EE445L Embedded Systems Design Lab Fall 2019 (8/28/2019 version)
Course Catalog Description Design of microcontroller-based embedded systems; interfacing from both a hardware and software perspective; and applications, including audio, data acquisition, and communication systems.

Course Specific Objectives of EE445L: The primary objective of EE445L is for the students to develop the ability to design microcomputer-based embedded systems. This class allows students to learn microcomputer interfacing from both a hardware and software perspective.

Professor's Personal Objective for the Course: My objectives for this course is for the software centric students to become proficient with hardware and the hardware centric students become proficient with software such that when you are in industry you make more money than those students who elect to be isolated in their comfort zone be it SW or HW.

Outcomes: After the successful conclusion of EE445L, students should be able to design embedded systems including hardware/software interfaces for devices like LCD displays, motors, keyboards, analog sensors and speakers. Furthermore, students will be able to deploy these systems into the IoT environment.

Attendance: Students are expected to attend all lectures. The book covers more information than the class and we will use lectures to map our way through the book. If you miss class you may find it difficult to catch up. DO NOT assume that you can watch old videos of the lectures from 2015 and not come to class.

Prerequisites: EE312 and EE319K with a grade of at least C- in each; EE411 and EE313, or BME311 and BME343, with a grade of at least C- in each; and credit with a grade of at least C- or registration for BME333T, or EE333T.

Grading :
50% Laboratory assignment with a large weight applied to Labs 7, 8 and 11
15% Quiz 1, closed book (1-page crib notes), **Thursday, October 10,** 3:30-4:45pm, **in class**
15% Quiz 2, open book, open notes, **Thursday, November 21,** 3:30-4:45pm, **in class**
20% Final, closed (no crib notes)/open book, **Tuesday, December 17, 2:00 pm-5:00 pm,** regularly scheduled time and place
When studying, focus on the topics that apply to the ARM Cortex M and the lab assignments. You will find old quizzes and finals with solutions on the class web site. I have no expected grade cutoffs or expected GPA for this class. You can view the previous GPAs for most of your classes at UT (MyEdu reports I give a GPA in this class of about 3.3). All professors want a 5 on their teaching evaluation, and all students want an A. However, I feel both should only be awarded for excellence.

Instructor: Jonathan W. Valvano, EER 5.820
Office Hours: Tue 11-12, Tue 2-3, Thur 11-12, Thur 2-3, Fri 10-12, Fri 1-2 You may schedule additional office hours by appointment or drop in if you see my door open. *There is a direct correlation between higher grades on the exams and attending office hours when you have questions.*
Class: **EER 1.516**, Tuesday, Thursday 3:30-4:45pm
email: valvano@mail.utexas.edu (put "EE445L" in the email title, send no ZIP files)
Class web page: http://users.ece.utexas.edu/~valvano/EE445L/
Required Text: Embedded Systems: Real-Time Interfacing to ARM Cortex M Microcontrollers, December 2017, ISBN: 978-1463590154 (fourth edition is ok)

Lecture Videos: https://www.youtube.com/playlist?list=PLyg2vmIzGxXGBxFu8nvX3KBadSdsNAvbA

Equipment to buy:
1) Board. Every student will be required to have a Texas Instruments TM4C123 LaunchPad by Friday 9/6. Since we will be using the TM4C123 kit in EE319K and EE445L for a few years, you will have the option of selling it at the end of the semester. If you can find an EK-LM4F120XL board, it could also be used. Since it is only $13, we suggest each student purchase a board and a breadboard. Buying options for the board can be found by searching www.octopart.com https://octopart.com/search?q=EK-TM4C123GXL However, one option is to purchase it directly from www.ti.com . We have been using the TM4C123 board in EE319K since Fall 2013, so you might be able to find one used. If you do purchase a used microcontroller board, ask a TA or me to run the board tester to make sure all the pins work. If it still works at the end of the semester, you will be able to sell this board to students in the next semester.
2) LCD. Each group of two students will need to a LCD graphics display. We will be using Sitronix ST7735R 18-bit color 1.8" TFT LCD display for $20 plus shipping, http://www.adafruit.com/products/358 If you want a lower cost version you could order it from China (search ST7735R on Amazon or ebay). EE445L has a design competition where students build embedded system. Using the same LCD for labs and for the project will save you time. Just like the microcontroller board, you will have the option of selling the Sitronix LCD to students next semester.
3) Breadboard. You will need a solderless breadboard. We strongly recommend you do not buy used or borrow a breadboard, because as the breadboards get old they fail in mysterious and extremely annoying ways (shorts and opens). The Twin Industries TW-E40-1020 is a breadboard that is easy to find. You can find it for sale on the internet by searching www.octopart.com : https://octopart.com/search?q=TW-E40-1020 Any breadboard, any size will be OK. Another approach is to search "solderless breadboard" on amazon.com aliexpress.com or ebay.com
4) Wirestrippers and voltmeter. You will need own your own pair of wire-strippers and a digital multimeter. You will be stripping a lot of 22 or 24 gauge wire as you build the interface circuits. Your meter must be able to measure voltage and resistance, so a meter costing around $20 will suffice. Since you will be making hundreds of solder joints this semester, we suggest you use the high-quality irons available on the second floor. The NI MyDAC you bought in EE302 can be used for as the voltmeter.

