DENT-412: Fundamentals of Craniofacial and Dental Technology (3 units)

Course objectives: On successful completion of this course, participants should be able to:

1. Describe the basic terminology in dentistry such as basic tooth anatomy (outcome a).
2. Explain the imaging modalities used in dentistry and its applications (outcome a).
3. Analyze and understand the fundamentals of research in dental implants, dental biomaterials, and biomaterials testing (outcome a).
4. Describe the fundamentals of CAD-CAM and digital dental technology (outcome a).
5. Explain the role of bio-nanotechnology in the research field of regeneration of enamel (outcome a).
6. Describe the role of saliva in the development of innovative technology in the field of craniofacial oral-dental sciences (outcome a).
7. Prepare written reports and technical illustrations summarizing prior literature, procedures, technical results, experiments and projects (outcome n).
8. Prepare through independent study of textbooks, readings, and journal papers the presentation of an independent research project (outcomes k, l, m).

Course synopsis: This course will consist of a series of 2h 40 minute classes presented by Faculty of the USC School of Dentistry. Each class will address one topic related to the advancing field of craniofacial biotechnology, dentistry and medicine, and will highlight interdisciplinary interactions between clinical sciences, craniofacial biotechnology, bioengineering and engineering.

Format: Class meets Tuesdays 2:00-4:50 pm at room Guggenheim Hall, 4th floor, Herman Ostrow School of Dentistry, 925 West 34th St, Los Angeles, CA 90089.

Grading: Final course grade will be based upon midterm (30%), one Student Project presentation (20%), homework (20%), class attendance (10%) and final Student Presentations (20%). The midterm will consist of multiple choice questions. Class attendance (10%) will be graded as 0 if student misses one class without an acceptable excuse (proof of medical appointment, proof of attendance to a conference, and similar).

In the projects, students will focus on one of the themes of the course and will (1) review the biotechnology involved in that area; (2) identify an unsolved problem, unsatisfactory result or a technological challenge in the field; (3) propose a solution or a new device or a new design or identify the characteristics of the solution to that problem and which disciplines of engineering and dentistry/medicine should be involved in the solution. Student projects will be assessed through two short Powerpoint presentations by the students.

Through the Student Projects and presentations this course contributes strongly to BME program outcomes a) apply knowledge of mathematics, science, and engineering; e) an ability to identify, formulate, and solve engineering problems, and g) an ability to communicate effectively, l) an understanding of biology and physiology.
**Course Director (DEN):** Reyes Enciso, PhD (School of Dentistry)  
**Faculty (School of Dentistry):** Reyes Enciso, Glenn Clark, James C. Earthman, Pascal Magne, Mahvash Navazesh, Alon Frydman, Richard Lin, Janet Oldak, Cherilyn Sheets.

