

## NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

<b>COURSE OUTLINE TEMPLATE</b>			
<b>Course Title</b>	Biomaterials		
<b>Course Code</b>	MT 663	<b>No. of Credits</b>	03
<b>Department</b>	MME	<b>Faculty</b>	Dr.N.RameshBabu
<b>Pre-requisites Course Code</b>	Nil		
<b>Course Coordinator(s) (if, applicable)</b>	NA		
<b>Other Course Teacher(s)/Tutor(s) E-mail</b>	NA	<b>Telephone No. Email</b>	3464 nrb@nitt.edu
<b>Course Type</b>	<b>Elective course</b>		
<b>COURSE OVERVIEW</b>			
<p><b>Biomaterials</b> is a elective course in M.Tech Materials Science and Engineering . There is no prerequisite to register for this course for the MTech students of Materials Science and Engineering. This course is intended for introducing the Biomaterials for different applications. An understanding of the materials behavior in vitro and invivo, the mechanism responsible for their behavior, the effect of composition, structure and physiological environment on the properties of the biomaterials and the development of biomaterials for different applications will be discussed.</p>			
<b>COURSE OBJECTIVES</b>			
<p>The objective of this course is to provide students a fundamental understanding of different materials (metallic, ceramic, polymeric, composite, and biological materials) for biomedical-applications and their in-vitro and in-vivo characteristics. This course will also provide students an introduction to bone biology, tissue engineering and ethical issues in biomaterials research.</p>			

<b>COURSE OUTCOMES (CO)</b>	
<b>Course Outcomes</b>	<b>Aligned Programme Outcomes (PO)</b>
<p>After the completion of this course, the student will be able to:</p> <p>At the end of this course, the students would be able to:</p> <p>Understand the properties of different biomaterials [1]</p> <p>Understand the synthesis and processing methods for producing the different biomaterials [1,2]</p> <p>Know the advantages and disadvantages of different biomaterials and select materials for different applications. [1,3]</p> <p>Characterize the biomaterials for their physico-chemical properties and analyze the cell-material interactions [1,3]</p> <p>Design new biomaterials for different biomedical applications [6,7]</p>	<ol style="list-style-type: none"> <li>1. Materials Science and Engineering post graduates are attaining knowledge of materials and their science &amp; Engineering</li> <li>2. Materials Science and Engineering post graduates are talented to formulate and analyse the engineering data.</li> <li>3. Materials Science and Engineering post graduates can recognize classify and solve engineering problem.</li> <li>4. Materials Science and Engineering post graduates are capable of exploring the resources to collect the required data, analyse and solve critical problems.</li> <li>5. Materials Science and Engineering post graduates have skills in locating and applying modern tools to resolve the complex engineering problems</li> <li>6. Materials Science and Engineering post graduates are competent to work in research, industrial sectors and with multi-faceted team</li> <li>7. Materials Science and Engineering post graduates have the capacity to design, plan and execute complex processes adhering to environmental considerations and cost effectiveness.</li> </ol>

<b>COURSE TEACHING AND LEARNING ACTIVITIES</b>			
<b>S.No</b>	<b>Week</b>	<b>Topic</b>	<b>Mode of Delivery</b>
1.	I-III	Introduction to biomaterials; need for biomaterials; Salient properties of important material classes; Property requirement of biomaterials; Metallic implant materials, ceramic implant materials, polymeric implant materials, composites as biomaterials; Orthopedic, dental and other applications.	Classroom teaching by Chalk and Talk + PPTs+ Invited Guest Lectures + Exposure to the facilities available at NITT/Research Labs/Industry
2.	IV-VI	Biomaterials preparation and characterization; Processing and properties of different bioceramic materials; Mechanical and physical properties evaluation of biomaterials; New and novel materials for biomedical applications. Design concept of developing new materials for bio-implant applications; Nanomaterials and nanocomposites for medical applications;	
3.	VII-IX	Concept of biocompatibility; cell-material interactions and foreign body response; assessment of biocompatibility of biomaterials; In-vitro and In-vivo evaluation; Dissolution study, cytotoxicity test, cell adhesion test; Antibacterial assessment: Kirby–Bauer disc diffusion method or antibiotic sensitivity test and spread plate method.	
4.	X-XII	Biomaterials for drug delivery, timed release materials; biodegradable polymers; Blood compatible materials; Biomimetics; Bone biology: bone architecture, collagen, osteoblasts, osteoclasts, etc; Protein mediated cell adhesion;	
5.	XIII-XV	Introduction to tissue engineering; Applications of tissue engineering; Biomaterials world wide market, technology transfer and ethical issues; Standards for biomaterials and devices.	

