arrivals and airport transfers. Settle into campus accommodation.		Evening meal
Sunday	Breakfast	Induction and orientation to UEA and Norwich.	

WEEK ONE	**07:00-09:30**	**09:30-12:00**	**12:00-14:00**	**14:00-16:00**	**16:00 onwards**
Monday	Breakfast	Welcome, Programme Learning Outcomes, Expectations and Engagement	Break	Academic session	Social activity
Tuesday	Breakfast	Academic session	Break	Project work	Free time
Wednesday	Breakfast	Academic session	Break	Academic session	Social activity
Thursday	Breakfast	Academic session	Break	Project work	Free time
Friday	Breakfast	Academic session	Break	Academic session	Social activity
Saturday	**Cultural group excursion**				
Sunday	**Free time to explore Norwich or further afield.**				

WEEK TWO	**07:00-09:30**	**09:30-12:00**	**12:00-14:00**	**14:00-16:00**	**16:00 onwards**
Monday	Breakfast	Academic session	Break	Academic session	Free time
Tuesday	Breakfast	Academic session	Break	Project work	Social activity
Wednesday	Breakfast	Academic session	Break	Mock presentations	Free time
Thursday	Breakfast	Project work	Break	Preparations for final assessment	Free time
Friday	Breakfast	Preparations for final assessment	Break	Final assessment	Finale social activity
Saturday	Breakfast	Departures / Free time			
Sunday					