**Schedule of classes:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture/Activity</th>
<th>Presenter</th>
<th>Homework due that date</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/10/2017</td>
<td>Introduction to dental terminology</td>
<td>Dr. Enciso</td>
<td></td>
<td>Gugenheim Hall</td>
</tr>
<tr>
<td>1/17/2017</td>
<td>Introduction to Craniofacial biotechnology</td>
<td>Dr. Enciso</td>
<td>Hw1</td>
<td>Gugenheim Hall</td>
</tr>
<tr>
<td>1/24/2017</td>
<td>Biomimetic approach to porcelain bonded restorative materials</td>
<td>Dr. Magne</td>
<td>Provide topic for project</td>
<td>Gugenheim Hall</td>
</tr>
<tr>
<td>1/31/2017</td>
<td>Biomimetic approaches to enamel bioceramics</td>
<td>Dr. Oldak</td>
<td>Hw2 is due</td>
<td>Gugenheim Hall</td>
</tr>
<tr>
<td>2/7/2017</td>
<td>Dental Implants</td>
<td>Dr. Frydman</td>
<td>Bring copy of 1st paper to present</td>
<td>Gugenheim Hall</td>
</tr>
<tr>
<td>2/14/2017</td>
<td>Bio-imaging applied to craniofacial oral-dental structures and functions</td>
<td>Dr. Enciso</td>
<td></td>
<td>Gugenheim Hall</td>
</tr>
<tr>
<td>2/21/2017</td>
<td>Student Presentations Group A</td>
<td></td>
<td>Powerpoint due</td>
<td>Gugenheim Hall</td>
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<tr>
<td>2/28/2017</td>
<td>Student Presentations Group B</td>
<td></td>
<td>Powerpoint due</td>
<td>Gugenheim Hall</td>
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<tr>
<td>3/7/2017</td>
<td>CAD-CAM Applications to Dental Restorations</td>
<td>Dr. Lin</td>
<td></td>
<td>Gugenheim Hall</td>
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<tr>
<td>3/14/2017</td>
<td>Spring Break</td>
<td></td>
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<tr>
<td>3/21/2017</td>
<td>Bio-nanotechnology applications for saliva diagnostics</td>
<td>Dr. Mahvash</td>
<td></td>
<td>Gugenheim Hall</td>
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<tr>
<td>3/28/2017</td>
<td>Dental implants and technological advancements</td>
<td>Dr Sheets</td>
<td>1st draft of presentation</td>
<td>Gugenheim Hall</td>
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<tr>
<td>4/4/2017</td>
<td>Video games in dentistry</td>
<td>Dr. Clark</td>
<td></td>
<td>Gugenheim Hall</td>
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<tr>
<td>4/11/2017</td>
<td>MIDTERM</td>
<td>Dr. Enciso</td>
<td></td>
<td>Gugenheim Hall</td>
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<tr>
<td>4/18/2017</td>
<td>Student Presentations Group A</td>
<td>Dr. Enciso</td>
<td>Powerpoint due</td>
<td>Gugenheim Hall</td>
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<tr>
<td>4/25/2017</td>
<td>Student Presentations Group B</td>
<td>Dr. Enciso</td>
<td>Powerpoint due</td>
<td>Gugenheim Hall</td>
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<tr>
<td>5/2/2017</td>
<td>Study Week</td>
<td></td>
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<tr>
<td>5/9/2017</td>
<td>Turn in Final Presentation</td>
<td></td>
<td>Final make-up Presentation due (if needed)</td>
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**Source material:** Two copies of the books recommended for reading are available under “Class reserve” at the Jennifer Ann Wilson Dental Library. They are:


The journal articles recommended for reading are:


Clinical research websites of interest will be provided during the classes such as:
• National Institutes of Health. www.nih.gov/
• OVID at USC http://www.usc.edu/hsc/dental/library/e_resources/ovid_usc.html
• National Institute of Biomedical Imaging and Bioengineering (NIBIB) www.nibib.nih.gov
Academic and Professional Conduct:
Should there be any suspicion of academic, professional or ethical dishonesty, students are referred to the Ostrow Student Professional Performance Evaluation Committee (SPPEC). The review process can be found in the Code of Ethics and Behavioral Guidelines on the School intranet.

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” https://policy.usc.edu/student/scampus/part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct.

Discrimination, sexual assault, intimate partner violence, stalking, and harassment are prohibited by the university. You are encouraged to report all incidents to the Office of Equity and Diversity/Title IX Office http://equity.usc.edu and/or to the Department of Public Safety http://dps.usc.edu. This is important for the health and safety of the whole USC community. Faculty and staff must report any information regarding an incident to the Title IX Coordinator who will provide outreach and information to the affected party. The sexual assault resource center webpage http://sarc.usc.edu fully describes reporting options. Relationship and Sexual Violence Services https://engemannshc.usc.edu/rsvp provides 24/7 confidential support.

Support Systems
A number of USC’s schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the American Language Institute http://ali.usc.edu, which sponsors courses and workshops specifically for international graduate students.

The Office of Disability Services and Programs http://dsp.usc.edu provides certification for students with disabilities and helps arrange the relevant accommodations.

If an officially declared emergency makes travel to campus infeasible, USC Emergency Information http://emergency.usc.edu will provide safety and other updates, including ways in which instruction will be continued by means of Blackboard, teleconferencing, and other technology. In addition, the Herman Ostrow School of Dentistry provides the case library, intranet, email listserv, and other technologies specific to the school. Ostrow students should access the Ostrow School of Dentistry Intranet for additional specific information in the event of an emergency.

� BIOMEDICAL ENGINEERING PROGRAM OUTCOMES

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data.

(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

(d) an ability to function on multidisciplinary teams.

(e) an ability to identify, formulate, and solve engineering problems.

(f) an understanding of professional and ethical responsibility.

(g) an ability to communicate effectively.

(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

(i) a recognition of the need for, and an ability to engage in life-long learning.

(j) a knowledge of contemporary issues.

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

(l) an understanding of biology and physiology.

(m) the capability to apply advanced mathematics (including differential equations and statistics), science, and engineering to solve problems at the interface of engineering and biology.

(n) an ability to make measurements on and interpret data from living systems.

(o) an ability to address problems associated with the interaction between living and non-living materials and systems.