



Chaudhary Bansi Lal University, Bhiwani
(A State University established under Haryana Act No. 25 of 2014)

(Template-1: Cover Page)

TITLE.....

**A
Research/Internship/Dissertation report
Submitted for the award of**

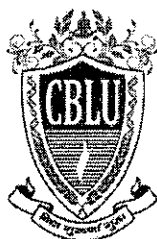
M. Sc./PG Diploma in Biotechnology

By

Name of student (...Roll number...)

Under the Guidance of

Supervisor's Name



**DEPARTMENT OF BIOTECHNOLOGY
CHAUDHARY BANSI LAL UNIVERSITY**

Month, Year



Chaudhary Bansi Lal University, Bhiwani
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(Template-2: Declaration by the student)

CHAUDHARY BANSI LAL UNIVERSITY
DEPARTMENT OF BIOTECHNOLOGY

DECLARATION

It is certified that

- a. The work contained in this research dissertation/internship is original and has been carried out by me under the guidance of my supervisor.
- b. The work has not been submitted to other University/Institute for any degree or diploma.
- c. I have followed the University guidelines and ethics throughout the study.
- d. Wherever I have used materials (data, theoretical analysis, figures, and text) from other sources, I have given due credit to them by citing them in the text of the dissertation and giving their details in the references. Further, I have taken permission from the copyright owners of the sources, wherever necessary.

Date:

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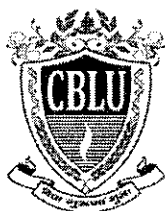
Signature

(Name of the Student with Roll number)



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(Template-III: Certificate by the Department)



चौधरी बंसी लाल विश्वविद्यालय, भिवानी
Chaudhary Bansi Lal University, Bhiwani
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CERTIFICATE

This is to certify that the Dissertation/research/Internship report entitled submitted by to Chaudhary Bansi Lal University, Bhiwani, for the partial fulfillment of the award of..... M.Sc./PG Diploma..... in Biotechnology, is a record of bona fide research work carried out by him/her under my supervision and has not been submitted to other University/Institute for any degree or diploma.

Signature

Name:
(Supervisor)

Signature

Name:
(Head of the Department)

**M.Sc. Biotechnology****Topics based on Indian Knowledge System (IKS)**

These topics — though not limited to the ones listed — are recommended for classroom teaching, oral or poster presentations, assignments, group discussions, debates, and declamations. Such activities aim to enhance students' scientific understanding of Indian Knowledge Systems (IKS) and their connections with modern biology. These practices will help cultivate interest in ancient Indian wisdom and uncover the scientific principles underlying these traditional concepts and practices.

Semester I**25BT101: Cell Biology**

- 1. Ayurvedic Sneha and membrane fluidity:** Integrate a session on Sneha (oily substances in Ayurveda, e.g., ghee) to explain lipid bilayer fluidity in cell membranes. Relates to lipid structures in membrane function.
- 2. Herbal treatments for organelle health:** Add a case study on Ayurvedic herbs like Ashwagandha for mitochondrial and organelle health. Relates to therapeutic interventions for organelle dysfunction.
- 3. Yogic Asanas and cytoskeletal dynamics:** Include a lecture on Yogic Asanas (postures) influencing cytoskeletal proteins and cell motility via physical movement. Relates to cytoskeleton structure and extracellular matrix interactions.
- 4. Vata dosha and cell motility:** Include Vata dosha (Ayurvedic principle of movement) to discuss cytoskeletal dynamics and cellular migration. Relates to cytoskeleton-driven motility.
- 5. Rasayana for cell cycle regulation:** Integrate a session on Rasayana (Ayurvedic rejuvenation therapies) to discuss cell cycle modulation using herbs. Relates to cell proliferation control.
- 6. Vedic Mantras and cell communication:** Include a topic on Vedic Mantras (sound vibrations) as analogs to cellular signaling and gene expression regulation. Relates to intercellular communication.
- 7. Ayurvedic herbs for signaling modulation:** Add a case study on herbs like Tulsi for modulating signaling pathways. Relates to signal transduction and receptor functions.
- 8. Arbuda, cancer etiology, and Herbal interventions for cancer prevention:** Add a discussion on Arbuda (tumors in Ayurveda) to compare with modern cancer etiology and oncogenes. Relates to tumor formation mechanisms. Add a case study on Ayurvedic herbs like Turmeric for cancer prevention. Relates to oncogene suppression and chemotherapy.
- 9. Vedic aging (Jara), cell death and Rasayana for stem cell renewal:** Include a topic on Vedic Jara (aging) to explore programmed cell death and senescence. Relates to cellular aging processes. Integrate a session on Rasayana therapies to discuss stem cell renewal and tissue regeneration. Relates to stem cell biology and repair.
- 10. Cell staining with herbal dyes:** Include an experiment using turmeric (Ayurvedic dye) for cell microscopy, comparing with synthetic stains. Relates to cell visualization techniques.