Lab: EER1.806 (shared with EE445M/EE380L.12 in spring)

Unique Numbers:
Unique: 16310 TTH 9:30 a.m.-11:00 a.m.
Unique: 16315 MW 10:30 a.m.-12:00 p.m.
Unique: 16320 TTH 11:00 a.m.-12:30 p.m.
Unique: 16325 TTH 12:30 p.m.-2:00 p.m.
Unique: 16330 TTH 2:00 p.m.-3:30 p.m.

Great TAs: email all TAs professors and staff **f19_ee445l@utlists.utexas.edu**
Bhagawat Vinay
Jaxter Kim
Sikender Ashraf
Matthew Barondeau

Reference materials on the web:
http://users.ece.utexas.edu/~valvano/Datasheets Data sheets for devices used in EE445L

http://users.ece.utexas.edu/~valvano/arm/ Starter files for EE445L and EE345M
http://users.ece.utexas.edu/~valvano/embed/toc1.htm C programming reference manual
http://users.ece.utexas.edu/~valvano/EE345LFinal/ Old exams
Put this DLL LaunchPadDLL.dll into your Keil/ARM/bin folder so you can simulate some of the TM4C123 LaunchPad devices used in EE319K.

Other references: For programming in C see the EE312 materials or the second half of the EE306 text.

Specific EE319K topics needed for EE445L: LED interface, switch interface, busy-wait synchronization, serial communication concepts (start bit, data bits, stop bit, baud rate, bandwidth), UART programming, analog to digital conversion (range, resolution, precision, accuracy), ADC programming, digital to analog conversion (range, resolution, precision, accuracy), interrupt concepts (arm, enable, acknowledge, vector), Output compare interrupt programming
Specific EE312 topics needed for EE445L: Modular programming, differences between pointers and numbers, when to use permanent allocation and when to use temporary allocation, definitions of **int8_t uint8_t int16_t uint16_t int32_t and uint32_t**, understanding and use of **static**, **const** and **volatile**, understanding call by value versus call by reference, stack frames, structures, linked lists, fifo queues, verification. The most important component students must be able to accomplish is the translation of a problem statement into software code. The second most important skill we expect students to have is the ability to debug software.
Specific EE302/EE411/EE313/EE438 topics needed for EE445L: RLC circuits, NPN and PNP transistors, input impedance, output impedance, linear amplifiers using op amps, oscilloscopes, sampling, frequency response, Bode Plots, Fourier Transform, and spectrum measurements (frequency domain).
Teaching philosophy: I strongly encourage students to take an active role in this class. Questions are welcome before, during and after class. Please feel free to email, visit or call me if you have questions. I am very accessible!!
Specific Objectives of EE445L The primary objective of EE445L is for the students to develop the ability to design microcomputer-based embedded systems. This class allows students to learn microcomputer interfacing from both a hardware and software perspective.
Microcomputer Architecture (EE319K review)
An introduction to the microcomputer, architecture, The Cortex M4 Instruction Set, Cortex M4 Addressing Modes, I/O and Memory Organization, The memory map of the TM4C123
Programming Microprocessors (EE312, EE322C review)
Data Structures in C (arrays, tables, linked lists, stacks, and fifo queues), Writing Quality Programs in C, Passing Parameters (Conceptual and Implementation Levels), Modular Programming, Verification and Testing, Documentation
Microcomputer Bus Interfaces
Digital Hardware, Modules and Signals, Drivers, Registers, Timing equations, Timing diagrams,
Parallel and Serial Input-Output
TM4C Parallel I/O Devices, Device Driver Software, Buffered Input and Output, Table and Linked List Interpreters, TM4C Synchronous and Asynchronous Serial Input-Output, Synchronization in I/O devices, Blind-Cycle Synchronization, Busy-Wait Synchronization, Interrupt Synchronization, Polled Interrupts, Vectored Interrupts, Interrupt Priority
Parallel Port Interfaces
Keyboards, Key Debouncing, Keyboard Scanning Techniques, LED Scanning Techniques and LCD Interfacing
Data Acquisition Systems

