



CENTRE OF GENOMICS AND BIOINFORMATICS



DEEN DAYAL UPADHYAYA GORAKHPUR UNIVERSITY
GORAKHPUR-273009, UTTAR PRADESH

Information Brochure

2022-23

BACKGROUND

The term “omics” refers to the field of study in biology ending in –omics. Omics term is used with suffix-ome to address the study of respective field in totality like genomics for genome, proteomics for proteome, metabolomics for metabolome and many more. Genomics is a branch of science associated with a comprehensive study of genome of an organism. The innovations in sequencing technologies in the recent years have led to the sequencing of several genomes giving substantial importance to the genomics for better understanding of life processes. The state-of-the-art genomic technologies have direct intervention in agriculture, health and environment and substantial efforts are being made to use these health and sustainable environment. With the advent of technological advancement in sequencing technologies for crop improvement, better human in the recent years several microbial, plants, animals and human genomes have been sequenced. The exponential increase in the sequencing data led to the emergence of appropriate databases for storage, retrieval and analysis by scientists from different disciplines throughout the world. In the era of science of “omics” the relevance of the bioinformatics is being several tools, software and databases are being developed for supporting biological research in general.

CENTRE OF GENOMICS AND BIOINFORMATICS: GENESIS

To promote multidisciplinary approach in National Education Policy 2020, Deen Dayal Upadhyay Gorakhpur University initiated this centre emphasizing on three core academic functions i) research and innovation; ii) learning, teaching and outreach programs and iii) research collaborations at national and international level. The relevance of emerging state-of-the-art technologies of genomics and bioinformatics for addressing problems related with agriculture, health, industry, environment and forensic is established globally. A proposal for the establishment of Centre for genomics and bioinformatics was initiated from Department of Biotechnology and was later on passed by all academic bodies of the University i.e. Faculty of Sciences (dated 21/11/2020), Academic Council (dated 26/11/2020) and Executive Council (dated 27/11/2020).

VISION

To be an important catalyst for the growth of Genomics, Bioinformatics, Agriculture, Biotechnology and related industries in Uttar Pradesh and India

MISSION

To grow into world class Centre for Genomics and Bioinformatics through its education, research and entrepreneurship programmes

VICE- CHANCELLOR’S MESSAGE



Prof. Rajesh Singh
Hon'ble Vice Chancellor

The advancements in Next Generation Sequencing technologies and the ability to analyze large amounts of data are bound to have a dramatic impact on almost all domains of life, including healthcare, agriculture, food security, environment, forensic and so on. It is necessary to initiate India-relevant, collaborative research programmes to translate the benefits of this emerging area. Further, the global demand for well-trained professionals in genomics and big data analysis necessitates intensive training and educational programmes in this area to create adequate manpower and employment opportunities. Therefore, Centre of Genomics and Bioinformatics, was established at Deen Dayal Upadhyay Gorakhpur University and has launched research and training programme in genomics and bioinformatics. The centre is also involved in running academic courses like M.Sc. Bioinformatics, M.Sc. Plant Biotechnology, under and postgraduate courses in Agricultural Sciences. The centre has long term vision and mission to guide its activities. Its interdisciplinary faculties plays a crucial role in enabling the centre to achieve its goal

OBJECTIVE/TASK OF CENTRE

- ❑ To develop state-of-the art lab facilities in Genomics and Bioinformatics
- ❑ To identify the research problems in agriculture, human health and environment where genomics and bioinformatics intervention is needed
- ❑ To conduct functional genomics of sequenced crops prevalent in this region to identify the potential genetic resources for crop improvement.
- ❑ To assist plant breeders to develop potential molecular markers for specific traits
- ❑ To decipher the microbial diversity of soil of this region with immense potential for producing industrially important enzymes/metabolites using both conventional and metagenomics approach
- ❑ To develop cost effective diagnostic tools for viral, bacterial and other diseases prevalent in this region
- ❑ To assist in DNA sequence analysis for forensic purpose
- ❑ To provide support in analysis of single nucleotide polymorphism in various diseases
- ❑ To develop tools and software for analysis of genomics data related to cancer and other chronic diseases
- ❑ To conduct conformational studies of peptides using ab-initio quantum mechanics based approaches; Homology modeling, functional characterization of proteins; Sequence based phylogenetic clustering and structure prediction and Toxicology

