



UNC CHARLOTTE

The WILLIAM STATES LEE COLLEGE of ENGINEERING

Senior Design Project Description

Company Name	<i>UNCC ME Biomed</i>	Date Submitted	<i>11/14/18</i>
Project Title	<i>Single-Step Extrusion of Multi-Cellular Cerebral Vessels in 3D (BIO_CELL)</i>	Planned Starting Semester	<i>Spring 2019</i>

Personnel

Typical teams will have 2-3 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 facilitate the creation of a micro-sized neurovascular vessel that would provide insight into drug transport across the blood-brain barrier (BBB) and possibly the treatment of multiple pathologic conditions such as cancer and Alzheimer's Disease (AD). This project would enhance inter-disciplinary research opportunities for faculty and students across two areas (Biomedical Engineering and Neurosciences) toward solving critical clinical solutions.

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 (1) the optimization of a multi-axial tip layering hydrogel for 3D extrusion and (2) the invention and characterization of a single-step 3D bioprinting extrusion technique for fabrication of multicellular cerebral vessels.

Specifications:

1. Develop a protocol to synthesize single-step extrusion of co-axial hydrogels in dual/three layers embedding live cells.
2. Develop a protocol to culture cells after extrusion and achieve high cellular viability
3. Measure tightness of the BBB



UNC CHARLOTTE

The WILLIAM STATES LEE COLLEGE of ENGINEERING

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.*
 - Achievement of lumen thickness under 50 um and inner diameter under 500 um.
 - Achievement of cellular viability over 90 % after 3D printing.
 - Achievement of cerebral membrane tightness confirmed by localized ZO-1 proteins

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 and experiences in 3D bioprinting, cell culturing, microfluidics
- Requested biomed student William Groves who is currently working in this lab