Bridge circuits, op amps, low pass filters, instrumentation amplifiers, DAC, ADC, audio amplifiers

Motor interfacing

Stepper motors, DC motors, pulse-width modulation, integral control

System level design and integration

Power, packaging, component selection, PCB layout, user interfaces, performance evaluation, and collaborating in teams.

Safety warnings: We are not allowed to use leaded solder on campus. However, due to the lead in most solder, please wash your hands after soldering, before eating or drinking. If you drop the soldering iron, let it fall to the ground. Do not try and catch it. If you are pregnant or think you might be pregnant, have someone else do the soldering.

Lab Partners: Most labs should be performed with a partner. Some will be done with a group of 4 (see below). You and your lab partner(s) must be registered for the same lab section. The lab partnership must be registered with your TA (a simple hand written note signed by both students will suffice) during the week of Sept 9th. Once registered, the partnership will continue. A partnership can be dissolved only after discussion with the TA. Both partners must be present during the demonstration. It is expected that both partners will contribute to all aspects of each lab, and both partners are expected to be present during the check out. The point values are the same for all labs. Lab partners will be selected in your lab the week of January 28th. If you want to switch sections, there will be a googleDoc link on canvas, on which you can request a section swap. Basically, you will need another student (not your lab partner) with whom you will switch sections.

Laboratories

Lab 1. LCD Graphics, **done individually**
Lab 2. Debugging, oscilloscope fundamentals, logic analyzer, dump profile, **group of 2**
Lab 3. Alarm clock, LCD, edge-triggered input interrupts, and SysTick periodic interrupts, **group of 2**
Lab 4D. IEE802.11Wi-Fi communication, TCP, client-server, IoT, **group of 2**
Lab 5. 12-bit DAC, SPI, Music player, audio amp, **group of 2**
Lab 6. Introduction to PCB Layout, PCB Artist, **done individually, (paper design only)**
Lab 7. Design and Layout of an Embedded System, **group of 4**
Lab 8. Software Drivers for an Embedded System, **group of 4**
Lab 9. Temperature measurement, ADC, LCD, **group of 2**
Lab 10. DC motor control, timer interrupts, PWM output, input capture, integral control, **group of 2**
Lab 11. Final Design and Evaluation of Embedded System, **group of 4**

EE445L Laboratory Schedule (see your TA for the latest). Each week there are two 90 minute lab sessions, which are scheduled Monday/Wednesday or Tuesday/Thursday. You will show the preparation to your TA at the beginning of the second session. During the first session demonstrations will be made. The TA will sign your software listing when you demonstrate your system. The report (hardware/software/data plots) is due Friday uploaded to Blackboard according to the directions posted on Canvas. Any EE445L TA is authorized to checkout your lab. Please consult with your TA for specific due dates for your lab section.

Lab Schedule Please see the course web site for the latest lab schedule.

During the week of 9/2, please go to your scheduled EE445L lab sessions in EER1.806 to get a demonstration of the lab equipment. If you do not already own a TM4C123 board, you must purchase one. Each student should have their own board. The lab preparations (hardware diagrams and

syntax-free software source code printouts) must be uploaded to Canvas prior to the beginning of your lab period. PLEASE SEE YOUR TA ON EXACT REQUIREMENTS FOR TURNING IN LAB ASSIGNMENTS. In other words, please type your software into the PC before lab. Attendance in lab is required. All software for lab, and tests must include comments. All hardware must include R&C values specifying tolerance and type (e.g., 5% carbon), and chip numbers (be very specific e.g., INA122P). Pin numbers are required only for lab, not for the exams.

Students are encouraged to go to the last 1 hour of the other lab periods, but the first priority will be to the regular students. The uploading of preparations will close once Lab has begun. For the first 15 minutes of lab, the TA will lead a lab discussion session. The remaining lab time is available for debugging and lab checkout. At the end of the semester please verify with the checkout counter that your record is clear. All reports must be given to the TA by Friday December 6, 2pm.

This is an approximate schedule, please check the website for the latest version.