PROPOSED THEMATIC RESEARCH AREAS

GENOMICS

- ❑ Whole genome sequencing of crop / microbes relevant to this region
- ❑ Sequencing of metagenomes for deciphering novel sources of industrially important enzymes and also novel agriculturally important unculturable microbes
- ❑ Molecular identification of industrially important microbes to study their biodiversity in poorvanchal region
- ❑ Genomic intervention in the study of mechanism of action of anticancer molecules
- ❑ Genomic interventions in biodiversity study of agriculturally and medicinally important endophytes
- ❑ Genomic intervention in biofortification of crops (wheat) for Zinc and Iron
- ❑ Genomic intervention for developing biotic and abiotic stress tolerant crops relevant to this region
- ❑ Genomic intervention in metalloprotein study of arsenic in plants
- ❑ To study the host genetic susceptibility patterns for viral and bacterial infection in Eastern Uttar Pradesh
- ❑ Identification of risk factors and susceptible genes involved in pathogenesis of diseases common in poorvanchal region.

BIOINFORMATICS

- ❑ Genome annotation and Genome-wide identification of transcription factors/genes/alleles for biotic and abiotic stress tolerance using available genome sequences
- ❑ Bioinformatics based drug designing and development of inhibitors to combat infectious diseases
- ❑ Design effective drugs against, Dengue virus, Zika virus, Triple Negative Breast Cancer, G4-quadruplex inhibitors of mycobacterium tuberculosis, ion channels for neurodegenerative diseases, DNA intercalator/ groove binders, DNA junctions, and liquid crystals
- ❑ Interaction study of biologically active molecules with nanoclusters, leading to nano drug delivery systems
- ❑ Use Ordinary Differential Equations (ODE) based approaches with the law of mass action to formulate the intracellular pathways and to elucidate the complex behavior of biological system
- ❑ To develop mathematical model for disease trend prediction in Eastern Uttar Pradesh
- ❑ To develop statistical and mathematical model for system biology approach in biological sciences
- ❑ To prepare database of medicinal plant prevalent in this area for development of effective ayurvedic medicine

PROGRAMMES TO BE OFFERED

Two new programmes namely M.Sc. Bioinformatics and M.Sc. Plant Biotechnology initiated from BOS Department of Biotechnology DDU Gorakhpur University, Gorakhpur has been passed through faculty of Sciences, Academic council and Executive council of the University. Further, two PhD and four postdoctoral positions are sanctioned for research and training

MASTERS IN BIOINFORMATICS

M.Sc. Bioinformatics is a Masters course which specializes in the science of collecting and analysing complex biological data such as genetic information. Bioinformatics is a discipline at the interface between biology, computing, and statistics and is used in organismal biology, molecular biology and biomedicine. The program provides hands-on expertise in the essential multi-disciplinary fields of DNA sequencing, comparative genomics, genome annotation, analysis of mutations in cancer, analysis of the cellular organization, the discovery of new drugs and vaccines, molecular interaction networks, that comprise the core of Bioinformatics.

MASTERS IN PLANT BIOTECHNOLOGY

M.Sc. Plant Biotechnology course takes forward postgraduate learning to enhance student's knowledge and achieve expertise in the area of specialization. The program aims to build expertise of the students in the niche areas of Plant Biotechnology. The syllabus offers specialized subjects such as Biotechnology, Molecular Biology, Cell Biology, Plant Tissue Culture, Molecular Breeding, Genomics & Proteomics, Microbiology, Bioinformatics and Environmental Biotechnology.

