

Project Assignment: Term Paper
Topic Draft: 1/27/17
Proposal Due: 2/24/17
Paper Draft Due: 3/22/17
Final Paper Due: 4/12/17
Revisions Due: 5/5/17, 5 p.m. by email

Write a critical review focused on a specific biomedical application of biomaterials that is of interest to you, but not directly related to any research project you may already be participating in or have participated in the past. A list of potential topics is on the following page.

“*Review*” means that the paper attempts to survey relevant literature and developments in the subject matter from some point in the *historical* past up to the *present*. The review should include all, or a logical subset, of biomaterials used in the chosen biomedical device. Literature citations should primarily include peer-reviewed journals articles, conference proceedings and books, as well as relevant patents, FDA documents and ASTM standards. Web citations are generally not appropriate; however, appropriate use of web-based search engines will be essential. Search engines such as *Compendex*, *Web of Science*, *Medline*, and *Google Scholar* as well as other resources, will be introduced in class.

“*Critical*” means that the paper includes original *evaluation* and *organization* of the subject matter. What are the important performance requirements for the device? What are the important material properties needed to achieve the device performance requirements? How are these important material properties governed by the biomaterial structure? How can the material structure be tailored? (These above questions elaborate the all-important *processing-structure-property relationships*!) Other questions to stimulate your thoughts include the following: What’s the most important work that’s been done in this area and why? What are the merits or problems with specific contributions? How do different contributions or materials compare/contrast? What have been some unintended complications? What problems persist in this area? What is needed in order to achieve further improvements in the future?

The “working draft” has no requirements and will not be graded, but will provide an early opportunity to receive important feedback from the instructor. The “first draft” will be graded for 80% of your term paper grade. The paper should be less than 4000 words, not including references and figures, and follow formatting guidelines set forth by the journal, *Biomaterials* (available on Elsevier’s website). (The only exception is to include figures and tables within the manuscript text rather than at the end.) Compliance in completing the suggested revisions will constitute the remaining 20% of your term paper grade. Revised papers will be compiled by the instructor for a class “textbook” which will be distributed during finals week.

As a reminder, the term paper will represent independent and original work, without the aid of other students and without plagiarism. The instructor will make use of turnitin.com on a suspicious paper if necessary.

Orthopaedic

total-hip arthroplasty (THA)
(stem, acetabular cup, bearing surfaces)
total-knee arthroplasty (TKA)
fracture fixation devices (plates, nails,
screws, rods, etc.)
synthetic bone grafts substitutes
bone ingrowth scaffolds
tissue engineering scaffolds
cartilage grafts or scaffolds
tendon/ligament grafts or scaffolds
spinal fusion cage
disc replacement
other joints (e.g., finger, elbow, shoulder)

Dental

endosteal or subperiosteal implants
crowns, veneers
bridges, dentures
fillings and cements
adhesives and sealants
orthodontic braces and appliances

Cardiovascular

artificial heart valves
artificial heart
ventricular assist devices
hemodialysis
plasma filtration
occluder (heart defect repair)
stents
catheters and cannulas
endovascular grafts/prostheses
vascular grafts and scaffolds
blood substitutes
pacemakers and defibrillators
cardiopulmonary bypass

Cosmetic and General Surgery

sutures
hemostat
skin grafts and dressings
breast implants
adhesives and sealants

Neurologic

neural prostheses
bioelectrodes and insulators

Otologic

cochlear implants
middle ear implants
tympanostomy tubes

Ophthalmic

contact lens
intra-ocular lens
orbital reconstruction
eyelid implants
corneal implants
adhesives
retinal detachment

Pulmonary

esophageal segments
lung implants
tracheal tubes and stents

Pharmacologic

implanted drug delivery
transdermal drug delivery
oral drug delivery
ophthalmic drug delivery
intravenous drug delivery
oncologic (chemo-, radiation, hyperthermia)
biosensors (e.g., glucose monitoring)

Radiologic

X-ray/CT contrast agents
MRI contrast agents
nuclear contrast agents
ultrasound contrast agents

Gastrointestinal

capsule endoscopy
GI segments
artificial liver

Urological

bladder grafts
kidney implants
urethral bulking agents

Obstetrics and Gynecology

contraceptives (transdermal and IUD)
vaginal wall repair