Week	Chapter	Lecture	Topic [YouTube Playlist]
8/29	1, 2	aLec01 aLec02	Introduction to EE445L, Embedded Systems
9/2	2, 3	aLec03 aLec04 aLec05 aLec06 aLec07	Fixed-point, Graphics, Lab1 project, call graphs Arm Cortex M architecture, features of the TM4C123, data flow graphs, Introduction to interfacing, hardware software synchronization Interrupts, Lab2 project
9/9	2,3,4, 5	aLec08 aLec09 aLec10 aLec11	Critical sections, Debugging debugging techniques, and programming style, dumps, monitor Edge-triggered interrupts BJT transistor interface
9/16	3 11 11.4	aLec12 aLec13 aLec14 aLec15	Specifications and software style Introduction to communication systems Wifi, Wireless communication, client server, IoT (Lab 4 material) Demonstration of CC3100 Weather monitor, and Lab 4
9/23	11.4 8.4 7.5	aLec16 aLec17 aLec18 aLec19	Demonstration of ESP8266 DAC fundamentals, Nyquist Theorem (Lab 5 material) SPI and DAC interface, timing analysis Sound and Music Generation
9/30	9.2.2 8.4 9	aLec20 aLec21 aLec22 aLec23	TPA731 audio amplifiers, see Example 10.4 DAC performance measures PCB Layout, Lab 6 material System level design, clock, power, packaging
10/7	9	aLec24 aLec25	Lab 6 demo Quiz 1 review Quiz 1 (10/10)
10/14	9 10.6	aLec26 aLec27	Low power design, regulators, PCB layout Power supplies, batteries, regulators
10/21	8.1 9 Vol 3 6.1	aLec28 aLec29 aLec30 aLec31 aLec32	Enclosures, connectors Resistors, capacitors SDC File system using FAT16 Input capture, period measurement

10/28	10.2	aLec33	Sensors
	8.2	aLec34	Op amps
	8.2.3	aLec35	Threshold detection
	10.6	aLec36	Resistance bridge, instrumentation amplifier
11/4	8.3	aLec37	Analog filters: HPF, LPF, 2-pole Butterworth LPF
	10.4	aLec38	Introduction to Sampling
	10.5	aLec39	Nyquist Theorem, Aliasing, DFT
	10.6	aLec40	Data Acquisition Systems
11/11		aLec41	ADC Conversion Techniques
	8.5.2	aLec42	DC Motors, PWM, interface electronics (TIP120, snubber diodes)
	6.5	aLec43	BLDC, Servos, Stepper Motors
	6.1	aLec44	Input capture, tachometer interface
	6.5	aLec45	Control Systems,
		aLec46	Lab 10 demonstration
11/18	6,8,10		Quiz 2 review
	3.5		
	10.6		Quiz 2, 11/21
11/25	11	aLec47	Finite State Machines, Stepper Motors Lab 11 programming demo
		aLec48	Real-time operating systems
		aLec49	Communication Theory
		aLec52	Bluetooth
12/2	1.6	aLec50	Ethics
	4.10	aLec51	Keyboard Interfacing, Scanned LED Display
			Open house, final class competition, outside Lab

Legal Stuff: The 12th class day is Sept 13. The drop policy is extremely complicated. See your academic advisor or the Dean of Students for more information. Course evaluation is conducted on the last class day in accordance with the Measurement and Evaluation Center form. The final exam is at the time and place stated in the course schedule. The University of Texas at Austin provides upon request appropriate academic adjustments for qualified students with disabilities. For more information, contact the Office of the Dean of Students with Disabilities at 471-6259, 471-4241 TDD.

Religious Holy Days By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, I will give you an opportunity to complete the missed work within a reasonable time after the absence.

Scholastic dishonesty: "Faculty in the ECE Department are committed to detecting and responding to all instances of scholastic dishonesty and will pursue cases of scholastic dishonesty in accordance with university policy. Scholastic dishonesty, in all its forms, is a blight on our entire academic community. All parties in our community -- faculty, staff, and students -- are responsible for creating an environment that educates outstanding engineers, and this goal entails excellence in technical skills, self-giving citizenry, an ethical integrity. Industry wants engineers who are competent and fully trustworthy, and both qualities must be developed day by day throughout an entire lifetime. Scholastic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, falsifying academic records, or any act designed to give an unfair academic advantage to the student. The fact that you are in this class as an engineering student is testament to your abilities. Penalties for scholastic dishonesty are

