EP 315 Microprocessors 1 0 2 4

Prerequisites: EP211 Electronics Lab-1 (Analog Elec.)
EP212 Electronics Lab-2 (Digital Elec.)
Syllabus for course offered to Junior Year students in Engg. Physics program.

Motivation: This syllabus is drafted with the aim of providing physicists-in-training with a working knowledge of microprocessors. They should be able to effectively and comfortably use most aspects of the commonly found microprocessors and microcontrollers in modern-day labs. In the latter part of the course they are introduced to advanced concepts that may help them advance the state of the art after they've mastered the basics. Short lectures will discuss key theoretical concepts. The main focus will be on the labs, where students will perform experiments using the concepts, leading up to group-based final projects that may involve building some electro-mechanical devices.

Theory will cover:
Hardware and software architectures, Data and control paths, Registers and memory organization, Instruction set basics and programming, Memory addressing modes. I/O interfacing, interrupt and poll-driven I/O, timing. Advanced concepts: Overview of complex FPGA's used in industry, Limits of microprocessor performance: technological limits – silicon processing, quality control, power consumption, etc. Fundamental physics limits.

Labs will cover:
A) Software trial labs to demonstrate the use of instruction sets, memory mapping and optimization.
B) Simple hardware experiments for memory interfacing, poll and interrupt driven I/O.
C) group-based project where the students design and build something around a microprocessor or microcontroller. The suggested projects would have a combination of software and hardware work. An example would be a simple data acquisition application like an averaging voltmeter, or at a higher level an automated laser calibration system.

Texts/References:

1. R. S. Gaonkar, Microprocessor Architecture: Programming and Applications with the 8085/8080A, Penram International Publishing, 1996
2. D.V. Gadre: *Programming and Customizing the AVR microcontroller*
McGraw-Hill/TAB Electronics 2000 ~ ISBN: 007134666X ~ Paperback

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