MASTER OF SCIENCE (BIOINFORMATICS)

t		Paper Name	Credit	
Semester –1	Core Course			Total Credits 18
	BI-501	Molecular Biology	2+1	
	BI-502	IT tools and applications	2+1	
	BI-503	Basic Bioinformatics	2+1	
	Optional Course (Only One)			
	BI-510	Problem Solving Through C	2+1	
	BI-511	Structural Biology	3	
	Minor Course (Only one)			
	BI-520	Cell Biology	2+1	
	BI-521	Biochemistry	2+1	
	Ability Enhancement Compulsory Courses (AECC)AECC1			
	BI-530	Environmental Sustainability/Swachh Bharat Abhiyan activities/Biodiversity and its conservation	3	
Semester –2	Core Course			Total Credits 15
	BI-504	Introduction JAVA Programming	2+1	
	BI-505	Introduction to Genomics and Proteomics	2+1	
	Optional Course (only one)			
	BI-512	Probability and Information theory	3	
	BI-513	Data structure and algorithms	3	
	Minor Course (only one)			
	BI-522	Biomathematics and Biostatistics	2+1	
	BI-523	Introduction R Programming	3	
	Ability Enhancement Courses (AEC): Skill enhancement course			
Semester-3	Core Course			Total Credits 18
	BI-506	Database Management	2+1	
	BI-507	Perl programming for bioinformatics	2+1	
	BI-508	Optimization, machine learning and artificial intelligence	2+1	
	Optional Course (only one)			
	BI-514	Complex Algorithms in Bioinformatics	2+1	
	BI-515	PYTHON programming for Bioinformatics	3	
	Minor Course (only one)			
	BI-524	Statistical Methods in Bioinformatics	3	
	BI-525	Bio-safety and Scientific Communications	3	
Semester-4	Core Course			Total Credits 22
	BI-509	Molecular modeling and drug discovery	2+1	
	Minor Course (Only one)			
	BI-526	Human Genetics and Genome Project	3	
	BI-527	NGS data Analysis	2+1	
	Compulsory Course			
	BI-550	Course Seminar	0+1	
	BI-560	Thesis/Dissertation	15	

MASTER OF SCIENCE (PLANT BIOTECHNOLOGY)

	Paper Code	Paper Name	Credit	
Semester – 1	Core Course			Total Credits 18
	PBT-501	Plant Microbial Diversity	2+1	
	PBT-502	Molecular Biology	2+1	
	PBT-503	Plant Biochemistry	2+1	
	Optional Course (Only One)			
	PBT-510	Microbiology	2+1	
	PBT-511	Cell Biology	2+1	
	Minor Course (Only one)			
	PBT-520	Computational Biology	2+1	
	PBT-521	Biostatistics and Biostatistics	2+1	
	Ability Enhancement Compulsory Courses (AECC)AECC1			
	PBT-530	Environmental Sustainability/ Swachh Bharat Abhiyan activities/ Biodiversity and its conservation	3	
Semester – 2	Core Course			Total Credits 15
	PBT-504	Fundamental Genetics	2+1	
	PBT-505	Plant Physiology and Metabolism	2+1	
	Optional Course (only one)			
	PBT-512	Molecular Modeling and Drug Design	2+1	
	PBT-513	Recombinant DNA technology	3+1	
	Minor Course (only one)			
	PBT-522	Enzyme Technology	2+1	
	PBT-523	Immunochemistry	2+1	
	Ability Enhancement Courses (AEC): Skill enhancement course			
	PBT-540	Mushroom Culture/ Bio-fertilizer production/ Environmental Law/ Tourism and Hospitality management/ Life Skills and skill development/ Yoga studies	3	
Semester-3	Core Course			Total Credits 18
	PBT-506	Bioprocess Technology	2+1	
	PBT-507	Plant Biotechnology	2+1	
	PBT-508	Molecular Plant breeding	2+1	
	Optional Course (only one)			
	PBT-514	Plant Stress Biology	2+1	
	PBT-515	Photochemistry and Pharmacognosy	3	
	Minor Course (only one)			
	PBT-524	Biosafety and Scientific Communications	3	
	PBT-525	Molecular Plant Pathology	3	
	Ability Enhancement Compulsory Courses (AECC)AECC2			
	PBT-531	Human Values and professional Ethics/Gender Sensitization	3	
Semester-4	Core Course			Total Credits 22
	PBT-509	Genomics for crop improvement	2+1	
	Minor Course (only one)			
	PBT-526	Proteomics and Metabolomics	3	
	PBT-527	Plant Developmental Biology	3	
	Compulsory Course			
	PBT-550	Course Seminar	1	
	PBT-560	Thesis/Dissertation	15	
Total			22	

