

# Engineering Student Technology Committee

<http://www.engr.colostate.edu/ESTC>

College of Engineering  
Colorado State University

## 1. Title of Proposal: Computer Development Boards for ECE251

## 2. Proposal Participants:

*Primary Contact for Proposal*

Name: Bill Eads

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Department/Major: Electrical and Computer Engineering

Check One: **Faculty X Staff Student**

*Secondary Contact for Proposal*

Name: Sanja Manic

E-Mail: [S\\_Manic80@yahoo.com](mailto:S_Manic80@yahoo.com)

Department/Major: Electrical and Computer Engineering

Check One: **Faculty Staff Student X Graduate Student and ECE251 TA 2 years**

**3. Proposal Abstract (limit to 100 words):** ECE251, Introduction to Microprocessors, has been using the Freescale MC68HC12 for well over a decade as a hardware development board for students. The development environment for this processor is now unsupported, with several significant problems cropping up with each new release of Windows. We have decided to move to a modern ARM processor, with excellent software and hardware support, and a processor in widespread use in industry and education. Because of the modest cost of these units, we would like to provide a TI TM4C123G board and a Nokia 5110 graphics device for each student in the class.

## 4. Proposal Budget

TI Tiva C Series TM4C123G LaunchPad Evaluation kit: 80 units @ \$13/unit	Total \$1,040
Nokia 5110 Graphic LCD 48x84: 80 units @ \$10/unit	Total \$800
LaunchPad Boosterpacks 10 assorted units @ \$30/unit avg.	Total \$300
	<b><u>Grand Total \$2,140</u></b>

*Dollar or percentage amount requested from ESTC: We ask that ESTC funds a significant portion of these units, given the low per-unit cost. We recommend 75% ESTC funding, or \$1,605 total funding. The ECE Department would contribute the remaining 25% of costs.*

**5. Full description of proposal:** The current development board software is MiniIDE by MGTEK, which no longer provides formal or informal support. We are now seeing frequent program crashes and even Windows OS crashes when using this program, which is impacting the productivity of our students and TAs. We have sought solutions or workarounds to this problem with ENS with no success. It's time to move to a processor that is:

1. Fully supported, hardware and software
2. Modern (ARM RISC Architecture)
3. Widely used (ARM is used in virtually all smartphones today, including iPhones)
4. Inexpensive

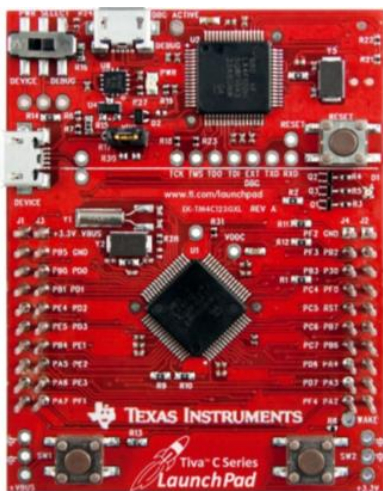
Bill Eads and a part-time student have been moving software to the TI TM4C123G with an ARM Cortex-M4 processor to validate that it will meet our instructional needs in ECE251. We know that this is a powerful processor with more than the functionality we have with our current board. We are now at a point of 99% certainty that, from an instructional point of view, it will meet these needs. We will be replacing a \$70 Axiom board using the MC68HC12 CISC processor developed by Motorola with the \$13 board and \$10 graphic display (see below) for use by each student, so that student work on these systems can be done outside the ECE Lab, at times that work for the students.

This proposal includes 65 units for ECE 251 students and 15 for expected Senior Design projects. Funding is also proposed for 10 BoosterPacks of various functionality, including several networking packs and several transducer packs. These boosterpacks piggyback directly onto the TM4C123G board and obtain power from that board. Dozens of these boosterpacks are available from several vendors. These boosterpacks range in price from \$5 to over \$100. The total number of students affected is:

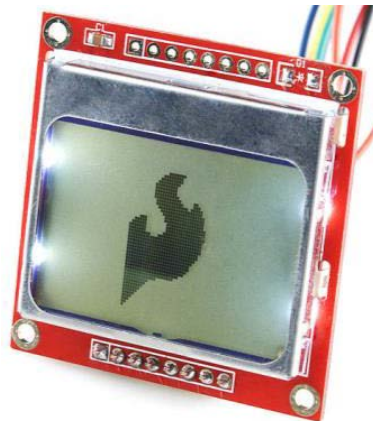
65 taking ECE251 each year and

20 students (approximately) in Senior Design, for whom this processor is powerful, expandable and well understood by students, who have used it in ECE251.

These units should be useful for 5-10 years in ECE251 and for Senior Design projects.



TI TM4C123 Board



NOKIA 5110 Graphics



Typical BoosterPack (WiFi)