



# Developing an On-Line Course for the Mobile User with a Social Networking Interface

by

Diane Jones, Web Designer, CED3

Roberto Cristi, Professor, ECE Dept

Naval Postgraduate School, Monterey, CA



Center for Educational Design,  
Development, & Distribution



# Introduction

**Roberto Cristi-** Professor, Naval Postgraduate School's **Electrical & Computer Engineering Department**



**Diane Jones** – Web Designer, Naval Postgraduate School's (NPS) **Center for Educational, Design, Development and Distribution (CED3)**

**The Naval Postgraduate School (NPS)** is an accredited research university operated by the United States Navy. Located in Monterey, CA, it grants both master's degrees and doctoral degrees. The NPS student population of 2400 students is mostly active-duty officers from all branches of the U.S. Military.



1. **The Project Proposal**
2. **Why Mobile Learning?**
3. **Existing *Digital Signal Processing* Course**
4. **New Mobile *Digital Signal Processing* Course**
5. **Mobile Development Tools**

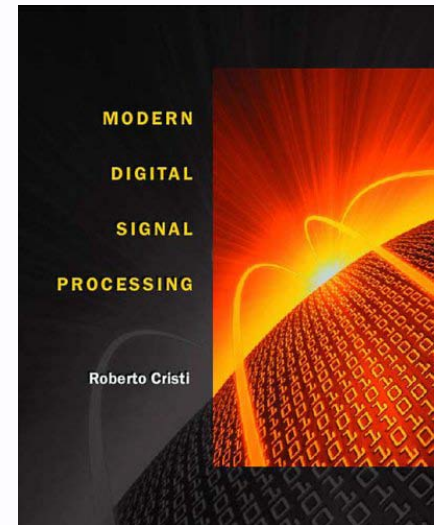


# The Project Proposal

**To develop a mobile learning version of an existing web-based Electrical Engineering course, EO3404 Applied Digital Signal Processing**

Requirements:

- **deliverable on mobile devices**
- **retain existing course content structure**
- **incorporate social networking**





# Why Mobile Learning?

## Educause Horizon Report, March 2011

### *Key Trend:*

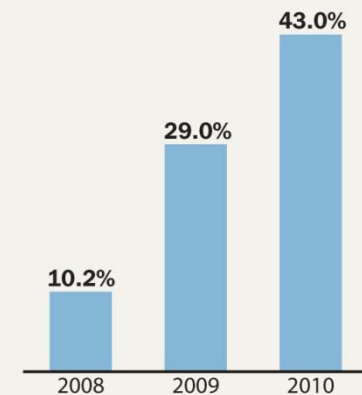
*People expect to be able to work, learn, and study whenever and wherever they want.*

## NPS Mobile Learning Survey

- 60% of the 1800 students surveyed already owned a smart phone
- 55% of students agreed they would use mobile learning if available.



