**Course Code:** EE-817

**Title:** Tissue & Cell Engineering

**Credit hours:** (3-0)

1. **Objectives**. The goal of this program is to train tomorrow's leaders in the subject area of cellular and tissue engineering. What is Cellular engineering? The integration of engineering principles and methods with cell and molecular biology approaches to solve basic and applied problems in biology and medicine. Examples: recombinant DNA technology for the production of bio pharmaceutics; experimental and theoretical analyses of cellular processes, including adhesion, signaling networks, and differentiation; physicochemical methods for drug/gene/protein delivery; cellular biomechanics and mechano-transduction; engineering of cell function; cell-machine interfaces. What is Tissue Engineering? The combination of cells, scaffolds/matrices, and biochemical factors to develop biological substitutes that restore, maintain, or improve tissue function. Examples: biomimetic materials that promote tissue healing; delivery of stem cells in appropriate matrices to restore bio functionality; natural and synthetic constructs to restore tissue or organ function, such as bioengineered pancreas and liver; living replacements for small caliber vascular grafts and joint articulating surfaces; in vitro surrogate models to study complex in vivo systems.

2. **Text Books**. Joseph, D. Bronzino, Tissue Engineering and Artificial Organs,

**3. Course Outline**

| Topics | Periods |
|---|---|
| Molecular Biology | 3 |
| Biotechnology | 3 |
| Bio nanotechnology | 3 |
| Tissue Engineering | 18 |
| Cell Engineering | 18 |
| Prostheses and artificial organs | 3 |
| **Total** | 48 |

**4. Course Outcomes:**

- Students should be able to:
- Apply their acquired laboratory skills and experimental design skills to cell and tissue engineering experiments

- Use experimental variables and controls
- Generate and analyze data
- Present experimental results
- Identify the engineering and biological issues relevant to cell and tissue engineering.
- Evaluate the critical issues in developing a tissue engineered construct
- Evaluate the governing principles of cell and tissue engineering through a comparison of what is physically performed in the laboratory with what is presented in the corresponding lecture component.

## 5. Recommended Reading

- Joseph, D. Bronzino, Tissue Engineering and Artificial Organs, 3rd. Ed. 2006.