ETec454 Course Specifications

Catalog Information

Course Number and Title: ETec454 – Embedded Systems

Credit Hours: 4

Course Description: The advanced study of microcontroller-based hardware and software applied to real-time embedded systems. Includes embedded software design, programming microcontrollers in C, real-time kernels and kernel services, hardware and software applications and testing techniques.

Prerequisites: ETEC 374, CSCI 141 or equivalent; EET major or written permission.

Prerequisite Outcomes:

1. In depth knowledge of microcontroller-based systems, preferably based on the 9S12x MCU.
2. Ability to design hardware and assembly language software for a standalone embedded system.
3. Strong programming background using assembly language and a high-level language – preferably C or C++

Schedule Information

Quarter: Winter 2007

Meeting Times and Rooms

Days	Times	Instructor	Room(s)
MWF	9:00-9:50	Todd Morton	ET333
T	9:00-10:50	Todd Morton	ET340

Lab Fee: $42.00

Enrollment Limit: 18

Student Resources

Student Syllabus: http://eet.etec.wwu.edu/etec454/454w07syl.pdf

Course Website: http://eet.etec.wwu.edu/etec454/index.html

Facilities and Materials

Required Text(s): Embedded Microcontrollers, Todd Morton

Lab Equipment: MCU Development Board, Windows PC w/ USB or Parallel-based BDM Pod, Mixed-Signal Oscilloscope, DMM

Software: Metrowerks Codewarrior, GNU make, CodeWright Editor, Noral BDM Debugger

Course Outcomes

1. Competency in C and assembly language programming using a modular programming environment. Understands and able to apply compilers, assemblers, linkers, libraries, and modules.
2. Understanding the C programming language and its application to real-time embedded microcontrollers – including data types and casting, local and static variables, functions, macros, pointers, arrays, structures, unions, enumerated types, mixed assembly-C conventions, and information hiding techniques.
3. Introduced to version control and the software release process.
4. Be able to analyze and design a simple cooperative real-time kernel with hard timing requirements – including task decomposition
5. Basic understanding of preemptive kernels. Able to design a system based on the MicroC/OS realtime kernel.
6. Understand the concept and applications for semaphores, mutexes, mailboxes, queues, and flags services.
7. Basic understanding of dynamic memory allocation in MicroC/OS.
8. Understand the importance of coding conventions, software ownership ethics, including plagiarism, licensing, and copyrights.
9. Can produce a well written formal lab report.
10. Understand the need for completing work in a timely manner.

Courses Contribution to the Program Outcomes

P – Primary to the purpose of the course. Course contains significant instruction and opportunities for practice.

S – Secondary to the purpose of the course. Course contains limited instruction and opportunities for practice.

N – Not a significant part of this course.

Program Outcome		Course Contrib	Applicable Course Outcome(s)
a	An appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines.	P	1, 2, 3, 4, 5, 6, 7
b	An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology	S	1, 2, 4
c	An ability to conduct, analyze and interpret experiments and apply experimental results to improve processes	P	2, 3, 4, 5, 6
d	An ability to apply creativity in the design of systems, components or processes appropriate to program objectives	P	2, 4, 5, 6, 7
e	An ability to function effectively on teams	N	
f	An ability to identify, analyze and solve technical problems	P	2, 4, 5, 6, 7
g	An ability to communicate effectively,	S	9
h	A recognition of the need for, and an ability to engage in lifelong learning	N	
i	An ability to understand professional, ethical and social responsibilities	S	8
j	A respect for diversity and a knowledge of contemporary professional, societal and global issues,	N	
k	A commitment to quality, timeliness, and continuous improvement	S	9, 10
A	The application of circuit analysis and design, computer programming, associated software, analog and digital electronics, and microcomputers to the building, testing, operation, and maintenance of electrical/electronic(s) systems	P	1, 2, 3, 4, 5, 6, 7, 8
B	The applications of physics or chemistry to electrical/electronic(s) circuits in a rigorous mathematical environment at or above the level of algebra and trigonometry	N	
C	The ability to analyze, design, and implement control systems, instrumentation systems, communications systems, computer systems, or power systems	P	2, 4, 5
D	The ability to apply project management techniques to electrical/electronic(s) systems	N	
E	The ability to utilize statistics/probability, transform methods, discrete mathematics, or applied differential equations in support of electrical/electronic(s) systems	N	

Outcome Assessment Tools

1. Laboratories, Tests, Homework
2. Embedded Micro Module Senior Survey