25BT102: Biochemistry



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1. **Tridosha and biochemical balance:** Include a lecture on Tridosha (Vata, Pitta, Kapha in Ayurveda) to explain pH and buffer systems in metabolism. Relates to biochemical homeostasis in Charaka Samhita.
2. **Traditional fermentation and Carbohydrate metabolism in Indian diets:** Add a discussion on traditional fermented foods (e.g., Idli, Dosa) to illustrate glycolysis and carbohydrate metabolism. Relates to carbohydrate breakdown pathways.
3. **Vedic Agni and energy metabolism:** Include a topic on Vedic Agni (digestive fire) as an analog to carbohydrate-based energy production. Relates to glycolysis and TCA cycle.
4. **Ayurvedic herbs for enzyme disorders:** Add a case study on herbs like Triphala for enzyme-related metabolic disorders. Relates to enzyme therapy in biochemistry.
5. **Sneha in therapeutic oils:** Include a lecture on Sneha (Ayurvedic fats, e.g., ghee, sesame oil) to discuss their roles in therapies like Abhyanga.
6. **Prameha and lipid metabolism:** Add a discussion on Prameha (Ayurvedic diabetes) to explore lipid metabolism disorders and ketone bodies. Relates to lipid metabolic pathways.
7. **Vedic elemental balance and lipids:** Integrate a session on Panchamahabhuta (five elements) to explain lipid functions in cellular membranes. Relates to lipid roles in membranes.
8. **Ayurvedic diet for lipid disorders:** Include a topic on Pathya-Apathya (Ayurvedic dietary rules) to address lipid metabolism imbalances. Relates to lipid disorder management.
9. **Aahar Vidhi, and herbal sources of vitamin:** Add a discussion on Ayurvedic Aahar Vidhi (nutrition principles) to explore vitamins as coenzymes in metabolism. Relates to vitamin biochemical roles. Add a case study on Ayurvedic herbs like Amla as natural vitamin sources. Relates to vitamin coenzyme functions.
10. **Prakriti-Purusha and genetic material:** Include a topic on Samkhya's Prakriti-Purusha duality as an analog to nucleic acid functions. Relates to genetic information flow.
11. **Protein/sugar quantification in herbs:** Add a practical on quantifying proteins/sugars in Ashwagandha extracts, linking to Ayurvedic nutrition. Relates to biochemical analysis.
12. **Chromatography of herbal extracts:** Add an experiment on separating compounds from Tulsi extracts using chromatography. Relates to biomolecule separation techniques.

25BT103: Microbiology

1. **Krimi in Charaka Samhita and Panchamahabhuta and microbes:** Include a lecture on Krimi (Ayurvedic pathogens, visible/invisible) to introduce microbes and their role in diseases. : Integrate a session on Vedic five elements (Panchamahabhuta) to discuss microbial taxonomy.
2. **Vrikshayurveda and microbial diversity:** Add a discussion on Vrikshayurveda's plant microbiology to explore microbial diversity in agriculture. Relates to microbial ecology.
3. **Vedic agriculture practices:** Add a case study on to illustrate soil microbe interactions. Relates to microbial diversity in ecosystems. Include a topic on Vrikshayurveda's use of microbes for soil health and crop growth.



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4. **Shodhana and sterilization:** Include a lecture on Shodhana (Ayurvedic purification) to discuss sterilization techniques in microbiology. Relates to microbial control methods.
5. **Asava-Arishta and microbial growth:** Add a discussion on Ayurvedic Asava-Arishta (fermented medicines) to illustrate microbial culturing methods. Relates to microbial growth techniques.
6. **Vedic hygiene for microbial control:** Integrate a session on Vedic hygiene practices to explore microbial contamination prevention. Relates to aseptic techniques.
7. **Ayurvedic herbs and microbiome:** Add a case study on herbs like Neem to modulate microbial metabolic pathways. Relates to microbial metabolic regulation.
8. **Dosha imbalances and microbiome** Include a lecture on Ayurvedic Dosha (Vata, Pitta, Kapha) imbalances to discuss microbiome.
9. **Microbial toxins in Sushruta Samhita:** Integrate a session on Sushruta's toxin concepts to discuss food poisoning microbes. Relates to microbial pathogenesis.
10. **Microbial isolation from Panchagavya:** Integrate an experiment isolating microbes from Panchagavya (Ayurvedic fermented cow product). Relates to microbial culturing.

25BT105: Molecular Biology

1. **Vedic Prana and genetic material:** Integrate a session on Vedic Prana (life force) as an analog to DNA replication energy needs. Relates to replication energetics.
2. **Herbal support for DNA protection:** Include a topic on Ayurvedic herbs like Amla for protecting DNA metabolism.
3. **Mantras and transcription regulation:** Include a lecture on . Relates to transcription mechanisms.
4. **Mantras and Yogic sound therapies:** Integrate a session on Vedic Mantras (sound vibrations) as analogs to the regulation of replication, transcription, and gene expression. Yogic sound therapies influencing DNA/RNA modification and gene expression.
5. **Ayurvedic herbs for gene expression:** Include a topic on herbs like Brahmi for rejuvenation of genetic material, modulating gene transcription and translation.
6. **Vedic creation and translation:** Add a case study on Vedic creation theories to regulate replication, transcription, and gene expression.
7. **Rasayana and DNA repair:** Include a lecture on Rasayana (Ayurvedic rejuvenation) to discuss DNA repair mechanisms.
8. **Vedic Dosha and DNA damage:** Integrate a session on Dosha imbalances causing DNA damage, repair, and regulation.
9. **Herbal antioxidants for DNA repair:** Include a topic on Ayurvedic herbs like Tulsi for supporting DNA repair via antioxidants. Relates to oxidative damage repair.
10. **Role of Ayurvedic lifestyle and Yogic meditation in epigenetics:** Add a discussion on Yogic meditation influencing DNA methylation, chromatin modification, eukaryotic gene regulation and epigenetic modifications.



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11. **Riboswitches in Vedic dietetics:** Include a topic on Vedic dietary principles to discuss riboswitches and gene regulation.
12. **Herbal gene regulation:** Add a case study on Ayurvedic herbs like Giloy for eukaryotic gene regulation, regulatory RNAs Relates to transcription factors and regulation.