Percentage of Students Who Use Mobile Devices Daily to Access the Internet



SOURCE: EDUCAUSE CENTER FOR APPLIED RESEARCH



# Existing Course: Overview

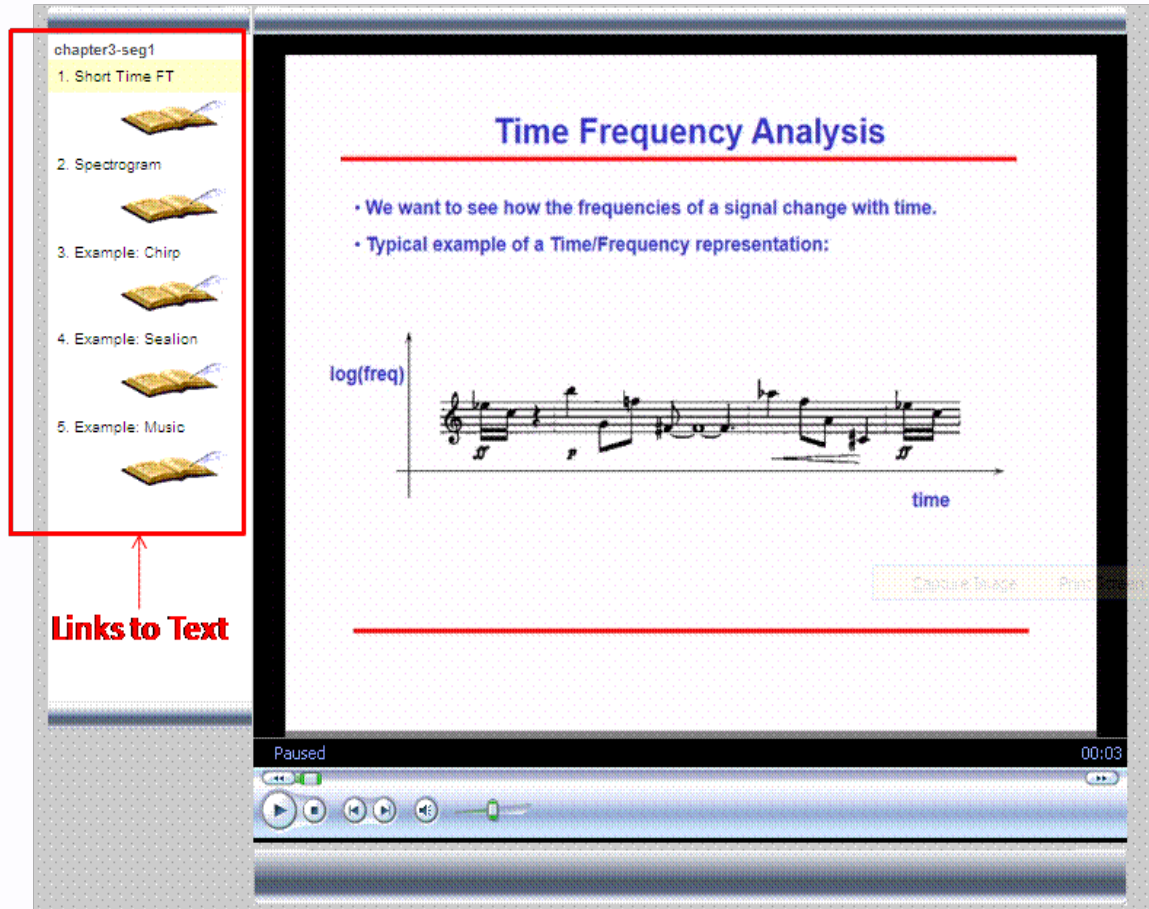
- Development of a highly technical and mathematical course, (EO3404: Applied Digital Signal Processing), for students of the Department of Defense DoD;
- Currently offered to cohorts with students in the US and deployed overseas (Afghanistan);
- Offered since 2009 through either the Internet and/or DVD to accommodate students with limited bandwidth (such as war zone or ship);
- 10 weeks course with a number of computer based assignments and exams;
- Material offered through prerecorded classes and e-textbook, all available on the same site








# Existing Course: Structure

- Lectures and e-textbook are both developed by the same author and they are cross-linked with each other;
- Lectures are organized into short segments (10-15min.) focused on a specific subject;
- A student can follow the course, according to his/her particular preference:
  - Textbook First: read the textbook with links to the lectures
  - Lectures First: watch the lectures with links to the textbook

Each video lecture has links to the textbook ....



The screenshot shows a video player interface. On the left is a table of contents for 'chapter3-seg1' with five items, each accompanied by a book icon. A red box highlights the first item, '1. Short Time FT', and a red arrow points from it to the text 'Links to Text' below. The main video area displays a slide titled 'Time Frequency Analysis' with two bullet points and a musical notation diagram. The diagram has a vertical axis labeled 'log(freq)' and a horizontal axis labeled 'time'. The video player controls at the bottom show 'Paused' and a timestamp of '00:03'.


chapter3-seg1	
1. Short Time FT	
2. Spectrogram	
3. Example: Chirp	
4. Example: Sealion	
5. Example: Music	

