

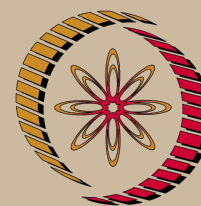
# Tissue Engineering - Web course

## COURSE OUTLINE

This course helps the learners to understand thoroughly the key concepts of tissue organization, remodeling and strategies for restoration of tissue function. This will enable them to design tissue regeneration and tissue injury repair strategies.

## COURSE DETAIL

| Sl. No | Course content  | Duration (in hours) |
|--------|---|---------------------|
| 1.     | Introduction to tissue engineering, Cells as therapeutic Agents with examples, Cell numbers and growth rates.   | 2                   |
| 2.     | Tissue organization, Tissue Components, Tissue types, Functional subunits. Tissue Dynamics, Dynamic states of tissues, Homeostasis in highly prolific tissues and Tissue repair. Angiogenesis.  | 3                   |
| 3.     | Cellular fate processes, Cell differentiation, Cell migration - underlying biochemical process.   | 3                   |
| 4.     | Cell division - mitotic cell cycle, Cell death - biological description of apoptosis.   | 3                   |
| 5.     | Coordination of cellular fate processes - soluble signals, types of growth factors and chemokines, sending and receiving a signal, processing a signal, integrated responses, soluble growth factor receptors, Malfunctions in soluble signaling.               | 3                   |
| 6.     | Cell-extracellular matrix interactions - Binding to the ECM, Modifying the ECM, Malfunctions in ECM signaling.<br><br>Direct Cell-Cell contact - Cell junctions in tissues, malfunctions in direct cell-cell contact signaling. Response to mechanical stimuli. | 3                   |
| 7.     | Measurement of cell characteristics - cell morphology, cell number and viability, cell-fate processes, cell motility, cell function.  | 2                   |
| 8.     | Cell and tissue culture - types of tissue culture, media, culture environment and maintenance of cells in vitro, cryopreservation.  | 3                   |



NP-TEL

# NPTEL

<http://nptel.iitm.ac.in>

## Biotechnology

### Pre-requisites:

- Basic Biology
- Cell Biology

### Additional Reading:

- Articles in Journals: Biomaterials, Advanced Drug Delivery Reviews.

### Hyperlinks:

- <http://web.mit.edu/langerlab/>
- <http://faculty.virginia.edu/laurencin/index.htm>

### Coordinators:

**Dr. S. Swaminathan**

Centre for Nanotechnology & Advanced Biomaterials  
SASTRA University

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| 9.  | Basis for Cell Separation, characterization of cell separation, methods of cell separation.  | 3  |
| 10. | Biomaterials in tissue engineering - biodegradable polymers and polymer scaffold processing. | 3  |
| 11. | Growth factor delivery, Stem cells.  | 3  |
| 12. | Gene therapy.  | 1  |
| 13. | Bioreactors for Tissue Engineering.  | 1  |
| 14. | In vivo cell & tissue engineering case studies: Artificial skin, Artificial blood vessels.   | 3  |
| 15. | In vivo cell & tissue engineering case studies: Artificial pancreas, Artificial liver.       | 3  |
| 16. | In vivo cell & tissue engineering case studies: Regeneration of bone, muscle.                | 3  |
| 17. | In vivo cell & tissue engineering case studies: Nerve regeneration.                          | 3  |
|     | <b>Total</b>   | 45 |

**References:**

- "Tissue Engineering", Bernhard O. Palsson, Sangeeta N. Bhatia, Pearson Prentice Hall Bioengineering.
- "Nanotechnology and Tissue engineering - The Scaffold", Cato T. Laurencin, Lakshmi S. Nair, CRC Press.