Semester II

25BT201: Molecular Immunology

1. **Vyadhikshamatva and immunity:** Include a lecture on Vyadhikshamatva (Ayurvedic immunity) to discuss cellular and humoral immunity. Relates to innate and adaptive immunity.
2. **Ojas as vital essence:** Add a discussion on Ojas (Ayurvedic vital essence) as an analog to immune system strength. Relates to immune response in Charaka Samhita.
3. **Ayurvedic herbs for humoral immunity:** Integrate a session on herbs like Guduchi for enhancing humoral immunity. Relates to antibody production.
4. **Vedic anatomical barriers:** Include a topic on Vedic views of physical barriers to discuss innate immunity mechanisms. Relates to immune barriers.
5. **Herbal immunomodulators:** Include a topic on Ayurvedic herbs like Ashwagandha for immune receptor modulation. Relates to immune diversity.
6. **Traditional immune diversity:** Add a case study on Ayurvedic views of immunity to discuss receptor diversity and antigen recognition. Relates to immune specificity.
7. **Tridosha and cytokine regulation:** Add a discussion on Vedic principles of Tridosha balance to explore cytokine functions in immune regulation and homeostasis. Relates to immune signaling.
8. **Traditional anti-inflammatory remedies:** Add a case study on Ayurvedic anti-inflammatory herbs like Turmeric for immune regulation. Relates to inflammation control.
9. **Ayurvedic tissue regeneration and transplantation:** Include a lecture on Ayurvedic tissue regeneration to discuss transplantation immunology. Relates to transplant compatibility.
10. **Dosha imbalances and autoimmunity:** Add a discussion on Dosha imbalances causing autoimmune disorders, comparing to modern immunology. Relates to immune disorders.
11. **Herbal vaccines in Ayurveda:** Include a topic on traditional herbal formulations as vaccine analogs in Ayurveda. Relates to vaccine development.
12. **Traditional diagnostics for immune disorders:** Add a case study on Ayurvedic diagnostics (e.g., pulse diagnosis) for immune disorders. Relates to immunodiagnostics.

25BT202: Developmental Biology

1. **Traditional hormonal control:** Include a topic on Ayurvedic hormonal balance for ovulation and germ cell health. Relates to reproductive biology.
2. **Herbal germ cell therapies:** Add a case study on Ayurvedic herbs like Shatavari for germ cell health. Relates to reproductive health.



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3. **Garbha Siddhanta and fertilization:** Include a lecture on Ayurvedic Garbha Siddhanta for fertilization processes. Relates to fertilization mechanisms.
4. **Herbal egg activation:** Integrate a session on herbs like Ashwagandha for egg activation in fertilization. Relates to reproductive biology.
5. **Charaka Samhita and embryonic development:** Include a lecture on Charaka's embryology for embryonic development stages. Relates to embryogenesis.
6. **Vedic neural induction:** Add a discussion on Vedic principles of neural development for neural induction. Relates to neurodevelopment.
7. **Herbal growth factors:** Integrate a session on Ayurvedic herbs like Brahmi as growth factors in development. Relates to growth signaling.
8. **Ayurvedic fetal development:** Add a case study on Ayurvedic therapies for fetal development support. Relates to embryonic growth.
9. **Vrikshayurveda and plant morphogenesis:** Include a lecture on Vrikshayurveda for plant morphogenesis and organogenesis. Relates to plant development.
10. **Rasayana and stem cells:** Add a discussion on Rasayana therapies for stem cell regeneration in plants and animals. Relates to stem cell biology.
11. **Herbal stem cell therapies:** Include a topic on Ayurvedic herbs like Aloe Vera for stem cell applications. Relates to regenerative biology.
12. **Traditional epigenetic reprogramming:** Add a case study on Ayurvedic epigenetic concepts for stem cell reprogramming. Relates to epigenetics.

25BT203: Genetic Engineering

1. **Vrikshayurveda and genetic engineering:** Include a lecture on Vrikshayurveda (Ayurvedic plant science) to discuss genetic engineering in agriculture. Relates to gene manipulation.
2. **Ayurvedic herbs as cloning vectors:** Integrate a session on using herbal compounds as potential cloning vectors in genetic engineering. Relates to vector design.
3. **Traditional genetic selection:** Include a topic on traditional plant breeding in Vrikshayurveda to discuss genetic selection. Relates to gene manipulation techniques.
4. **Ayurvedic gene stability:** Add a case study on Ayurvedic concepts of genetic stability.
5. **Gene therapy in Rasayana:** Add a discussion on Rasayana therapies to explore gene therapy applications in medicine. Relates to medical biotech.
6. **Vedic ethics in genetic modification:** Integrate a session on Vedic ethical principles (Dharma) for genetic engineering applications. Relates to biotech ethics.
7. **Biosafety in Vedic environmental ethics:** Include a lecture on Vedic environmental ethics to discuss biosafety in genetic engineering. Relates to regulatory frameworks.
8. **Ayurvedic ethics in gene editing:** Add a discussion on Ayurvedic or ancient Indian ethical principles for gene editing technologies. Relates to ethical considerations.



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9. **IKS trends in genetic engineering:** Add a case study on emerging IKS-based trends in genetic engineering, like herbal biotech. Relates to future trends.

25BT206: Bioinformatics

1. **Vedic classification of biological data:** Add a discussion on Vedic taxonomy to explore biological database structures. Relates to data categorization.
2. **Ayurvedic herb databases:** Integrate a session on creating databases for Ayurvedic herbs like Tulsi. Relates to biological data management.
3. **Traditional knowledge in databases:** Include a topic on incorporating IKS knowledge into modern biological databases. Relates to data integration.
4. **Vedic taxonomy and bioinformatics:** Add a case study on Vedic plant classification for bioinformatics database design. Relates to taxonomic databases.
5. **Vedic ancestry and phylogenetics:** Add a discussion on Vedic ancestry concepts to explore phylogenetic tree construction. Relates to evolutionary biology.
6. **Vedic medicine and functional genomics:** Add a discussion on Vedic medicinal principles to explore functional genomics applications. Relates to gene function analysis.
7. **Traditional views on gene function:** Include a topic on Ayurvedic concepts of gene function to discuss functional genomics. Relates to gene expression studies.
8. **Rasayana and drug discovery:** Include a lecture on Rasayana Shastra to discuss herbal drug discovery using bioinformatics. Relates to drug design.
9. **Tridosha and systems biology:** Add a discussion on Tridosha to explore systems biology modeling of biological networks. Relates to systems-level analysis.
10. **Vedic approaches to drug design:** Integrate a session on Vedic pharmacology for bioinformatics-based drug design. Relates to computational drug discovery.
11. **Traditional systems biology:** Add a case study on Ayurvedic systems biology (e.g., Tridosha networks) for modern applications. Relates to systems biology modeling.