**Links to Text**

### Time Frequency Analysis

- We want to see how the frequencies of a signal change with time.
- Typical example of a Time/Frequency representation:

log(freq)



time

Paused 00:03

... each section in the textbook has links to the videos:

## B3. Short Time Fourier Transform (STFT)

### Objectives:

- Understand the concept of a time varying frequency spectrum and the spectrogram
- Understand the effect of different windows on the spectrogram
- Understand the effects of the window length on frequency resolution

[Link to Video](#)

### 1. Introduction

[VIDEO: Short Time Fourier Transform \(19:24\)](#)

In a lot of applications, signal carry information and information changes with time. Unless we talk about a beacon, or some sort of synchronizing tone, most signals of interest present characteristics which change with time. In particular the frequency composition (ie the frequency spectrum) most of the time is time varying: just think of a piece of music or a sound from a speaker. The very fact that the pitch and the tone changes with time makes the signal interesting and suitable to carry information. It would be very boring to listen to a recording playing the same notes over and over or listening to someone who keeps repeating the same sound.

In this section we address the problem of representing the instantaneous spectrum of a signal. This can be done as a simple extension of the Discrete Fourier Transform (DFT) introduced in the previous section, applied to a window "sliding" on the signal. The end result is the spectrogram, which shows the evolution of frequencies in time. This information is very usefull in the analysis of a signal, since it gives a sort of signature in the time and frequency domain. Like a music score, as shown in the figure below, describes how the musical notes evolve in time, so the spectrogram shows how the various frequency components of a signal evolve with time.



Music Score as a Time-Frequency plot



# New Mobile Course: Video Lecture & Textbook

## Lectures and Textbook Accessible from the same page:

Text

EO3404: Short Time Fourier Transform (STFT)  
faculty.nps.edu/dll/mobile/eo3404/B-Discr...  
Google

**Introduction**    The Short Time Fourier Transform    The Spectrogram

**Introduction**

In a lot of applications, signal carry information and information changes with time. Unless we talk about a beacon, or some sort of synchronizing tone, most signals of interest present characteristics which change with time. In particular the frequency composition (ie the frequency spectrum) most of the time is time varying: just think of a piece of music or a sound from a speaker. The very fact that the pitch and the tone changes with time makes the signal interesting and suitable to carry information. It would be very boring to listen to a recording playing the same notes over and over or listening to someone who keeps repeating the same sound.

In this section we address the problem of representing the instantaneous spectrum of a signal. This can be done as a simple extension of the Discrete Fourier Transform (DFT) introduced in the previous section, applied to a window "sliding" on the signal. The end result is the spectrogram, which shows the evolution of frequencies in time. This information is very useful in the analysis of a signal, since it gives a sort of signature in the time and frequency domain. Like a music score, as shown in the figure below, describes how the musical notes evolve in time, so the spectrogram shows how the various frequency components of a signal evolve with time.

*Music Score as a Time-Frequency plot*

Video

EO3404: Short Time Fourier Transform (STFT)  
faculty.nps.edu/dll/mobile/eo3404/B-Discr...  
Google

