



SHARDA
UNIVERSITY
Beyond Boundaries



**SHARDA SCHOOL OF
BIO SCIENCE &
TECHNOLOGY**

BIOTECHNOLOGY

B - BIOLOGY
I - INNOVATION
O - ORGANISM
T - TECHNOLOGY
E - ENGINEERING
C - CELL
H - HEALTH
N - NUTRITION
O - OMICS
L - LABORATORY
O - ORGANISMS
G - GENETICS

— COURSE —

**PROTIEN
ENGINEERING
(NVF2102)**

**VALUE ADDED
COURSE BROCHURE-30 HRS
2025-26**

ABOUT THE UNIVERSITY

Sharda University is a leading Educational institution based out of Greater Noida, Delhi NCR. A venture of the renowned Sharda Group of Institutions (SGI), The University has established itself as a high quality education provider with prime focus on holistic learning and imbining competitive abilities in students.

The University is approved by UGC and prides itself in being the only multi-discipline campus in the NCR, spread over 63 acres and equipped with world class facilities.

Sharda University promises to become one of the India's leading universities with an acknowledged reputation for excellence in research and teaching. With its outstanding faculty, world class teaching standards, and innovative academic programs, Sharda intends to set a new benchmark in the Indian education system.

ABOUT SCHOOL

The Sharda School of Bio-Science and Technology is one of the most dynamic and vibrant School for Life Sciences and Biological Engineering in the Delhi-NCR, Greater Noida India. The school is providing excellent and quality educational opportunities in are areas of Moleuclar Biology, Biochemistry, Immunology, Microbiology, Virology, Cancer Biology, Plant Molecular Biology, Agriculture Biotechnology, Animal Biotechnology etc by training the student community for Entrepreneurship development, Research and technical skills for the student community in particular for those coming from the diverse cultural and socio-economic background of the nation. SSBT offers innovative postgraduate and PhD programmes that inculcate personal and professional enrichment leading to the formation of vivacious and enthusiastic student community.

ABOUT COURSE

This course bridges molecular biology with real-world applications in biotechnology, pharmaceuticals, agriculture, and healthcare. By the end of the course, students will understand how protein engineering serves as a cornerstone for developing innovative therapeutics, enzymes, and industrial biomolecules. The course also encourages entrepreneurial thinking and prepares students for careers in research, industry, and biotechnology startups.

COURSE CONTENT

Week	Content	Duration
1.	Structure of a gene, Transcription mechanism	2
2.	The structure of mRNA, Translation process	2
3.	The structure of mRNA, Translation process	2
4.	Basics of Recombinant DNA Technology (rDNA)	2
5.	Types of vectors, Prokaryotic and Eukaryotic hosts	2
6.	Codon bias, site-directed mutagenesis	2
7.	The importance of tagging (his-tags, biotin-streptavidin, glutathione tags etc.)	2
8.	Downstream process of purification (dialysis, ultrafiltration, concentration/fractionation by salting out etc.)	2
9.	Liquid column chromatography (size exclusion, ion-exchange, affinity), HPLC	2
10.	Importance of protein structure	2
11.	X-ray Crystallography, Nuclear Magnetic Resonance, Circular Dichroism	2
12.	Cryo-Electron Microscopy	2
13.	Therapeutic Peptides (Insulin, Semaglutide, Teriparatide)	2
14.	Therapeutic Proteins (Monoclonal Antibodies, erythropoietin, etc.)	2
15.	Fusion Proteins	2
Total		30hrs

RESOURCE PERSONS

Dr. Ankita Behl

Dr. Ankita Behl is working as an Assistant Professor in the Department of Life Sciences, School of Bio-science and Technology at Sharda University, Greater Noida, India. She is a molecular parasitologist whose research focuses on understanding stress adaptation and drug resistance mechanisms in *Plasmodium falciparum*, the causative agent of malaria. Her work explores how parasite proteins enable survival under hostile host environments and drug pressure, with the ultimate goal of identifying novel therapeutic targets. She earned her Ph.D. in Biotechnology from Guru Nanak Dev University, Amritsar in July 2019 and has an extensive postdoctoral research experience at Special Centre for Molecular Medicine, Jawaharlal Nehru University, New Delhi. She was awarded with prestigious DST-SERB National Post-doctoral Fellowship (N-PDF) in 2019 and DBT-Research Associateship in 2023. Dr. Behl's technical expertise integrates molecular biology, parasite cell biology, and advanced bioinformatics. This multidisciplinary approach provides a comprehensive framework to uncover parasite vulnerabilities and supports the design of next-generation antimalarial strategies. By combining parasite stress biology, computational analyses, and protein biochemistry, her research is paving the way toward innovative therapeutic avenues with profound implications for malaria control and global health.