25BT207: Metabolic Engineering

1. **Rasayana and metabolic engineering:** Include a lecture on Rasayana (Ayurvedic rejuvenation) to discuss metabolic pathway engineering. Relates to metabolic optimization.
2. **Vedic Agni and metabolic pathways:** Add a discussion on Vedic Agni (digestive fire) as an analog to metabolic pathways. Relates to biochemical pathways.
3. **Tridosha and metabolic balance:** Integrate a session on Tridosha to explore metabolic balance in engineering applications. Relates to metabolic regulation.
4. **Herbal modulation of metabolism:** Include a topic on Ayurvedic herbs like Ginger for modulating metabolic pathways. Relates to pathway engineering.
5. **Traditional fermentation for metabolism:** Add a case study on Ayurvedic fermentation (Asava-Arishta) for metabolic engineering. Relates to microbial metabolism.



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6. **Ayurvedic diagnostics and pathway analysis:** Add a discussion on Ayurvedic diagnostics (e.g., pulse) for metabolic pathway analysis. Relates to pathway modeling. **Herbal pathway modulators:** Include a topic on Ayurvedic herbs like Triphala for metabolic pathway modulation. Relates to pathway regulation.
7. **Traditional metabolic engineering:** Add a case study on traditional dietary practices for metabolic engineering applications. Relates to pathway optimization.
8. **Herbal bioproducts in Ayurveda:** Include a topic on Ayurvedic herbs for bioproduct development, like antioxidants. Relates to bioproduct applications.
9. **Vedic creation and synthetic biology:** Include a lecture on Vedic creation theories to discuss synthetic biology principles. Relates to synthetic biology design.
10. **Traditional trends in metabolic engineering:** Add a case study on IKS-based trends in metabolic engineering, like herbal bioproducts. Relates to future trends.

25BT208: Biology of Infectious Diseases

1. **Krimi and pathogens:** Include a lecture on Krimi (Ayurvedic pathogens) to discuss microbial pathogens and their classification. Relates to pathogen biology.
2. **Herbal antimicrobials:** Include a topic on Ayurvedic herbs like Neem for antimicrobial action. Relates to pathogen control.
3. **Traditional disease causation:** Add a case study on Ayurvedic views of infection causes (e.g., Dosha imbalance). Relates to disease etiology.
4. **Ojas and host-pathogen interactions:** Include a lecture on Ojas (Ayurvedic vital essence) to discuss host-pathogen interactions. Relates to immune defense.
5. **Traditional pathogen neutralization:** Add a case study on Ayurvedic detoxification for pathogen neutralization. Relates to immune effector functions.
6. **Ayurvedic public health and epidemiology:** Include a lecture on Ayurvedic public health principles to discuss epidemiology. Relates to disease spread analysis.
7. **Vedic hygiene and disease control:** Add a discussion on Vedic hygiene practices for disease control strategies. Relates to infection control.
8. **Herbal epidemiology:** Integrate a session on Ayurvedic herbs and Vedic approaches for epidemic management (e.g. rituals, herbs). Relates to epidemiological interventions.
9. **Rasayana and vaccines:** Add a discussion on Rasayana therapies as analogs to vaccine-induced immunity. Relates to vaccine development.
10. **Herbal vaccines in Ayurveda:** Include a topic on Ayurvedic herbal formulations as vaccine analogs. Relates to immunotherapy.

25BT209: Environmental Studies and Sustainable Development

1. **Panchamahabhuta and ecosystems:** Include a lecture on Vedic Panchamahabhuta (five elements) to discuss ecosystem dynamics. Relates to ecosystem structure.



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2. **Traditional ecological knowledge:** Include a topic on IKS-based ecological knowledge for ecosystem studies. Relates to the management of biodiversity and ecological diversity.
3. **Vrikshayurveda and resource management:** Include a lecture on Vrikshayurveda for sustainable natural resource management. Relates to resource conservation.
4. **Ayurvedic detoxification for pollution:** Add a discussion on Panchakarma for environmental pollution detoxification. Relates to pollution control.
5. **Vedic environmental purity:** Integrate a session on Vedic purity principles to discuss pollution mitigation. Relates to environmental health.
6. **Vrikshayurveda and conservation:** Add a discussion on Vrikshayurveda's plant conservation techniques. Relates to plant biodiversity.
7. **Ayurvedic herbs for biodiversity:** Integrate a session on herbs like Tulsi for supporting biodiversity. Relates to ecological health.
8. **Traditional conservation practices:** Include a topic on IKS-based conservation methods for biodiversity. Relates to conservation strategies.
9. **Vedic Dharma and sustainable development:** Include a lecture on Vedic Dharma for sustainable development principles. Relates to sustainability.
10. **Ayurvedic ecology and global issues:** Add a discussion on Ayurvedic ecology for addressing global environmental issues. Relates to environmental challenges.
11. **Traditional sustainable practices:** Include a topic on IKS-based sustainable agricultural practices and environmental management. Relates to sustainability strategies.
12. **Vedic solutions for climate change:** Add a case study on Vedic approaches to mitigate climate change impacts. Relates to global environmental solutions.

Semester III

25BT301: Plant Biotechnology

1. **Ayurvedic herbs in tissue culture:** Integrate a session on using herbs like Aloe Vera in plant tissue culture media. Relates to culture optimization.
2. **Traditional plant regeneration:** Include a topic on traditional plant regeneration methods in Vrikshayurveda. Relates to tissue culture regeneration.
3. **Herbal gene transformation:** Include a topic on transforming genes in medicinal plants like Tulsi. Relates to genetic engineering.
4. **Traditional marker-based selection:** Add a case study on Vrikshayurveda's marker-based plant selection. Relates to molecular breeding.
5. **Ayurvedic herbs for stress tolerance:** Add a discussion on herbs like Ashwagandha for plant stress tolerance. Relates to biotic/abiotic stress.
6. **Vedic plant ethics:** Include a lecture on Vedic Dharma for ethical issues in plant biotechnology. Relates to bioethics.