**Introduction**    **The Short Time Fourier Transform**    The Spectrogram

**Time Frequency Analysis**

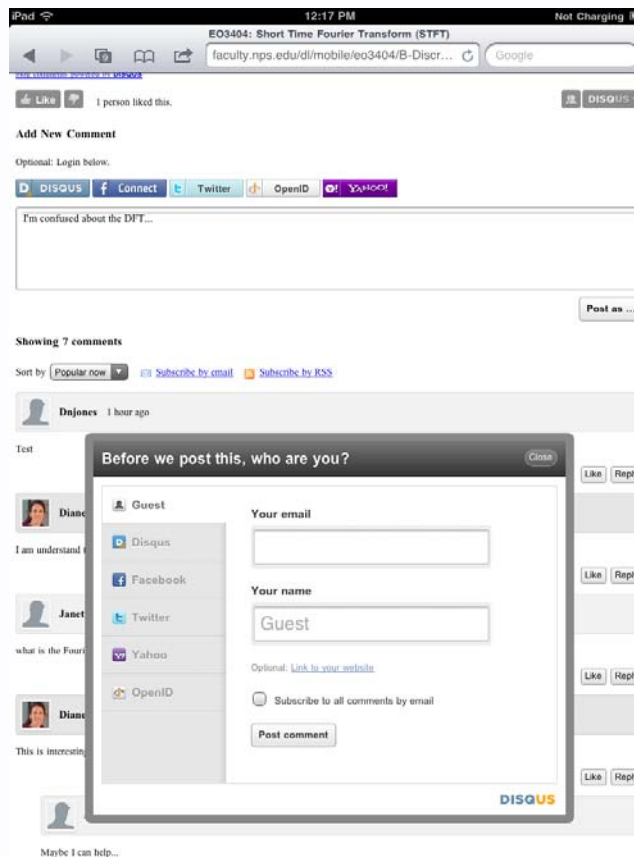
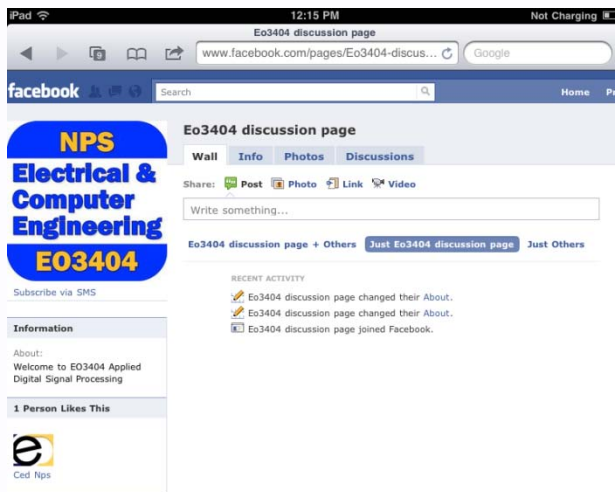
- We want to see how the frequencies of a signal change with time.
- Typical example of a Time/Frequency representation:

*Music Score as a Time-Frequency plot*



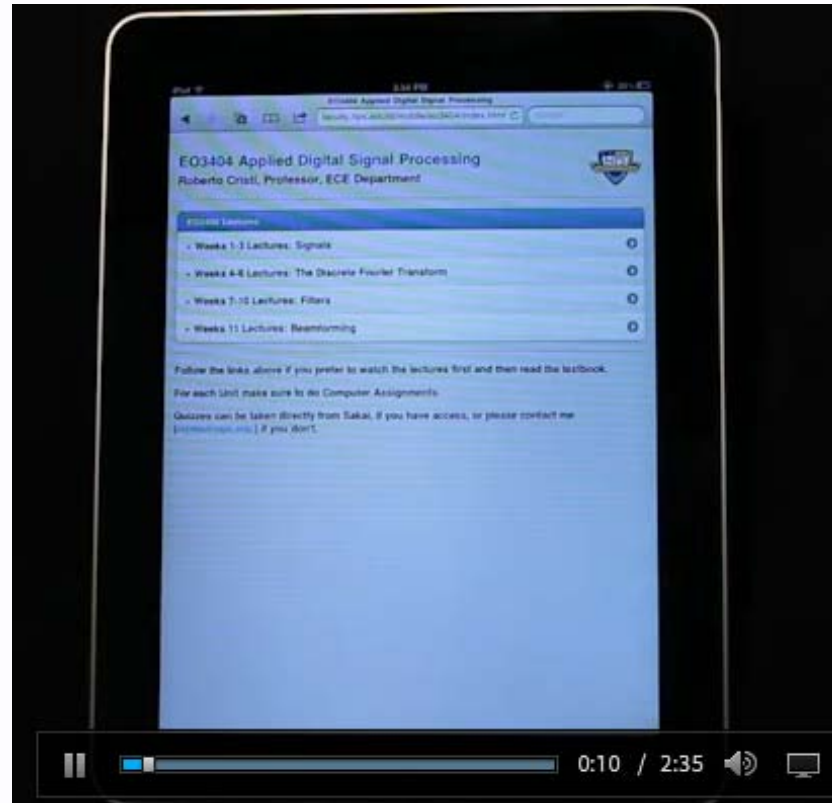
# Integrating Social Networking

... with addition of connection to social networking (Facebook, Disqus or others) to interact with other students and/or anybody else of interest:





# Example of application (video):



iPad demo video: [http://bit.ly/nps\\_ipad\\_demo](http://bit.ly/nps_ipad_demo)

iPad app: <http://bit.ly/hz7x2W>

## What is different about designing a web page for mobile device?

- W3C standards compliant web pages will work on mobile devices; just not optimized; good starting point.
- Mobile devices use state-of-art browsers, that utilize the most current web standards, support HTML5, CSS3, JavaScript
- Bandwidth and speed are limited – keep pages simple

```
<!DOCTYPE html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<title>EO3404 Applied Digital Signal Processing: Weeks 4-6 Lectures: The Discrete Fourier
Transform</title>

<link rel="shortcut icon" href="images/favicon.gif" type="image/ico" />
<link rel="apple-touch-icon" href="images/apple-touch-icon.png" />
<link rel="stylesheet" href="css/jquery.mobile-1.0a2.min.css" />
<script src="js/jquery-1.5.min.js"></script>
<script src="js/jquery.mobile-1.0a2.min.js"></script>
```

HTML 5 Doctype

Typical Web Mark-up

Home Screen Icon

Link in JQuery



# Mobile Development

## Our Basic HTML Page



### EO3404: Weeks 4-6 Lectures: The Discrete Fourier Transform

[Back](#) [EO3404 Home](#) [Discuss on Facebook](#)

- 
- B1. Fourier Analysis
    - » [PowerPoint Slides](#)
    - » [Text & Video Lecture: Section 1](#)
    - » [Text & Video Lecture: Section 2](#)
    - » [Text & Video Lecture: Section 3](#)
- 
- B2. Spectral Estimation
    - » [PowerPoint Slides](#)
    - » [Text & Video Lecture: Section 1](#)
    - » [Text & Video Lecture: Section 2](#)
- 
- B3. The Short Time Fourier Transform (STFT)
    - » [PowerPoint Slides](#)
    - » [Text & Video Lecture: Section 1](#)
    - » [Text & Video Lecture: Section 2](#)
- 

[Take Quiz 2](#)

## Same Page w/CSS & JQuery Mobile linked



EO3404: Weeks 4-6 Lectures: The Discrete Fourier ...

Back EO3404 Home Discuss on Facebook

B1. Fourier Analysis

- » PowerPoint Slides
- » Text & Video Lecture: Section 1
- » Text & Video Lecture: Section 2
- » Text & Video Lecture: Section 3

B2. Spectral Estimation

- » PowerPoint Slides
- » Text & Video Lecture: Section 1
- » Text & Video Lecture: Section 2

B3. The Short Time Fourier Transform (STFT)

- » PowerPoint Slides
- » Text & Video Lecture: Section 1
- » Text & Video Lecture: Section 2

[Take Quiz 2](#)



## Using CSS to achieve “the mobile look”

**Example Linking in Style Sheet for iPhone using a media query:**

```
<link media="only screen and (max-device-width:480px)"  
href="../../../css/iphone.css" type="text/css" rel="stylesheet" />
```

**Example CSS3 application to create the iPhone/iPad text look:**

```
#header a  
{text-shadow: text-shadow:0 1px 0 #ffffff;  
background-image:-webkit-gradient(linear, 0 100%, 0 0%,  
from(#FDC88C), to(#F89E5B)); }
```

**B3. The Short Time Fourier Transform (STFT)**



Embossed Text



# Mobile Development Tools

## Using JQuery Mobile



A Touch-Optimized Web Framework for Smartphones & Tablets

**JavaScript is an scripting language designed to add interactivity to web pages.**

**JQuery Mobile is an Open Source JavaScript library designed for touch-screen mobile devices. It simplifies writing JavaScript for the non-programmer.**

```
<script src="js/jquery.mobile-1.0a3.min.js"></script>
```

