BMME 780
Real-time Computer Systems II
Course Syllabus

1. *Department*: Joint Dept. of Biom. Engr. *Number*: BMME 780 *Credit Hours*: 3
Title: Real-time Computer Systems II *Not Required*

2. *Course Description*:

Students will use the dsPIC digital signal processing chip to acquire and process physiological signals. This is a combination DSP chip and microcontroller. More information on this chip is available at http://ww1.microchip.com/downloads/en/DeviceDoc/dsPIC30F_brochure_DS70095H.pdf

The class will consist of lectures on how to use the different DSP features of the microcontroller, and several mini-projects in which students acquire and process different physiological signals. There will also be a more extensive project in the latter part of the semester.

Students will research and prepare some of the lectures themselves. Programming will be in C.

3. *Prerequisite(s):* BMME 120 or having experience with microcontroller programming (PIC or otherwise)

4. *Textbook(s) and/or other required material*:
none

5. *Course objectives. By the end of this course, the student should be able to: (use demonstrative verbs)*
1. Write code in C to do the following on a dsPIC microcontroller:
   a. Respond to input from user (via buttons or keypad)
   b. Perform basic mathematical operations using the DSP processor
   c. Perform table lookups
   d. Display output to user (via LCD display, LEDs or PC display)
   e. Acquire and analyze analog signals in “real-time”; this will include FFT and filter processing

2. Write code in PIC C that is well organized, functional, and with meaningful comments.
3. Develop an extensive project, based on the dsPIC, which utilizes its DSP capabilities. For graduate students, it is expected that this will be related to your research. For undergraduates, I will help you pick out a BME-related project that is of interest to you.

6. *Topics covered (number of lectures per topic, based on 28, 75-minute lectures per semester)*:

1. Introduction to the dsPIC (1)
2. dsPIC architecture (1)
3. dsPIC addressing modes (1)
4. I/O ports and tables (1)
5. Timers (1)
6. Serial I/O (2)
7. Interrupts (2)
8. Mathematical operations using the DSP processor (2)
9. FFT (4)
10. Digital filters (4)

The remainder of the class time will be spent working together on software code in the instrumentation lab.

7. *Class/laboratory schedule (sessions per week and duration of each session)*:
Two 75-minute classes per week.

Date of preparation and person(s) who prepared this description:
R. Goldberg, January 9, 2006