**25BT302: Animal Cell Technology**

1. **Traditional tissue preservation:** Include a topic on Ayurvedic tissue preservation methods for cell lines. Relates to cell storage.
2. **Vedic fermentation and bioreactors:** Add a discussion on Vedic fermentation for bioreactor design principles. Relates to bioreactor technology.
3. **Herbal media for cell culture:** Integrate a session on using Ayurvedic herbs in cell culture media. Relates to culture media design.
4. **Vedic cell growth concepts:** Add a case study on Vedic growth principles for cell culture in bioreactors. Relates to cell proliferation.
5. **Ayurvedic healing and medical applications:** Include a lecture on Ayurvedic healing for animal cell applications in medicine. Relates to regenerative medicine.
6. **Sushruta Samhita and tissue engineering:** Add a discussion on Sushruta's tissue regeneration for tissue engineering principles. Relates to tissue engineering.
7. **Vedic tissue regeneration:** Integrate a session on Vedic views of regeneration for tissue engineering applications. Relates to tissue repair.
8. **Traditional regenerative therapies:** Add a case study on Ayurvedic regenerative therapies for tissue engineering. Relates to regenerative medicine.
9. **Vedic animal ethics:** Include a lecture on Vedic Dharma for ethical issues in animal cell technology. Relates to bioethics.

25BT303: Environmental Biotechnology

1. **Vedic ecology and pollution control:** Include a lecture on Vedic Panchamahabhuta for pollution control strategies. Relates to environmental biotech.
2. **Ayurvedic detoxification for pollution:** Add a discussion on Panchakarma for environmental pollution detoxification. Relates to bioremediation.
3. **Vrikshayurveda and environmental health:** Integrate a session on Vrikshayurveda for managing environmental pollution. Relates to ecological biotech.
4. **Herbal bioremediation:** Add a case study on Ayurvedic herbs like Neem for bioremediation of pollutants. Relates to environmental cleanup.
5. **Ayurvedic hospital waste management:** Add a discussion on Ayurvedic principles for managing biomedical waste. Relates to specialized waste management.
6. **Ayurvedic pharmacy and effluent treatment:** Include a lecture on Ayurvedic pharmacy for effluent treatment methods. Relates to wastewater treatment.
7. **Vedic water purification:** Add a discussion on Vedic water purification rituals for effluent treatment. Relates to water treatment technologies.
8. **Herbal effluent treatment:** Integrate a session on herbs like Tulsi for effluent treatment in biotech. Relates to phytoremediation.



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9. **Vedic biofuels:** Include a lecture on Vedic energy concepts for biofuel production in pollution control. Relates to bioenergy.
10. **Vrikshayurveda and biopesticides:** Add a discussion on Vrikshayurveda for biopesticide development. Relates to pest control biotech.
11. **Phytoremediation in Ayurvedic herbs:** Integrate a session on herbs like Neem for phytoremediation of pollutants. Relates to environmental cleanup.
12. **Traditional pollution control:** Include a topic on traditional pollution control methods in Ayurveda. Relates to pollution mitigation.
13. **Vedic sustainability in biotech:** Add a case study on Vedic sustainability principles for pollution control technologies. Relates to sustainable biotech.

25BT305: Enzyme Technology

1. **Rasa Shastra and enzyme properties:** Include a lecture on Rasa Shastra to discuss enzyme properties and catalysis. Relates to enzyme characteristics.
2. **Herbal enzyme activators:** Integrate a session on Ayurvedic herbs like Ginger as enzyme activators. Relates to enzyme function. **Ayurvedic enzyme action:** Add a case study on Ayurvedic concepts of enzyme action in metabolism. Relates to enzyme catalysis.
3. **Herbal enzyme modulators:** Integrate a session on herbs like Triphala for modulating enzyme kinetics. Relates to enzyme regulation.
4. **Ayurvedic enzyme inhibition:** Add a case study on Ayurvedic herbs for enzyme inhibition strategies. Relates to enzyme regulation.
5. **Tridosha and metabolic regulation:** Include a lecture on Tridosha for enzyme-mediated metabolic regulation. Relates to metabolic control.
6. **Herbal metabolic regulation:** Integrate a session on herbs like Ashwagandha for regulating metabolic enzymes. Relates to metabolic pathways.
7. **Ayurvedic enzyme applications:** Include a lecture on Ayurvedic enzyme use in medicine (e.g., digestive aids). Relates to enzyme applications.
8. **Rasa Shastra and synthetic enzymes:** Add a discussion on Rasa Shastra for designing synthetic enzymes. Relates to enzyme engineering.
9. **Herbal biosensors:** Include a topic on Ayurvedic herbs in enzyme-based biosensors. Relates to biotech applications.

25BT306: Cancer Biology

1. **Arbuda and cancer etiology:** Include a lecture on Arbuda (Ayurvedic tumors) to discuss cancer etiology. Relates to oncogenesis.
2. **Vedic cancer causation:** Add a discussion on Vedic views of disease causation for cancer biology. Relates to cancer initiation.



