



**Doctor of Philosophy (Ph. D.)
Academic Curriculum**



**Department of Biotechnology,
Faculty of Science,
Siddharth University, Kapilvastu,
Siddharth Nagar, UP- 272202**

To be implemented from Academic Session 2022-23

 
सिद्धार्थ विश्वविद्यालय

Doctor of Philosophy (Ph. D.)



Programme Specific Outcomes:

The program provides rigorous research training to doctoral students in contemporary areas of Biotechnology and allied disciplines. The approach for solving research problems by students, analytical, computational, experimental techniques and often include multiple approaches. The students graduating from this program aim for career in academia, research labs, industries related to agriculture, health and food.

Course Code	Core Courses	Credit	Course Nature
DBTC-601	Research Methodology (Research Ethics, Plagiarism)	04	Core
DBTC-602	Genomics for Crop Improvement	06	Core
DBTC-603	Bioinformatics and Computer Aided Drug Designing	06	Core
DBTP-604	Research Project	00	No Credit
	Total Credits	16	

Pre-Ph. D. Course work guidelines:

- This course will be of 16 credits and will comprise of 3 papers.
- The minimum passing marks of pre-Ph.D. course work will be 55% or equivalent grade/CGPA according to point no. 7.8 of UGC regulation 2016 of UGC 2016 manual.
- The student who earns 16 credits in Pre Ph.D. course work, will be awarded Post Graduate Diploma in Research (PGDR) in his subject.
- The student will be enrolled for research work in Ph.D. after passing the Pre Ph.D. course work.
- A research project will also be conducted in Pre Ph.D. course work apart of the mentioned theory course.
- The grades based on obtained marks in research project will be marked on grade sheet of student of pre Ph. D. course work, but these will not be included in calculating CGPA.

DBTC-601 Research Methodology

Unit –I

Introduction: Definition of research, Qualities of researcher, components of research problem, various steps in scientific research, hypothesis, research purposes, research design, literature searching.

Unit – II

Design and planning of experiments, Time scheduling: Aims and objectives, expected outcome, methodology to be adapted, planning of experiments for achieving the aims and objectives, importance of reproducibility of research work.

Unit – III



Statistical analysis and Fitting of data: Introduction to statistics- Probability theories conditional probability, Poisson distribution, Binomial distribution and properties of normal distributions, Estimates of means and proportions, Chi-Square test, Association of Attributes, t-test – standard deviation, - coefficient of variations, Correlation and regression analysis, Introduction to statistical packages, plotting of graphs, Sources of data: Primary data, secondary data, Sampling merits and demerits of experiments.

Unit - IV

Scientific writing and Publication ethics: Structure and Components of research report, Types of report: research papers, thesis. Research project reports, pictures and graphs, citation styles, Publication ethics: definition, introduction and importance, best practices/ standard setting initiatives and guidelines, publication misconduct, definition concept, Violation of publication Ethics, Authorship and contributor ship, identification of publication misconduct, complain and appeals.

Books Recommended:

1. "How to write and publish" by Robert A. Day and Barbara Gastel, (Cambridge University Press).
2. "Survival skills for Scientists" by Federico Rosei and Tudor Johnson, (Imperial College Press).
3. "How to research" by Loraine Blaxter, Christina Hughes and Malcolm Tight (Viva Books).
4. "Probability and Statistics for Engineers and Scientists" by Sheldon Ross (Elsevier Academic Press).
5. "The Craft of Scientific Writing" by Michael Alley (Springer).
6. "A Student's guide to Methodology" by Peter Clough and Cathy Nutbrown (Sage publication).
7. "Ethics in Competitive Research: Do not get scooped; do not get plagiarized" by P. Chaddah (2018). ISBN:978-938748086
9. Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN: 978-81-939482-1-7.

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DBTE-602 Genomics and Crop Improvement

Unit - I

Introduction to the nuclear, chloroplast and mitochondrial genomes, genome size and complexity, mapping of genome: genetic and physical maps, map-based cloning, molecular markers in plant genome analysis; RFLP, RAPD, STS, Microsatellite, SCAR (Sequence characterized amplified regions), SSCP (single strand conformational Polymorphism), and AFLP analysis, FISH and GISH for genome analysis.

