PRESENTED BY:
BDG LIFESCIENCES

NEXT GENERATION SEQUENCING

10-DAY TRAINING PROGRAM

EVERY DAY 60-90 MIN LIVE SESSION

WWW.BDGLIFESCIENCES.COM

INTRODUCTION

Do you know how doctors can pinpoint the exact cause of a rare disease, or how scientists tracked the variants of COVID-19 in real-time? The answer lies in **Next-Generation Sequencing (NGS).**

Every living thing—from the smallest bacteria to you—carries a unique set of instructions called DNA. For decades, reading these instructions was slow and expensive. NGS has changed everything by allowing us to read billions of these "letters" simultaneously. This technology is the engine behind "personalized medicine," where treatments are tailored to your specific genetic makeup. In this course, you won't just learn about this technology; you'll learn how to use it to solve biological mysteries.

TRAINERS

The training programs at BDG Lifesciences are conducted by highly experienced resource persons with strong academic and research backgrounds in bioinformatics, computational biology, drug discovery, molecular modeling, genomics, and artificial intelligence applications in life sciences. Our trainers include research professionals and subject-matter experts who have worked on real-world research projects, guided students for science fairs and publications, and delivered advanced workshops internationally. With over a decade of experience mentoring students—from high school to postgraduate levels—our team focuses on building strong conceptual foundations while providing hands-on exposure to industry-standard tools and research methodologies. The teaching approach emphasizes clarity, structured progression, practical application, and personalized guidance to ensure students not only understand the concepts but also gain confidence in applying them independently.

OVERVIEW

This 10-day intensive program takes you on a journey from the wet lab to the computer lab. We start with the Molecular Foundations, exploring how DNA is organized and how it varies between individuals.

WEEK 1: THE TECH SIDE

Students will explore the evolution of sequencing, from the early days of Sanger sequencing to cutting-edge "Third-Generation" tools like Oxford Nanopore. They will learn how we prepare biological samples for the sequencer through a process called "Library Preparation".

WEEK 2: THE DATA SIDE

Once the machine spits out data, the real detective work begins. The students will learn to use professional-grade software (like BWA and GATK) to align DNA reads to a reference genome and identify mutations.

SCHEDULE

Day	Module	Topics Covered	Practical / Demonstration
Day 1	Genomic Foundations	Genome organization, chromatin structure, gene architecture, central dogma	Visualization in UCSC Genome Browser
Day 2	Genetic Variation	SNPs, Indels, CNVs, SVs, somatic vs germline mutations	Variant browsing in Ensembl
Day 3	Evolution of Sequencing	Sanger sequencing chemistry, capillary electrophoresis, throughput comparison	--Theory Session --
	Illumina Technology	Bridge amplification, sequencing-by-synthesis, reversible terminators	-- Theory Session --
Day 4	Third-Generation Sequencing	PacBio SMRT, Oxford Nanopore, long-read dynamics, error rates	-- Theory Session --
	Library Preparation	Fragmentation, adapter ligation, indexing, PCR bias	-- Theory Session --

SCHEDULE

Day	Module	Topics Covered	Practical / Demonstration
	NGS File Formats	FASTQ, Phred quality score calculation, SAM/BAM, VCF	-- Theory Session --
Day 5	Quality Control	GC bias, adapter contamination, quality trimming	FastQC/MultiQC
	Read Alignment	Reference genome concept, BWA, HISAT2, mapping quality	Alignment(sample dataset)
Day 6	Post-Alignment Processing	SAMtools, duplicate marking, sorting, indexing	BAM file manipulation
	Variant Calling	GATK HaplotypeCaller, filtering metrics (QD, MQ, FS)	VCF inspection
Day 7	RNA-Seq Analysis	Count matrices, normalization (TPM, FPKM), log2FC, FDR	Differential expression (DESeq2 conceptually)
Day 8	Functional Annotation	Gene Ontology, KEGG pathways, enrichment statistics	Enrichr/DAVID
Day 9	Data Visualization	Heatmaps, PCA, volcano plots, IGV genome viewer	Visualization in R
Day 10	Translational Genomics	Biomarker discovery, precision medicine, clinical reporting	Case study analysis

FEE- $ 260 US

For this small amount, students gain practical experience in modern genomic analysis and data interpretation techniques that are transforming healthcare and precision medicine. This program builds a strong academic and research foundation that can significantly strengthen future STEM pathways, science fair projects, and college applications.

NOTE-

- All live sessions will be conducted via Zoom.
- A concise summary of each session will be provided to participants for revision and reinforcement.
- The recording of each session will be shared for future reference and review.
- A Certificate of Completion will be awarded by BDG Lifesciences upon successful completion of the program.

BENEFITS OF THIS COURSE

MASTER "BIG DATA" SKILLS

Biology is no longer just about petri dishes; it's about data. You will gain hands-on experience with Linux and coding environments like Google Colab, skills that are highly valued in any STEM career.

COLLEGE & CAREER READINESS

Genomics is revolutionizing fields like oncology (cancer research), forensics (CSI-style DNA testing), and even agriculture. Having NGS experience on your college application will set you apart from other students.

TACKLE REAL-WORLD PROBLEMS

You will learn how scientists identify "biomarkers" for diseases and how precision medicine is making healthcare more effective for everyone

A STEPPING STONE TO INTERNSHIPS

Biotech companies and university labs look for students who already understand Linux, "Big Data," and genomic file formats (BAM, VCF). This course gives you the technical edge needed to land competitive internships.

IN THIS PROGRAM, STUDENTS WILL DISCOVER HOW NEXT-GENERATION SEQUENCING (NGS) AND ADVANCED COMPUTATIONAL TOOLS ARE REVOLUTIONIZING THE WAY WE TREAT DISEASES GLOBALLY. BY DECODING THE HUMAN GENOME AT MASSIVE SCALE, SCIENTISTS ARE MOVING AWAY FROM "ONE-SIZE-FITS-ALL" MEDICINE AND TOWARD TARGETED THERAPIES THAT ARE SAFER AND MORE EFFECTIVE.