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3. **Herbal anticancer agents:** Integrate a session on Ayurvedic herbs like Turmeric for cancer prevention. Relates to chemoprevention.
4. **Ayurvedic oncogene concepts:** Add a case study on Ayurvedic parallels to oncogenes in cancer biology. Relates to molecular oncology.
5. **Tridosha and cancer metabolism:** Include a lecture on Tridosha imbalances to discuss cancer cell metabolism. Relates to metabolic reprogramming.
6. **Vedic Marana and apoptosis:** Add a discussion on Vedic Marana (death) for apoptosis in cancer cells. Relates to programmed cell death.
7. **Herbal glycolysis inhibition:** Integrate a session on herbs like Guduchi for inhibiting cancer cell glycolysis. Relates to metabolic targeting.
8. **Ayurvedic metabolic balance:** Add a case study on Ayurvedic diet for cancer metabolic balance. Relates to cancer metabolism.
9. **Ojas and tumor immunity:** Include a lecture on Ojas (Ayurvedic vital essence) for tumor immunosurveillance. Relates to immune response to cancer.
10. **Herbal immunotherapy:** Integrate a session on Ayurvedic herbs like Ashwagandha for cancer immunotherapy. Relates to immune modulation.
11. **Rasayana and cancer treatment:** Include a lecture on Rasayana Shastra for cancer treatment strategies. Relates to chemotherapy.
12. **Vedic personalized therapy:** Add a discussion on Vedic personalized medicine for cancer treatment approaches. Relates to precision oncology.
13. **Traditional lifestyle for cancer:** Include a topic on Ayurvedic lifestyle (Dinacharya) for cancer prevention. Relates to preventive oncology.
14. **Ayurvedic diet for cancer:** Add a case study on Pathya-Apathya diet for cancer management. Relates to dietary therapy.

25BT307: microRNA Technology

1. **Ayurvedic gene regulation and miRNAs:** Include a lecture on Ayurvedic gene regulation for miRNA functions. Relates to miRNA biology.
2. **Vedic non-coding RNAs:** Add a discussion on Vedic subtle energy concepts for non-coding RNAs like miRNAs. Relates to RNA biology.
3. **Herbal miRNA biogenesis:** Integrate a session on herbs like Brahmi for miRNA biogenesis modulation. Relates to miRNA processing.
4. **Ayurvedic gene silencing:** Add a case study on Ayurvedic concepts of silencing for miRNA-mediated gene regulation. Relates to RNA interference.
5. **Yogic cellular processes and miRNAs:** Include a lecture on Yogic practices influencing miRNA-mediated cellular processes. Relates to cellular regulation.



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6. **Vedic developmental miRNAs:** Add a discussion on Vedic embryology for miRNA roles in development. Relates to developmental biology.
7. **Herbal miRNAs in stress response:** Integrate a session on herbs like Ashwagandha for miRNA stress responses. Relates to stress biology.
8. **Ayurvedic cancer diagnostics and miRNAs:** Include a lecture on Ayurvedic diagnostics for miRNA-based cancer detection. Relates to diagnostic biomarkers.
9. **Traditional biomarkers:** Include a topic on Ayurvedic biomarkers (e.g., pulse diagnosis) for miRNA diagnostics. Relates to diagnostic techniques.
10. **Rasayana and miRNA therapeutics:** Include a lecture on Rasayana for miRNA-based therapeutic strategies. Relates to RNA therapeutics.
11. **Traditional off-target effects:** Include a topic on Ayurvedic views of unintended effects for miRNA therapy challenges. Relates to therapeutic safety.

25BT308: Research Orientation

1. **Ayurvedic research problems:** Include a lecture on identifying research problems using Ayurvedic texts like Charaka Samhita. Relates to research design.
2. **Traditional patent search:** Integrate a session on Ayurvedic patent systems for research problem identification. Relates to intellectual property.
3. **Vedic research design:** Include a topic on Vedic principles for designing research studies. Relates to research methodology.
4. **Herbal research areas:** Add a case study on Rasayana-based research problems in biotechnology. Relates to research focus areas.
5. **Vrikshayurveda and experimental design:** Include a lecture on Vrikshayurveda for experimental design in biotech research. Relates to experimental methodologies.
6. **Vedic Dharma and bioethics:** Include a lecture on Vedic Dharma for ethical considerations in biological research. Relates to research ethics.
7. **Vedic views on GMOs:** Integrate a session on Vedic perspectives on genetically modified organisms in research. Relates to biotech ethics.
8. **Ayurvedic bio-waste disposal:** Add a case study on Ayurvedic waste disposal methods for research labs. Relates to biosafety.

25BT309: Biotech Management and Entrepreneurship

1. **Vedic principles for biotech startups:** Include a lecture on Vedic Dharma (ethical duty) for decision-making in biotech ventures. Relates to entrepreneurial planning.
2. **Traditional entrepreneurial support:** Integrate a session on traditional Indian systems for supporting biotech entrepreneurship. Relates to startup ecosystems.
3. **Herbal venture ideas:** Include a topic on Ayurvedic herb-based business ideas for biotech ventures. Relates to entrepreneurial opportunities.



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4. **Ayurvedic product market demand:** Include a lecture on assessing demand for Ayurvedic biotech products like herbal medicines. Relates to market analysis.
5. **Herbal market gap analysis:** Include a topic on identifying market gaps for Ayurvedic herb-based products. Relates to market research.
6. **Ayurvedic IT for business performance:** Add a case study on using IT tools for Ayurvedic biotech market analysis. Relates to business analytics.
7. **Vedic organizational structure:** Include a lecture on Vedic organizational principles (e.g., Arthashastra) for biotech company structure. Relates to organizational design.
8. **Ayurvedic company startups:** Add a discussion on Ayurvedic principles for starting biotech companies. Relates to business setup.
9. **Herbal e-business in Ayurveda:** Add a case study on e-commerce for Ayurvedic biotech products. Relates to digital business models.
10. **Herbal biotech entrepreneurship cases:** Add a case study on successful Ayurvedic biotech entrepreneurs. Relates to leadership case studies.

