

## **Two New GE Area B3 Courses on Technology** ES 101A (lecture) and ES 101B (laboratory)

### **Introduction**

The acquisition of scientific knowledge during the last few decades has influenced all aspects of human life such as personal, educational, social, political, and economic. This influence has been worldwide in an irreversible manner, and in a manner unparalleled in the history of mankind. This has changed our culture at home, outside home, nation-wide and worldwide. It has impacted our thinking, learning, manner, mode and speed of communication, interaction, productivity, recreation, and all aspects of life in general. It has resulted in a large vocabulary of scientific and technical terms. Electronic gadgets are an integral part of daily life. Terms such as digital voice and video, decibels, bits and bytes, bit rate, bandwidth, broadband, modem, DSL, ADSL, wireless, mobile, cellular, optical fiber, LCD are part of everyday language – not merely terms that refer to a specific technology, standard or a protocol.

An ordinary citizen may feel uncomfortable with these terms and devices; as a result, he/she may be unprepared to participate fully in the new cultural evolution. Many have accepted these terms and gadgets in their lives without much understanding of their meaning, function and/or operation some with wrong notions and interpretations. While these terms have become part of everyday language, their use is generally without understanding the nuances.

Therefore, there is an ever-increasing need to educate our students, irrespective of their majors, about the new scientific and technical fabric of the evolving culture, to make them fully educated citizens of the modern society, to give meaning to their new vocabulary and to make them knowledgeable about and comfortable with their new living environment.

Therefore, with the above objectives in mind, the ES Department has designed two GE Area B3 courses ES 101A: Communication in the Digital Age, a 3-unit lecture course, and ES 101B: Communication in the Digital Age Laboratory, a 1-unit lab course, that will be offered every semester beginning Fall '09. The lab course will satisfy the GE Science lab requirement. Details of the courses are given below.

## Syllabus of the GE Area B3 lecture course

### ES 101A: Communication in the Digital Age (3)

**Instructor:** Dr. Mohammad Haider

**Office:** Salazar Hall #2010B

**Office Hours:** TBA

**Tel:** (707) 664-2030;      **fax:** (707) 664-2361;      **e-mail:** Haider@sonoma.edu

**Class Duration/frequency:** Lectures: one hour and 15 minutes, twice a week

#### **Course objectives:**

The objectives of this course are to achieve the GE Area B3 objectives which are:

1. Improve their understanding of the concepts and theories of science and technology.
2. Understand the interconnected and ever-changing relationships among the natural, physical, and technological sciences.
3. Critically assess the social and ethical implications of science and technology in relations to their daily lives.
4. Improve problem solving and critical thinking skills through application of scientific knowledge using hands-on activities.
5. Utilize technology in pursuit of intellectual growth and efficacious human interaction.
6. Explore and research application of scientific methods in laboratory.

#### **Course Description:**

Concept of digital age, technology and modern communications, understanding various routinely used technical terms and commonly known computer and communications components and devices; understanding digital voice, video and data communication, mobile communication and communication through internet; ill effects such as radiation, invasion of privacy, unethical usages and protection from them; assessment of learning. (The companion laboratory course ES 101B is strongly recommended; the course does not apply to ES major)  
Prerequisite: GE Math eligibility.

**GE Area:** This course meets GE Area B3 requirement.

#### **Course syllabus and format**

**Format:** The course will have instructor lead lectures and discussion sessions. The students will be expected to do literature survey and write papers on the assigned topics, do home work and projects and participate actively in the discussions. The course will have two tests and one final exam.

#### **Lecture Plan**

1. Introduction to digital age and technology and its impact on daily life, historical perspectives of communication technology; interconnection between science and technology, impact of digital age on modern communication, analog and digital signals; understanding how voice and video are represented by digital signal and its effect on the quality of signal (2 weeks)

2. Developing an understanding of communication and networking terminology such as signal power, decibels, bits and bytes, bit rate, bandwidth, broadband and commonly known computer and communications components and devices such as IC chips, memory, lasers, LCD, HDTV. (2 weeks)
3. Developing a concept of voice, video and data communications over telephone lines, cables, microwaves and optical fibers (2 weeks)
4. Understanding the meaning of narrowband and broadband networks and the internet, how to access these networks, an understanding and operation of modems, DSL and ADSL network access technologies. (1 week)
5. Develop an understanding of the concept and operation of mobile and cellular communications and by-pass technology (wireless local loops) to by-pass local telephone networks. (1 week)
6. Understanding various types of communications devices and components which enable modern communication (1 week)
7. Concept of seamless global networking; how to make cost-efficiency tradeoffs in selecting devices, services and/or setting up home networks. (2 weeks)
8. The ill-effects of technology such as health hazards, loss of privacy, fraud and protection against these; social and ethical implications; communication in the future. (2 weeks).
9. Discussion and review of the course (1 week).