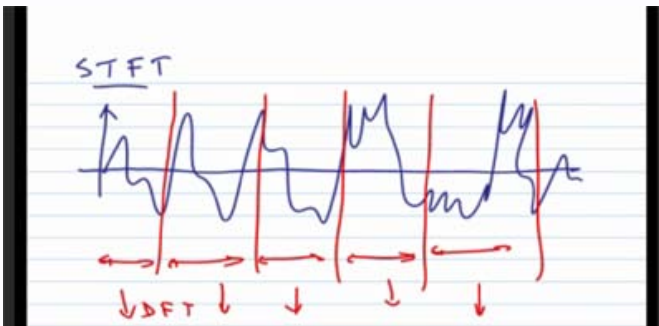
### Examples of uses:

- add animated events to page elements when user clicks
- provides css for mobile UI themes
- HTML 5 data attributes, such as “data-role” to store data on an element

```
<li data-role="list-divider">B2. Spectral Estimation</li>
```

## Incorporating the Video Lectures

- Tablet PC (Dell, Lenovo ...)
- Webcam (Logitech)
- Screen Capture Software (TechSmith Camtasia Studio)
- Low cost (\$3,000 at the most);
- Easily portable, so that classes can be recorded live during regular class times;
- Easy editing after class.



Using a stylus to write on screen



Tablet PC with Stylus



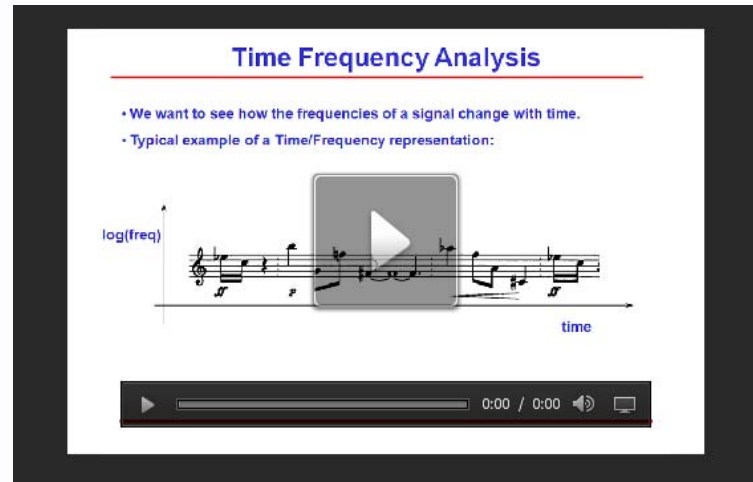
Web Camera

Image is licensed under the Creative Commons Attribution-Share Alike 3.0 Unported license.

## Incorporating the Video Lectures

**Flash video will not work on the iPhone/iPad!** Instead we use the HTML5 video tag, `<video></video>`, as seen below

Video must be an “**mp4**” format, can use software to convert your video format



```
<video class="videoSize" controls="controls" poster="stft.jpg" width="720" height="480">  
<source src="http://faculty.nps.edu/dl/mobile/eo3404/B-Discrete-Fourier-Transform/videos/stft.mp4"  
type="video/mp4" /></video>
```



# Mobile Development Tools

## Incorporating Social Networking tools

The Disqus website, <http://disqus.com/> has clear instructions for adding their comment system to your website. It is a simple and free tool.

**DISQUS**

Discover your community

**DISQUS** is a comments platform that helps you build an active community from your website's audience. It has awesome features, powerful tools, and it's easy to install.

**facebook**

Facebook helps you connect and share with the people in your life.



# Conclusion

Mobile Devices are allowing students to access course material from virtually anywhere

We have the opportunity to utilize the state-of-the-art capabilities these new devices afford for educational experiences

Integrating space for conversation and feedback is essential, especially for Distance Learning students

The tools needed to convert your own course to a mobile application for phones and tablets is relatively simple and inexpensive