

### MS4612 – Drug Delivery and Tissue Engineering

<b>Course Code</b>	MS4612				
<b>Course Title</b>	Drug Delivery and Tissue Engineering				
<b>Pre-requisites</b>	MS4013	Biomaterials			
<b>Pre-requisite for</b>	NIL				
<b>No of AUs</b>	3				
<b>Contact Hours</b>	LECTURES	26	Lab	13	
<b>Course Aims</b>					
<p>This prescribed elective course aims to deepen your understanding on two major biomedical applications of materials. The course will equip you with the basic principles of drug delivery and tissue engineering and the important roles played by biomaterials in these applications. It also presents engineering analyses of drug delivery along with biological and materials aspects of tissue engineering. All of this knowledge is essential for students who wish to specialize in medical materials or pursue a career in the fields of drug delivery or tissue engineering.</p>					
<b>Intended Learning Outcomes (ILO)</b>					
<p>By the end of the course, you should be able to:</p> <ol style="list-style-type: none"> <li>1. Define drug delivery, controlled release and targeted delivery</li> <li>2. Compare and contrast the advantages and limitations of various drug delivery routes</li> <li>3. Illustrate the critical roles of polymers in drug delivery systems</li> <li>4. Explain the mechanisms and roles of materials in diffusion-controlled systems, osmotic-controlled and degradation-controlled drug delivery systems</li> <li>5. Distinguish zero-order release from first-order release kinetics</li> <li>6. Estimate the drug release rate from diffusion-controlled, osmotic-controlled and degradation-controlled drug delivery system</li> <li>7. Explain the mechanism and roles of materials in stimuli-responsive drug delivery systems</li> <li>8. Explain the principles of passive and active targeting in targeted delivery</li> <li>9. Define tissue engineering and its contribution in regenerative medicine</li> <li>10. Describe the three main pillars that contribute to a successful tissue engineered product</li> <li>11. Compare and contrast the advantages and limitation of various cell sources for tissue engineering applications</li> <li>12. Analyze the major building blocks of extra-cellular matrix (ECM) and its functions</li> </ol>					

as nature's scaffold

13. Explain the basic considerations in design and materials selection for biomaterial scaffolds
14. Describe various common scaffold fabrication methods
15. Recognize different environmental factors (bioreactors and signalling) that affect tissue engineering

### **Course Content**

- Fundamentals of drug delivery
- Controlled and targeted delivery
- Principles of tissue engineering
- Biomaterial substrates for tissue engineering

### **Reading and References**

Treatise on Controlled Drug Delivery, A.Kydonieus, Editor. Marcel Dekker, 1992.

Biomaterials Science, An Introduction to Materials in Medicine, B.D. Ratner, A.S. Hoffman, F.J. Schoen, J.E. Lemons, 3rd Edition, Academic Press, 2013

Handbook of Pharmaceutical Controlled Release Technology, D.L. Wise, 1st Edition, CRC Press, 2000.

Principles of Tissue Engineering, R.P.Lanza, R.Langer, J.Vacanti, Editors, 4th Edition, Academic Press, 2014.

Biomaterials for Tissue Engineering Applications, J.A. Budrick, R.L. Mauck, Editors. Springer-Verlag, 2011.

Bioreactor Systems for Tissue Engineering, T. Scheper, C. Kasper, M. Van-Griensven, R. Pörtner, Editors. Springer-Verlag, 2009.

### **Course Policies and Student Responsibilities**

(1) CA

Absentees must be supported by a medical certificate or other valid official documents.

### **Academic Integrity**

Good academic work depends on honesty and ethical behavior. Quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honor Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student of NTU, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at the University. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, and collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the [academic integrity website](#) for more information. Consult your instructor(s) if you need any

clarification about the requirements of academic integrity in the course.