<b>COURSE ASSESSMENT METHODS</b>				
<b>S.No.</b>	<b>Mode of Assessment</b>	<b>Week/Date</b>	<b>Duration</b>	<b>% Weightage</b>
1	One Assignment	XIII week	-----	10
2	One Seminar	XIV- XV weeks	20 min per student	15
3	One cycle test	X/XI week	1.5 h	25
4	Re-test	XII/XIII week	1.5 h	25 (If any student misses 1 <sup>st</sup> cycle test for medical reasons)
5	Guest Lectures (2 lectures)	After VIII week	1 h/2 h each	Nil (Subjected to the approval from Institute for inviting the guest)
6	Attendance	-----	-----	Minimum 50% attendance required for writing the semester examination
7	End semester exam based on classroom teaching	XV1/XVII	3 h	50
<b>ESSENTIAL READINGS : Textbooks, Reference books, Website addresses, Journals, etc</b>				
<ol style="list-style-type: none"> <li>1. Hench L. Larry, and Jones J., (Editors), Biomaterials, Artificial organs and Tissue Engineering, Woodhead Publishing Limited, 2005.</li> <li>2. Hench L. Larry, &amp; Wilson J., (Editors), An Introduction to Bioceramics, World Scientific, 1994</li> <li>3. Biomaterials (Journal published by Elsevier).</li> <li>4. Journal of Biomedical amaterials Research (Journal published by Wiley)</li> <li>5. Journal of Materials Science: Materials in medicine (Springer Publication)</li> <li>6. Journal of the SBAOI (published by Society for Biomaterials and Artificaila Organs, India)</li> </ol>				

**COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)**

The exit survey will be assessed based on the questionnaire prepared by the Institute/class teacher and the expected attainment to be greater 75%.

The feedback collected from students by the Institute is to be informed to the teacher to improve the course in future semesters.

**COURSE POLICY**

**(Including plagiarism, academic honesty, attendance, grading etc.)**

1. The students are expected to attend all the classes except for medical reasons. Minimum attendance of 50% (including the concession for on-duty and medical reasons) is required for writing the semester examination.
2. Apart from technical content and presentation, plagiarism will be checked for the assignments.
3. The relative grading policy will be followed and the passing minimum marks will be fixed based on Institute guidelines.

**ADDITIONAL COURSE INFORMATION**

Students can contact the Course Coordinator at any time through email/phone. The Course Coordinator is available for consultation by appointment through email/phone. The Course Coordinator email id/phone number are available in this course plan.

**FOR SENATE'S CONSIDERATION**

**Course Faculty**  
**(Dr.N.Ramesh Babu)**

**Class Committee Chairman**  
**(Dr.N.Ramesh Babu)**

**HOD/MME**  
**(Dr.S.P Kumaresh Babu)**

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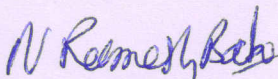
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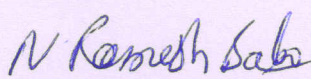
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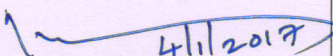
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4/11/2017  
HOD/MME  
(Dr.S.P Kumaresh Babu)