A. COURSE SYLLABUS

1. General Information:
   Course Number: INEL 6048
   Course Title: Advanced Microprocessor Interfacing
   Credit-Hours: 3 credits (conference hours per week)

2. Course Description:
   This course covers intermediate and advanced concepts and techniques for the interfacing of microprocessors. Subjects covered include: review of embedded processors and systems, architecture and instruction set; software and hardware development; embedded and real-time operating system concepts; bus, input/output and memory interfacing; interfacing of multiprocessors; communication protocols; and applications. A final project is required.

3. Pre-requisites:
   Good knowledge of computer programming is required. An understanding of the basics of image processing is helpful.

4. Textbook, Supplies and Other Resources:

5. Purpose:
   This is a course for graduate students in Electrical or Computer Engineering.

6. Course Goals:
   After completing this course the student should:
   1. understand basic concepts and techniques of embedded software & hardware microprocessor interfacing
   2. be able to develop a prototype of an embedded application
   3. be familiar with the design techniques and issues of embedded systems

7. Requirements:
   All students are expected to:
   - Complete all lessons.
   - Do all assigned readings and related homework.
   - Perform design exercises and projects at home or laboratory.
   - Come to class prepared to answer questions or pop quizzes on previous material.
   - Come to class all the time and on time.
   - Pass all tests to receive credit for the course.

8. Laboratory/Field Work (If applicable):
   Laboratory work is part of a required design project. Additional laboratory exercises will be required to complement lecture.
9. Department/Campus Policies:

9a. Class attendance: Class attendance is compulsory. The University of Puerto Rico, Mayagüez Campus, reserves the right to deal at any time with individual cases of non-attendance. Professors are expected to record the absences of their students. Frequent absences affect the final grade, and may even result in total loss of credits. Arranging to make up work missed because of legitimate class absence is the responsibility of the student. (Bulletin of Information Undergraduate Studies, pp 39 1995-96)

9b. Absence from examinations: Students are required to attend all examinations. If a student is absent from an examination for a justifiable reason acceptable to the professor, he or she will be given a special examination. Otherwise, he or she will receive a grade of zero of "F" in the examination missed. (Bulletin of Information Undergraduate Studies, pp 39, 1995-96)

9c. Final examinations: Final written examinations must be given in all courses unless, in the judgment of the Dean, the nature of the subject makes it impracticable. Final examinations scheduled by arrangements must be given during the examination period prescribed in the Academic Calendar, including Saturdays. (see Bulletin of Information Undergraduate Studies, pp 39, 1995-96).

9d. Partial withdrawals: A student may withdraw from individual courses at any time during the term, but before the deadline established in the University Academic Calendar. (see Bulletin of Information Undergraduate Studies, pp 37, 1995-96).

9e. Complete withdrawals: A student may completely withdraw from the University of Puerto Rico, Mayagüez Campus, at any time up to the last day of classes. (see Bulletin of Information Undergraduate Studies, pp 37, 1995-96).

9f. Disabilities: All the reasonable accommodations according to the Americans with Disability Act (ADA) Law will be coordinated with the Dean of Students and in accordance with the particular needs of the student.

9g. Ethics: Any academic fraud is subject to the disciplinary sanctions described in article 14 and 16 of the revised General Student Bylaws of the University of Puerto Rico contained in Certification 018-1997-98 of the Board of Trustees. The professor will follow the norms established in articles 1-5 of the Bylaws.

10. Campus Resources (If applicable):
General Library and University Computer Center is available to obtain professor's reference materials. The University's Counseling Office has a tutorial program for students who need extra help.
There are special laboratories at the Department, including computational facilities for the use of authorized students during posted hours.
11. Tentative Course Topics

1. Introduction and overview of the course
2. Embedded system design process
3. Instruction Sets
   a. Arm
   b. PowerPC
   c. Digital Signal Processors
4. Hardware interfacing
   a. Memory organization & interfacing
   b. I/O devices, DMA
5. Software interfacing
   a. Embedded programming techniques, compilers, profiling, power estimation, etc
   b. Embedded operating system concepts
      i. Multitasking, Context Switching
      ii. Cooperative, preemptive
      iii. Scheduling policies
      iv. Inter-process communication
      v. Real-time systems
      vi. Embedded linux
      vii. Commercial OSes
6. FPGA's
   a. Custom logic
   b. Glue logic
   c. Hardware accelerators
7. Networking protocols used in embedded systems (I2C, CAN, Ethernet)
8. System design techniques
9. Hardware/software partitioning

12. Instructor data

   • Name: Manuel Toledo Quiñones
   • Office: Terrats 214
   • Office Hours:
     Tues. 9:30am-10:30am; Wed. 1:00pm-2:30pm; Thurs. 8:30am-10:30am
   • Telephone: x 3097
   • Email: mtoledo@ece.uprm.edu
   • Course Web Page: http://www.ece.uprm.edu/~mtoledo/6048

13. Student Evaluation Criteria

   Your grade will be based on two quizzes, laboratory exercises, homework and a design project that will culminate in a class presentation. This presentation will constitute the final exam. The laboratory exercises and homework will be combined into a single grade that will account for 40% of your final grade. The final project will count for 30% of your final grade. Each quiz will count for 15% of the final grade.