25BT310: Bioethics and Biosafety

1. **Vedic Dharma and bioethics:** Include a lecture on Vedic Dharma for bioethical principles in biotechnology. Relates to ethical frameworks.
2. **Ayurvedic views on GMOs:** Add a discussion on Ayurvedic perspectives on genetically modified organisms. Relates to biotech ethics.
3. **Vedic ethics in human cloning:** Integrate a session on Vedic ethical views on human cloning and biotech. Relates to cloning ethics.
4. **Traditional biological weapons:** Include a topic on Vedic views against biological weapons for biosafety. Relates to biosecurity.
5. **Herbal bioethics in Rasayana:** Add a case study on Rasayana-based ethical considerations in biotech. Relates to bioethical applications.
6. **Vedic biohazard containment:** Add a discussion on Vedic containment principles for biohazards. Relates to biosafety measures.

Semester IV

25BT401: Bioprocess Technology

1. **Asava-Arishta and fermentation:** Include a lecture on Asava-Arishta (Ayurvedic fermented medicines) to discuss fermentation technology principles. Relates to microbial fermentation processes.
2. **Vedic strain improvement:** Add a discussion on Vedic plant breeding (Vrikshayurveda) for microbial strain improvement in fermentation. Relates to strain optimization techniques.
3. **Traditional sterilization methods:** Include a topic on Shodhana (Ayurvedic purification) for sterilization in fermentation processes. Relates to microbial control methods.



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4. **Vrikshayurveda for bioprocess scale-up:** Add a case study on Vrikshayurveda's agricultural scaling for bioprocess scale-up. Relates to industrial fermentation.
5. **Vedic engineering and fermenter design:** Include a lecture on Vedic engineering principles (e.g., Shilpa Shastra) for fermenter design. Relates to bioreactor technology.
6. **Herbal foam control:** Include a topic on Ayurvedic herbs like Neem for foam control in fermenters. Relates to bioprocess stability.
7. **Vedic bioreactor design concepts:** Add a case study on Vedic vessel designs as analogs to modern bioreactors. Relates to fermenter engineering.
8. **Antibiotic production in Rasayana Shastra:** Include a lecture on Rasayana (Ayurvedic rejuvenation) for antibiotic production via fermentation. Relates to bioproduct synthesis.
9. **Organic acids in Ayurvedic fermentation:** Add a discussion on Asava-Arishta for organic acid production in fermentation. Relates to metabolite production.
10. **Vedic views on vitamin production:** Integrate a session on Vedic nutrition for vitamin production via fermentation. Relates to bioproduct applications.
11. **Herbal antioxidants in bioprocesses:** Add a case study on herbs like Amla for antioxidant production in fermentation. Relates to industrial bioproducts.
12. **Food fermentation in Ayurvedic diets:** Include a lecture on Pathya-Apathya (Ayurvedic dietary rules) for food fermentation applications. Relates to food biotechnology.

25BT402: Biotechniques

1. **Ayurvedic fluid analysis and flow cytometry:** Include a topic on Ayurvedic fluid diagnostics (e.g., urine analysis) to explore flow cytometry. Relates to cell sorting.
2. **Traditional microscopy with natural dyes:** Add a case study on using natural dyes like turmeric for microscopy. Relates to staining techniques.
3. **Rasa Shastra and chromatography:** Include a lecture on Rasa Shastra (Ayurvedic alchemy) to discuss biomolecule separation via chromatography. Relates to separation techniques.
4. **Herbal spectroscopy in Rasayana:** Integrate a session on Rasayana herb analysis using spectroscopy for compound identification. Relates to analytical spectroscopy.
5. **Traditional color-based diagnostics:** Include a topic on Ayurvedic color diagnostics to discuss spectroscopic applications. Relates to diagnostic spectroscopy.
6. **NMR in Ayurvedic compound analysis:** Add a case study on NMR analysis of Ayurvedic compounds like Triphala. Relates to structural elucidation.
7. **Microarrays in traditional drug profiling:** Include a topic on Ayurvedic drug profiling to discuss microarray applications. Relates to high-throughput analysis.
8. **Ayurvedic quality control of biomolecules:** Add a case study on Ayurvedic quality control (e.g., for herbal extracts) using blotting. Relates to biotech applications.

**25BT404: Stem Cell and Regenerative Biology**

1. **Rasayana and stem cells:** Include a lecture on Rasayana (Ayurvedic rejuvenation) for stem cell biology and regeneration. Relates to stem cell properties.
2. **Vedic cell potency:** Add a discussion on Vedic Shakti (potency) as an analog to stem cell differentiation potential. Relates to cell pluripotency.
3. **Herbal stem cell therapies:** Integrate a session on Ayurvedic herbs like Ashwagandha for stem cell support. Relates to regenerative therapies.
4. **Garbha Siddhanta and embryonic stem cells:** Include a lecture on Garbha Siddhanta (Ayurvedic embryology) for embryonic stem cell studies. Relates to embryonic stem cells.
5. **Ayurvedic adult stem cells:** Add a discussion on Ayurvedic tissue regeneration for adult stem cell applications. Relates to adult stem cells.
6. **Traditional stem cell benefits:** Add a case study on Ayurvedic regenerative therapies for stem cell applications. Relates to regenerative medicine.
7. **Vedic genetic disease treatment:** Add a discussion on Vedic healing principles for gene therapy in genetic diseases. Relates to gene therapy applications.
8. **Ayurvedic cardiovascular stem cells:** Add a case study on Ayurvedic therapies for cardiovascular stem cell applications. Relates to regenerative cardiology.
9. **Vedic philosophy and stem cell ethics:** Include a lecture on Vedic Dharma for ethical issues in stem cell research. Relates to bioethics.