severe and can include, but are not limited to, a written reprimand, a zero on the assignment/exam, re-taking the exam in question, an F in the course, or expulsion from the University. Don't jeopardize your career by an act of scholastic dishonesty. Details about academic integrity and what constitutes scholastic dishonesty can be found at the website for the UT Dean of Students Office and the General Information Catalog, Section 11-802."
You are encouraged to study together and to discuss information and concepts with other students. You can give "consulting" help to or receive "consulting" help from such students in oral form. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an email, an email attachment file, a portable storage device, or a hard copy. Copying of any part of a program is cheating without explicit reference to its source. We do enter lab assignments turned in by EE445L students through a plagiarism checker, comparing them to assignments of this and previous semesters. If we find two programs that are copied, there will be a substantial penalty to both students, e.g., failure in the course. Students who cheat on tests or in lab will fail. Prosecution of cases is very traumatic to both the student and instructor. It is appropriate to use software out of the book, class website as long as all copy-pasted software is explicitly referenced. Copy-pasting software from current or past students is scholastic dishonesty. Policies concerning the use of other people's software in this class:

- I strongly encourage you to study existing software.
- All applications and libraries must be legally obtained. E.g.,
  You may use libraries that came when you bought a compiler.
  You may use software obtained from the web.
  You may copy and paste from the existing source code.
- You may use any existing source code that is clearly referenced and categorized:
  original: completely written by you,
  derived: fundamental approach is copied but it is your implementation,
  modified: source code significantly edited to serve your purpose,
  copied: source code includes minor modifications.

The University Honor Code is "The core values of the University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the University is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community." http://registrar.utexas.edu/catalogs/gi09-10/ch01/

The **Digilent Analog Discovery 2** is a low-cost but wonderful tool for this class. It is not required, but very handy, especially if you need to work at home this semester.

Software applications

To complete EE445L labs it will take time outside of the 3 scheduled lab hours. With the crowding we expect in EER, it will be important for you to configure a development system on your laptop (Keil version 4.7x, PuTTy, and PCB artist). This way you will be mobile and flexible about where and when you work on lab. For Keil 4.7x installation see http://users.ece.utexas.edu/~valvano/Volume1/uvision/ . For PuTTY see http://www.putty.org/ . For PCB artist see http://www.4pcb.com/free-pcb-layout-software/

Request samples (DIP or PDIP package) The parts labeled 1) 2) 3) 4) will be requested for you. In other words, we will make one request for the entire class. However, keep these web sites in mind as you design your Labs 7, 8, 11. You will order something as part of Lab 6. **Please order 2,3,4,5 now. Then wait until you design Lab 7, and then order what you need.** You will need to register with an official University email address (e.g., YourName@mail.utexas.edu) rather than a junk email address

(e.g., aol.com or gmail.com). For general information on getting free samples, see http://www.ladyada.net/library/procure/samples.html**.**

http://www.analog.com/en/index.html Analog Devices
AD8032ANZ rail-to-rail op amp

http://www.maxim-ic.com/ Maxim IC
MAX5353ACPA+ or MAX5353BCPA+ single 3.3V-powered, 12-bit SPI interface DAC (ACPA or BCPA)
MAX552BCPA 12-bit multiplying DAC
MAX1246ACPE+ 3.3V-powered, 12-bit ADC, such as the (A or B, with or without +)
MAX5155ACPE dual 12-bit SPI interface DAC (ACPE or BCPE)

http://www.ti.com Texas Instruments (we have ordered these for you)
1) INA122P rail-to-rail instrumentation amp
2) OPA2350PA rail-to-rail dual op amp
3) LM4041CILPR adjustable shunt reference for Lab 5.
4) TLV5618ACP dual 12-bit DAC for Lab 5.
5) TPA731D audio amplifier for Lab 5.

http://www.samtec.com/ SamTec connectors
10-pin LCD connector, BCS-110-L-S-TE (need 1 for the ST7735 LCD to connect to PCB)

Search engine for parts http://octopart.com/
Game engine http://www.3dgamestudio.com/
Hobby parts http://www.sparkfun.com/
Surplus http://www.allelectronics.com/ http://www.bgmicro.com/
Full line http://www.digikey.com/
http://www.mouser.com/
http://www.newark.com/

Put your embedded system in a box (not free, but a good source for choices)
http://www.okw.co.uk/ OKW Enclosures Ltd
http://www.tekoenclosures.com/ Teko Enclosures Solutions
http://www.pactecenclosures.com/ PacTec Enclosures