Unit - II

Whole genome analysis: ordered genomic libraries (Cosmid, YAC, BAC libraries), Genome sequencing in plants, Next generation sequencing technologies, Applications of sequence information in plant genome analyses; Comparative genomics.

Unit - III

Marker assisted selection (MAS), Genomic assisted breeding approaches, Genomics and geoinformatics for crop improvement; Integrating functional genomics information on agronomically/economically important traits in plant breeding.

Unit - IV

Plant gene expression and regulation, functional genomics-expression analysis using microarrays, transposon tagging and Insertional mutagenesis - methods and significance, TILLING and EcoTILLING, Diversity Array Technology, transcriptomics.

Unit - V

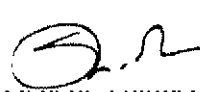

Plant Genetic Engineering techniques: Agrobacterium mediated, Particle bombardment, Electroporation; transgene stability and gene silencing. CRISPR-Cas mediated genome editing technology for genetic engineering of plants.

Unit - VI

Genetic engineering for crop quality improvement (protein, essential amino acids, vitamins, minerals nutrients, etc.). Genetic engineering for resistance against abiotic (drought, salinity, flooding, temperature, etc.) and biotic (insect pest, fungal, viral and bacterial diseases, weeds, etc.) stresses.

Books Recommended:

1. Molecular Biology of the Cell by Bruce Alberts, Bray D, Lewis J, Raff M, Roberts K and Watson J D. Garland Publishing Inc. New York.
2. Molecular Cloning: a Laboratory Manual by Sambrook J, Fritsch E F and Maniatis T. Cold Spring Harbor laboratory Press. New York.
3. Plant Biotechnology by Adrian S, Nigel S and Mark F. Oxford University Press.
4. Biotechnology in crop Improvement by Chawla H S. International Book Distributing Company

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DBTC-603 Bioinformatics and Computer-Aided Drug Designing

Unit - I

Bioinformatics and its applications, Sequence and structure databases, Sequence retrieval, Sequence and structure file formats, Microarray databases, Pathways databases, and related analysis, PDB, Drug binding database, Molecular modelling data bank, Chemical compound databases, searching and designing of ligands

Unit – II

Pair-wise sequence alignment, gaps, Gap-penalties, Scoring matrices, and its applications, Local and global sequence alignment, Multiple sequence alignment, Sequence similarity tools

Unit - III

Gene prediction, Detection of functional sites, Gene expression and related tools, Phylogenetic analysis, Comparison of the genetic sequence of organisms, Phylogenetic analysis tools, Genome annotation, Comparative genomics

Unit - IV

Protein Microarray, Drug target discovery, protein folding, Three-dimensional structure prediction, Ramachandran plot, active site analysis, Pharmacophore mapping, Grid maps, prediction of protein structure from sequences

Unit – V

Natural product, Chemoinformatics and Pharmacoinformatics, Lead compound, Lead Designing, Combinatorial chemistry, Molecular High Throughput Screening (HTS), Lead optimization strategies

Unit - VI

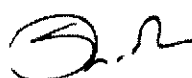
QSAR, Database generation and Chemical libraries, Docking methods, and Tools, Molecular dynamics simulation, ADME property, Herb-drug interactions, pharmacogenomics, Pathway models, Systems biology, and simulation.

Books Recommended:

1. Bioinformatics: Sequence and Genome Analysis by David W. Mount, Cold Spring Harbor
2. Computer-Aided Drug Design (2020) by Singh DB, Springer Singapore
3. Computer-Aided Drug Design and Delivery Systems (2011) by Nag A and Dey B, The McGraw-Hill Companies, Inc
4. Bioinformatics: Methods and Applications (2021), by Singh DB and Pathak RK, Academic Press (Elsevier)

DBTP-604 Research Project

Students will have to do a research project related to their Major subject. It will be evaluated and it's marks will be shown on marksheet but not included in calculation of percentage.

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