25BT405: Molecular Modeling

1. **Herbal protein modeling:** Integrate a session on modeling proteins from Ayurvedic herbs like Tulsi. Relates to computational modeling.
2. **Ayurvedic homology modeling:** Add a discussion on homology modeling of Ayurvedic herbal compounds. Relates to protein modeling.
3. **Vedic model refinement:** Integrate a session on Vedic refinement principles for molecular model optimization. Relates to model accuracy.
4. **Rasayana and drug discovery:** Include a lecture on Rasayana Shastra for bioinformatics-based drug discovery. Relates to drug design.
5. **Vedic pharmacogenetics:** Add a discussion on Vedic personalized medicine for pharmacogenetic drug discovery. Relates to pharmacogenomics.
6. **Traditional personalized medicine:** Include a topic on Ayurvedic personalized therapies for drug discovery. Relates to precision medicine.
7. **Ayurvedic drug discovery strategies:** Add a case study on Ayurvedic strategies for modern drug discovery. Relates to drug development.
8. **Herbal QSAR in Rasayana:** Integrate a session on quantitative structure-activity relationship (QSAR) for Ayurvedic herbs. Relates to drug optimization.



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9. **Ayurvedic ADMET principles:** Add a case study on Ayurvedic ADMET (absorption, distribution, metabolism, excretion, toxicity) for drug design. Relates to pharmacokinetics.

25BT406: Study Oriented Project

1. **Ayurvedic herb genomics project:** Include a project on genomic analysis of Ayurvedic herbs like Tulsi. Relates to molecular biology research.
2. **Vedic ethics in biotech research:** Add a project incorporating Vedic ethical principles in biotech experiments. Relates to research ethics.
3. **Vrikshayurveda plant studies:** Integrate a project on Vrikshayurveda-based plant biotechnology studies. Relates to plant biotech research.
4. **Herbal drug development project:** Include a project on developing drugs from Ayurvedic herbs like Ashwagandha. Relates to pharmaceutical research.
5. **Traditional fermentation research:** Add a project on Ayurvedic fermentation (Asava-Arishta) for bioproduct development. Relates to bioprocess research.

25BT407: Systems Biology

1. **Tridosha and systems biology:** Include a lecture on Tridosha (Vata, Pitta, Kapha) for systems biology modeling of biological networks. Relates to systems-level analysis.
2. **Vedic biological modeling:** Add a discussion on Vedic principles of interconnectedness for systems biology models. Relates to network biology.
3. **Herbal systems biology:** Integrate a session on Ayurvedic herbs in systems biology for metabolic modeling. Relates to computational biology.
4. **Traditional mass-action kinetics:** Include a topic on Ayurvedic metabolic principles for mass-action kinetics in systems biology. Relates to kinetic modeling.
5. **Herbal bifurcation analysis:** Integrate a session on Ayurvedic herbs influencing bifurcation in biological systems. Relates to system dynamics.
6. **Ayurvedic metabolism and networks:** Include a lecture on Ayurvedic metabolic principles for modeling metabolic networks. Relates to metabolic pathways.
7. **Vedic graph theory in biology:** Add a discussion on Vedic interconnectedness for graph theory in metabolic networks. Relates to network analysis.
8. **Herbal oscillators in Rasayana:** Integrate a session on Rasayana herbs for oscillatory behavior in systems biology. Relates to dynamic regulation.
9. **Traditional stochastic modeling:** Include a topic on Ayurvedic variability concepts for stochastic modeling. Relates to probabilistic models.

25BT408: Tissue Engineering

1. **Sushruta Samhita and tissue engineering:** Include a lecture on Sushruta's tissue regeneration for tissue engineering principles. Relates to regenerative medicine.



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2. **Vedic stem cell potency:** Add a discussion on Vedic Shakti (potency) for stem cell applications in tissue engineering. Relates to cell differentiation.
3. **Herbal tissue regeneration:** Integrate a session on Ayurvedic herbs like Aloe Vera for tissue regeneration. Relates to tissue engineering applications.
4. **Traditional cell-matrix interactions:** Include a topic on Ayurvedic tissue formation (Dhatu) for cell-matrix interactions. Relates to extracellular matrix.
5. **Ayurvedic Bhasma as biomaterials:** Include a lecture on Bhasma (calcined metals) as biomaterials in tissue engineering. Relates to biomaterial design.
6. **Vedic biodegradable polymers:** Add a discussion on Vedic material science for biodegradable polymers in tissue engineering. Relates to biomaterial properties.
7. **Ayurvedic angiogenesis therapies:** Add a case study on Ayurvedic herbs for angiogenesis in tissue engineering. Relates to vascularization.
8. **Traditional immune rejection therapies:** Include a topic on Ayurvedic therapies for managing immune rejection. Relates to immunosuppression.
9. **Rasayana and tissue regeneration:** Include a lecture on Rasayana for transplantation of engineered tissues. Relates to regenerative medicine.
10. **Herbal tissue growth:** Integrate a session on Ayurvedic herbs for supporting engineered tissue growth. Relates to tissue engineering.
11. **Ayurvedic skin regeneration:** Add a case study on Ayurvedic therapies for skin tissue regeneration. Relates to dermatological applications.

25BT409: Gene Editing

1. **Beeja Siddhanta and gene editing:** Include a lecture on Vedic Beeja (seed, hereditary unit) for gene editing concepts. Relates to genetic modification.
2. **Ayurvedic DNA repair:** Add a discussion on Ayurvedic rejuvenation for DNA repair in gene editing. Relates to DNA repair mechanisms.
3. **Herbal CRISPR delivery:** Integrate a session on Ayurvedic herbs for CRISPR delivery systems. Relates to delivery mechanisms.
4. **Ayurvedic CRISPR optimization:** Add a case study on Ayurvedic optimization methods for CRISPR technology. Relates to gene editing efficiency.
5. **Rasayana and gene therapy:** Include a lecture on Rasayana for gene editing applications in medicine. Relates to therapeutic gene editing.
6. **Vrikshayurveda and GM crops:** Add a discussion on Vrikshayurveda for genetically modified crop development. Relates to agricultural biotech.
7. **Vedic bioremediation:** Integrate a session on Vedic environmental principles for gene editing in bioremediation. Relates to environmental applications.
8. **Herbal safety in gene editing:** Add a case study on Ayurvedic herbs for ensuring safety in gene editing applications. Relates to therapeutic safety.