Interdisciplinary Team Members (Genomics and Bioinformatics)



Prof. Rajesh Singh

Vice Chancellor



Prof. Ajay Singh

Dean, Faculty of Science



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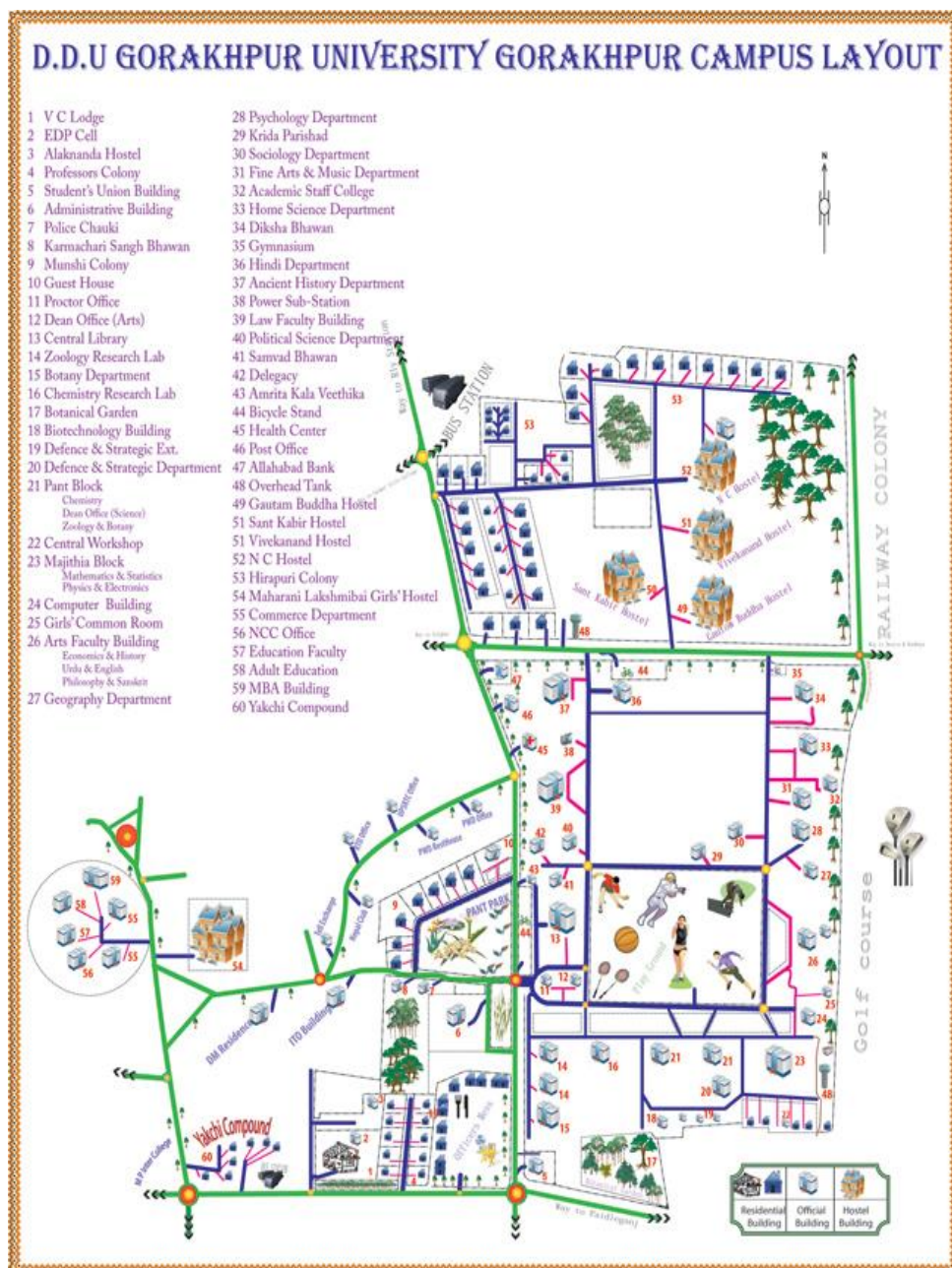


Dr. Kumari Sikha

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For more information



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