Curious about my research? See
http://users.ece.utexas.edu/~valvano/research

ABET Relationship of the Course to Student Outcomes: **All these apply to EE445L**
1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science and mathematics
2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3) An ability to communicate effectively with a range of audiences
4) An ability to recognize ethical and professional responsibilities in engineering situations and make

informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5) An ability to function effectively on a team whose members tighter provide leadership, create a collaborative and inclusive environment, establish goas, plan tasks, and meet objectives
6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

For more information see http://www.ece.utexas.edu/about/mission

Emergency Preparedness and Emergency Plan Instructions
Please review http://users.ece.utexas.edu/~valvano/emergency_terms.pdf

Every member of the university community must take appropriate and deliberate action when an emergency strikes a building, a portion of the campus, or entire campus community. Emergency preparedness means we are all ready to act for our own safety and the safety of others during a crisis. It takes an effort by all of us to create and sustain an effective emergency preparedness system. Your support is important to achieving the best possible outcomes during a crisis event.

As a University faculty member, you are responsible for pointing out your classrooms' building emergency evacuation routes and for reviewing emergency procedures with students at the beginning of each semester.
This review should include a mention of the monthly emergency communications test (every first Wednesday at 11:50 a.m.) and the list of communications channels the university uses during emergencies. It should also include a review of the attached document outlining emergency terms (e.g., the difference between "shelter-inplace" and "lockdown") and instructions for faculty and students to follow during emergencies. As a matter of convenience, we recommend including this information in your syllabus along with the phone number for the Behavior Concerns Advice Line (BCAL: 512-232-5050). This is the number to call if you have concerns regarding the attitude or actions of students, staff, or other faculty.

Finally, at the end of your emergency preparedness review, request that students requiring assistance in evacuation inform you in writing of their needs during the first week of class. This information must then be provided to the Fire Prevention Services office by fax (512-232-2759), with "Attn. Mr. Roosevelt Easley" written in the subject line.

Thank you in advance for taking the time to ensure the safety of your classroom. I assure you this small effort can yield much greater rewards should the unthinkable happen. If you would like more information regarding

emergency preparedness, visit http://www.utexas.edu/safety/preparedness/.

Emergency Communications

Emergencies may range from inclement weather, to building evacuations, to campus closures, and the university has a variety of tools to communicate with the public in the event of these and other possible emergencies. Depending on the type of emergency, we may use some or all of the following tools to communicate with faculty, staff and students:

Siren System

This system is tested around noon on the first Wednesday of every month, and delivers a siren warning and public address in the event of certain outdoor emergencies. Read more about the siren system.

Emergency Web Site

You may want to bookmark the emergency Web site because it is updated with information during actual emergencies or campus closures.

Local Press and Social Media

University Communications staff send emergency information to the press and update social media with public safety messages. Because of the transient nature of our population, the university depends a great deal on the press and social media to keep students, faculty, and staff informed during campus emergencies.

Pager System

Our campus first responders, resident advisors, and some building managers are part of the AWACS paging system. The pagers send text messages about emergencies on campus and alert city responders (APD, AFD, EMS, Office of Emergency Management, etc.) to campus crisis situations.

Fire Panel Systems

Residence halls are equipped with fire panel systems that have a public address capability. Resident advisors are trained to use these systems in emergencies in order to make announcements to the entire building regarding evacuation, shelter in place, etc.

Text Alerts

The university collects cell phone numbers from members of the campus community for emergency text messages. Sign up for campus text alerts online.

University Group E-mail

During emergencies, UT Safety Alert sends an “urgent” group e-mail to every student, faculty and staff member. The e-mail directs individuals to the emergency Web site for additional information and instruction.

Voicemail to Office Telephones

This tool leaves a voice message on every faculty and staff member’s office phone on campus.

Cable TV

Residence halls and several of our public gathering places have cable televisions where emergency announcements get posted.

Public Safety Patrol Car Announcements

UTPD patrol cars are equipped with PA systems, which officers can use to provide instructions to pedestrians during emergencies.

University Emergency Information Line — 512-232-9999

Students, faculty, and staff can call this main number for information about campus closures.

The implementation of each tool described above is assigned to an individual who has at least two

backups who can also
carry out the communications task. Individuals with electronic communication tools assigned to them have remote access
(from their homes, etc.) to those tools. The police department and the associate vice president for Campus Safety and
Security are typically the ones who deliver emergency information to university administration. Upon considering this
information, administration develops the messages and activates campus-wide communications. The only exceptions to
this are the sirens and pager system, which are activated directly by UTPD in extremely urgent situations where
immediate action is required.