

## **CONTEMPORARY BIOLOGY & BIOTECHNOLOGY FOR INNOVATION (ABS-834)**

**Credit Hrs 3(3-0)**

### **Educational Objectives:**

1. The purpose of the course is to provide an understanding of contemporary biology and biotechnology as a basis for successfully launching new high- tech ventures. The course will examine technical bases and limitations to present technologies, and the potential applications of extending existing technologies or developing novel methodologies for new venture creation. The course will provide experience in using all aspects of the natural sciences (physics, chemistry and biology) and relevant engineering approaches for both identification of incremental improvements and as the basis for alternative technologies. Case studies will be used to illustrate recent commercially successful (and unsuccessful) biotechnology-based venture creation, and will illustrate characteristics for success.

2. This course will provide an exposure to and good understanding of current methods (both laboratory and industrial scale) and their applications in the biotechnology arena. It is anticipated that this class will focus primarily on providing a good understanding of a set of core methodologies while the second course will emphasize applications and explore a broad range of possible areas that should extend beyond the current realm of biotechnology.

### 3. **Course Outcomes:**

- a. The student must be able to think like a scientist and an entrepreneur to develop new industrial products.
- b. Use the tool of industrial biotechnology for problem-solving.
- c. Application of biotechnological knowledge in real world scenarios.

### 4. **Course Content:**

- a. Current DNA sequencing technologies - theory, practice, instrumentation, limitations
- b. Methods for detection of variation without sequencing
- c. Methods of analysis of variation without sequencing
- d. High throughput methods, including automation and robotics
- e. Nucleic acid microarrays
- f. Protein microarrays
- g. Protein-protein interaction studies
- h. Protein-ligand interactions, antibodies.
- i. Proteomics; various forms of mass spectrometry Computer-aided design of both large and small molecules
- j. Fluorescence techniques
- k. Combinatorial chemistry
- l. Atomic force microscopy
- m. Nanotechnology (perhaps join with physics)
- n. Industrial bio-production - cells, proteins, antibiotics etc (with Chem. Eng)
- o. Transgenics - cell, tissues, plants, animals.
- p. Data management
- q. Data analysis
- r. Data mining.
- s. Review of existing world centers in bioinformatics, the types of data that they contain and the services that they offer.
- t. Examination of emerging trends in the types of data being generated, the way it is managed and possibilities for new directions.

**Recommended Books:**

1. **Modern Biotechnology: Connecting Innovations in Microbiology and Biochemistry to Engineering Fundamentals** by Nathan S. Mosier and Michael R. Ladisch.
2. **Contemporary Biology and Biotechnology for Innovation.** Online Guide created for Contemporary Biology and Biotechnology for Innovation I, Emmitt Jolly.
3. **A Machine to Make a Future: Biotech Chronicles** by Paul Rabinow & Talia Dan-Cohen.