Dr. Smita

Dr Smita Jain is Assistant Professor in the Department of Life Sciences, School of Basic Science and Research. She has more than 8 years of UG/PG teaching experience and had been associated with Department of Biochemistry, Institute of Home Economics, University of Delhi. She has completed her MSc (Biotechnology), UGC-CSIR JRF-SRF scholar and PhD in Biochemistry from Delhi University. Her area of specialization is exploring the neurodegenerative changes, altered protein expression in clinical disorders such as Migraine, headache related neuronal disorders. During her PhD tenure, she has identified the adverse toxicity of xenobiotics including pesticides and plant derived drugs with respect to its bioaccumulation and transport across the highly specific and impermeable blood-brain barrier, subsequent impact on the brain inhabited memory related proteins. She has published her research work in various peer reviewed national and international journals of high impact factor. She has also published few book chapters published nationally. She has been awarded with an Institutional Research Grant by Research and Development Centre, Sharda University to explore the role of Vitamin D and memory neurotrophins in association with ferritin levels in migraine patients of North India. She has been assigned as Departmental ERP (Enterprise Resource Planning) champion by Dean academic Affairs, Shada University from past two years. She is also part of Cultural and Sports Committee for conducting Co-curricular programs/activities/events at Intra-Departmental and Inter-Departmental level.

School: SSBT

Programme: PG.

Branch: M.Sc. Biotechnology/Microbiology/Zoology/Virology & Immunology/ Food Science and Technology

Batch : 2025-2027

Current Academic Year: 2025-2026

1. Course Code	NVF2102	
2. Course Title	Protein Engineering	
3. Credits	0	
4. Contact Hours (L-T-P)	30 Hours	
Course Type	Value added course	
5. Course Objective	1. To introduce fundamental concepts of Protein Biology 2. To train the students in the concept of recombinant protein production. 3. To make the students understand the concept of protein engineering.	
6. Course Outcomes	On successful completion of the course, students will be able to: CO1: To understand the basic concepts of gene expression and protein synthesis. CO2: To understand the concept of recombinant DNA technology. CO3: To understand and explain the process of protein purification. CO4: To get the concept of structure determination of protein. CO5: To get deep insight of peptides and proteins for therapeutic applications. CO6: To develop an idea about the protein engineering.	
7. Course Description	This course bridges molecular biology with real-world applications in biotechnology, pharmaceuticals, agriculture, and healthcare. By the end of the course, students will understand how protein engineering serves as a cornerstone for developing innovative therapeutics, enzymes, and industrial biomolecules. The course also encourages entrepreneurial thinking and prepares students for careers in research, industry, and biotechnology startups.	
8. Outline syllabus		CO Mapping
Unit 1	Transcription, Translation, and Structure of Protein	
A	Structure of a gene, Transcription mechanism	CO1,CO6
B	The structure of mRNA, Translation process	CO1,CO6
C	Structures of protein (primary to quaternary), Protein Folding	CO1,CO6
Unit 2	Production of Recombinant Proteins	
A	Basics of Recombinant DNA Technology (rDNA)	CO2,CO6
B	Types of vectors, Prokaryotic and Eukaryotic hosts	CO2,CO6
C	Codon bias, site-directed mutagenesis	CO2,CO6
Unit 3	Purification of recombinant proteins	
A	The importance of tagging (his-tags, biotin-streptavidin, glutathione tags etc.)	CO3,CO6
B	Downstream process of purification (dialysis, ultrafiltration, concentration/fractionation by salting out etc.)	CO3,CO6
C	Liquid column chromatography (size exclusion, ion-exchange, affinity), HPLC	CO3,CO6
Unit 4	Protein structure determination	
A	Importance of protein structure	CO4,CO6
B	X-ray Crystallography, Nuclear Magnetic Resonance, Circular Dichroism	CO4,CO6
C	Cryo-Electron Microscopy	CO4,CO6
Unit 5	Engineered Proteins in Commercial Use	
A	BTherapeutic Peptides (Insulin, Semaglutide, Teriparatide)	CO5,CO6
B	Therapeutic Proteins (Monoclonal Antibodies, erythropoietin, etc.)	CO5,CO6
C	Fusion Proteins	CO5,CO6
Mode of Examination	Quiz/Viva	