

# Short-Term Offline Internship on Working with Proteins

## For Undergraduate Students in Life Sciences & Biochemistry

This **4-week hands-on internship** is designed for undergraduate students in **life sciences and biochemistry** to provide **practical training in protein isolation, purification, characterization, and functional analysis**. The program integrates **biochemical, biophysical, and computational approaches** for working with proteins, preparing students for research and industry applications.

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## Internship Structure & Study Design

### Week 1: Fundamentals of Protein Biochemistry & Extraction

★ **Objective:** Understanding protein structure, function, and basic experimental techniques.

- **Introduction to Proteins:** Structure, classification, and biological functions.
- **Protein Folding & Stability:** Role of chaperones, denaturation, and aggregation.
- **Protein Extraction & Cell Lysis Methods:** Using bacterial, plant, or animal cells.
- **Quantification & Preliminary Analysis:** Bradford assay, Lowry assay, and BCA assay.
- **Centrifugation & Fractionation Techniques:** Differential and density gradient centrifugation.

#### 🔗 Lab Work:

- ✓ Protein extraction from bacterial/plant/animal tissues.
  - ✓ Determination of protein concentration using spectrophotometry.
  - ✓ Cell lysis techniques (mechanical, enzymatic, and chemical).
  - ✓ Solubility and stability testing of extracted proteins.
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### Week 2: Protein Purification Techniques

★ **Objective:** Learning chromatography-based methods for protein purification.

- **Chromatography Principles & Techniques:**
  - Ion-exchange chromatography
  - Size-exclusion chromatography
  - Affinity chromatography (His-tag, GST-tag purification)
- **Ultrafiltration & Dialysis for Protein Purification.**
- **Ammonium Sulfate Precipitation & Protein Fractionation.**
- **Case Studies on Purification Strategies for Different Proteins.**

### **Lab Work:**

- ✓ Purification of a recombinant protein using affinity chromatography.
  - ✓ Gel filtration chromatography for protein fractionation.
  - ✓ Dialysis for buffer exchange and removal of contaminants.
  - ✓ Analyzing purification efficiency using SDS-PAGE.
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## **Week 3: Protein Characterization & Structural Analysis**

★ **Objective:** Understanding techniques for protein identification and structure determination.

- **Electrophoresis & Mass Spectrometry:** SDS-PAGE, Native-PAGE, and Western Blot.
- **UV-Visible & Fluorescence Spectroscopy for Protein Characterization.**
- **Protein-Protein & Protein-Ligand Interactions:** ELISA, ITC, and Surface Plasmon Resonance (SPR).
- **Circular Dichroism (CD) & FTIR Spectroscopy for Secondary Structure Analysis.**

### **Lab Work:**

- ✓ SDS-PAGE for molecular weight determination.
  - ✓ Western blot for protein identification.
  - ✓ Spectroscopic analysis of protein structural changes.
  - ✓ Protein-ligand interaction studies using UV-Vis spectroscopy.
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## **Week 4: Functional Analysis & Research Project**

★ **Objective:** Applying protein biochemistry techniques to research problems.

### **Choose One Research Project:**

- ✓ Enzyme kinetics and inhibition analysis.
- ✓ Protein-ligand binding studies using computational docking.
- ✓ Protein folding and aggregation studies.
- ✓ Recombinant protein expression and purification analysis.

### **Final Presentation & Certification:**

- Students present their findings in a **seminar**.
  - Expert evaluation from academia/industry professionals.
  - **Certificate of Completion** provided.
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# Expected Outcomes of the Internship

## 🔗 Technical & Laboratory Skills:

- ✓ Hands-on experience in protein extraction, purification, and characterization.
- ✓ Proficiency in chromatography, electrophoresis, and spectroscopy techniques.
- ✓ Understanding of protein structure-function relationships.
- ✓ Knowledge of computational tools for protein analysis.

## 🔗 Research & Analytical Skills:

- ✓ Ability to design experiments and analyze protein data.
- ✓ Experience in protein-protein interaction and functional assays.
- ✓ Critical thinking in optimizing purification protocols.
- ✓ Ability to present and interpret scientific data.

## 🔗 Industry Readiness & Career Advancement:

- ✓ Exposure to protein-based drug development and industrial applications.
  - ✓ Training in analytical techniques relevant to biotech and pharma industries.
  - ✓ Certification for career enhancement in protein research.
  - ✓ Networking opportunities with industry professionals.
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## How to Apply?

- Submit an application via [**Your Institution/Organization Link**].
- Provide an updated CV and a statement of interest.
- Limited seats available! Apply before [**Deadline Date**].

For more details, contact:

✉ Email: [**Your Email**]

📞 Phone: [**Your Contact Number**]

🌐 Website: [**Your Website**]

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