**Text Book and References:**

The scope of the material covered in the proposed course is quite wide, though at a basic level. There is no single book which can do justice with the course. Therefore, a compendium will be prepared extracting desired materials from various books, magazines, web-postings, references. This will be supplanted with the lecture notes. Necessary permission will be obtained for the use of copyrighted material. This compendium will be made available to the students for use in the course. In addition a list of references will be provided for the students to do literature survey and supplement the classroom instructions.

## **Syllabus of the GE Area B3 laboratory course**

### **ES 101B: Communication in the Digital Age Laboratory (1)**

**Instructor:** Dr. Mohammad Haider

**Office:** Salazar Hall #2010B

**Office Hours:** TBA.

**Tel:** (707) 664-2030;      **fax:** (707) 664-2361;      **e-mail:** Haider@sonoma.edu

**Class Duration/frequency:** Laboratory: two hours and 30 minutes, once a week

#### **Course objectives:**

The objectives of this course are to achieve the GE Area B3 objectives which are:

1. Improve their understanding of the concepts and theories of science and technology.
2. Understand the interconnected and ever-changing relationships among the natural, physical, and technological sciences.
3. Critically assess the social and ethical implications of science and technology in relations to their daily lives.
4. Improve problem solving and critical thinking skills through application of scientific knowledge using hands-on activities.
5. Utilize technology in pursuit of intellectual growth and efficacious human interaction.
6. Explore and research application of scientific methods in laboratory.

#### **Course Description:**

Laboratory to demonstrate the concepts discussed in the course ES 101A and give hands-on experience to the students. (Does not apply to ES major)

**GE Area:** This course meets the GE science laboratory requirement.

#### **Course syllabus and format**

##### **Laboratory Plan:**

The course will have about 14 laboratory sessions (10 experiment sessions and four discussion sessions), one per week in the ES Department's six laboratories. The students will conduct approximately ten hands-on experiments that will illustrate the concepts learned in the lectures and expose the students with various types of components, equipment and devices. The discussion sessions will address the relationship of various technical concepts to the principles of science and their applicability and usefulness in our daily life and the society. It will also address the ethical questions that may arise due to the use or abuse of the above technology. Guest speakers from other departments, such as Environmental Studies, Philosophy, Biology, will be invited to enrich the above discussion giving their perspectives on these issues. The students will be expected to participate actively in these discussions. A framework of the ten experiments is given below.

1. Two sessions on hands-on experience and demos with electrical signals and various types of signals such as analog and digital signals, digital speech, digital video and synthetic speech used in computers and robots.

2. Two sessions on hands-on experience and demos relating to various types of computer and communications components and devices such as IC chips, various types of memory, lasers, LEDs, LCDs, solar cells; simple home-usable tools such as multimeter.
3. One session on hands-on experience with digital displays.
4. Three sessions on voice and video communications on telephone wires, cables; how speech becomes light and travels through fibers, radio communications.
5. One session on cell phone communications and communication through internet.
6. One session on home networking and networking devices such as hubs, routers and switches.

There will be total 10 laboratory experiment sessions. In each session students will learn the functionalities and usages of different communication devices/equipments. A sample laboratory experiment could be as follows.

#### A Sample Laboratory Experiment

In this experiment, students will become familiar with the basic communication concepts. How a real world voice signal is converted into an electrical signal by a microphone or transducer. They will also observe the difference between an analog and digital signal on an oscilloscope, how the signal changes based on changes in pitch and volume of voice and finally how these electrical signals get converted back into voice again. In the nutshell, a simple Laboratory Setup and lucid demonstration will help the learners to get a basic understanding of electrical communication, conversion of voice into electrical signal, patterns of analog and digital signals, and finally the conversion back of electrical signals to voice signal.

#### **Text Book and References:**

A laboratory manual will be developed by the ES faculty and made available to the students. In addition a list of references will be provided for the students to supplement their learning in the laboratory.