

Senior Design Project Description

Company Name	UNCC Biomedical Engineering	Date Submitted	8/3/2018
Project Title	Development of bioreactor template for bone reconstruction (BIO_RECON)	Planned Starting Semester	Fall 2018

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person.

Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

Discipline	Number	Discipline	Number
Mechanical	2	Electrical	
Computer		Systems	
Other ()			

Company and Project Overview:

Provide background information about the company, and an overview about the context for the project.

The goal of this project is to synthesize and characterize a porous bioceramic template that can serve as a carrier for cryopreserved bone cells. The project can be broken down into four parts; A) Synthesis of the porous bioceramic template, B) Characterization of the porous bioceramic template, C) seeding bone cells inside the porous ceramic, D) determine the effects of cryopreservation on cell viability.

Project Requirements:

This is a more detailed description of the design problem, project objectives and the desired output – describing the scope and specifications for what the project team will actually be designing and producing.

Scope:

This project aims at designing an off-the-shelf bone graft. Bone grafts are required to treat large bone defects. Porous bioceramic will be used as a carrier for bone cells. The presence of cells inside the porous bioceramic will accelerate new bone formation.

Specifications:

1. The porous scaffold should have mechanical stability compatible with bone
2. The pores of the bioceramic should be interconnected
3. The pore size should be >100 micron to allow for bone cell colonization and cryoprotectant diffusion



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4. The surface of the bioceramic should be bioactive to stimulate bone cell adhesion and viability
5. The cryoprotectant should have minimal toxicity on cells

Expected Deliverables/Results:

- *Bulletized list of all deliverables that the team is to provide to the supporter at the end of the project. Be specific here to avoid misunderstandings.*
 - Develop a protocol to synthesize porous bioceramic for cell delivery
 - Determine the mechanical properties of the porous ceramic
 - Analyze the porosity and pore size of the porous ceramic
 - Activate the ceramic surface in simulated body fluid
 - Analyze the surface chemistry of the bioceramic
 - Measure cell adhesion and spreading
 - Measure cell viability prior to and after cryopreservation

Disposition of Deliverables at the End of the Project:

Hardware developed is the property of the Industry Supporter. Please specify what disposition you would like for the hardware developed by the Project team. Typically the work product is displayed at the last Expo then immediately handed over to the supporter unless arrangements have been made to deliver at a future date.

List here any specific skills, requirements, knowledge needed or suggested (If none please state none):

- Prior background in materials engineering or basic chemistry or physics would be a plus
- Prior cell culturing skills desired but not essential