

Department of Electrical & Computer Engineering
Florida International University
Spring 2021

Classroom	:	Remote
Class Time	:	8:00 am—9:15 am (M & W)
Faculty	:	Dr. Alexander Pons
Office Hours	:	Mondays 10:00-11:00am or appointment
Office	:	EC – 3145
Phone	:	305.348.7253
Email	:	apons@fiu.edu
Prerequisite	:	EEL 4714 Introduction to Programming Embedded System and EEL 4740 Embedded Computing
Textbook	:	Julian Smart and Kevin Hock with Stefan Csomor Cross-Platform GUI Programming with wxWidgets ISBN 0-13-147381-6 Prentice Hall http://www.wxwidgets.org/docs/book/index.htm

Course Description

Graphical user interface (GUI) for embedded system included elements and style, events, component and object oriented user interface models, and graphical application programming issues. (3 Credits)

Course Objectives

Through successful completion of the course, the student will:

Understand GUI theory and be able to practice it.

Understand and be able to analyze problem and develop a GUI, especially for embedded computer system.

Be able to handle embedded GUI development project.

Topics Covered

1. Introduction to GUI Programming
2. Frame
3. Event Handling
4. Window Basics

5. Drawing and Printing
6. Handling Input
7. Sizers
8. Standard Dialogs
9. Custom Dialogs
10. Images
11. Clipboard
12. Drag and Drop
13. GUI data structure
14. Files and Streams
15. Sockets and Multithreading

ABET Relationship of course to program outcomes:

(Select corresponding boxes below to applicable program outcomes for the course.)

- 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 judgments, 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 together provide leadership, create a collaborative and inclusive environment, establish goals, 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.

Tentative Grading Scale

Grading Scale:		
A	95-100	"Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and honestly to demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook."
A-	90-94	
B+	86-89	
B	82-85	
B-	78-81	
C+	74-77	
C	70-73	
D	69-60	
F	0-59	

Grading Scheme

Assignments	20%
Attendance/Quizzes	5%
Midterm (no make-up)	30%
Final Exam (no make-up)	30%
Project	15%
Total	100%

Project Details

The project will consist of performing all of the development phases of Requirement Analysis, Design, Implementation, testing and deployment to the embedded platform. The completed project will consist of all of the mentioned documentation, including a user manual. A completed fully functional application executable must be submitted in conjunction with all documentation. The application is to execute on embedded environment according to the in class provided specifications.

University's Code of Academic Integrity

Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and honestly to demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational Mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook.

More information can be found at http://academic.fiu.edu/academic_misconduct.html

Department Regulations Concerning Incomplete Grades

To qualify for an Incomplete, a student:

1. Must contact (e.g., phone, email, etc.) the instructor or secretary before or during missed portion of class.
2. Must be passing the course prior to that part of the course that is not completed
3. Must make up the incomplete work through the instructor of the course
4. Must see the Instructor. All missed work must be finished before last two weeks of the following term.

University policies on sexual harassment, and religious holidays, and information on services for students with disabilities

Please visit the following websites:

<http://academic.fiu.edu/>

<http://drc.fiu.edu>

Course Policies

- **Attendance:** Attendance in the course is **mandatory** and student is not allowed to miss any class during the semester. There will be a **penalty** for missing classes and it may affect your final grade.
- **Academic Misconduct:** For work submitted, it is expected that each student will submit their own original work. Any evidence of duplication, cheating or plagiarism will result at least a failing grade for the course.
- **Unexcused Absences:** Two unexcused absences are permitted during the term. More than two will result in the loss of points from your final grade. (1 point per absence above two, 3 points per absence above 5).
- **Excused Absences:** Only emergency medical situations or extenuating circumstances are excused with proper documentation. After reviewing documentation you are required to email a description of the excuse and absence dates as a written record to apons@fiu.edu.
- **On Time:** As in the workplace, on time arrival and preparation are required. Two “lates” are equivalent to one absence. (Leaving class early is counted the same as tardy.)
- **Deadlines:** Assignments are due at the beginning of the class period on the date specified. Assignments submitted late (within 1 week) will receive half credit.
- To get assistance try to see me by an appointment.
- Students are encouraged to ask questions and to discuss course topics with the instructor and with each other.
- **Any work submitted should display Panther ID number and should be signed, as the students’ own work, and that no unauthorized help was obtained.**
- Cell phones, communicators, MP3 players, head sets are not allowed to be used in the class.
- **DO NOT** send assignments by email, only when instructed to do so.
- Instructor reserves right to change course materials or dates as necessary.

Exam policy

1. Make sure to complete the assigned homework in order to do well in the exam.
2. All exams are closed book and closed notes.
3. Use of any electronic device with keyboard is prohibited. This also applies to cellphones with messaging system.
4. No discussion is permitted during the exams.
5. Instructor is not compelled to give credit for something he cannot read or follow logically.
6. Cheating is considered as a serious offense. Students who are caught will receive the appropriate consequences.

Class Schedule

Week	Date	Weekly Topic
1	1/11	Basic and Fundamental Concepts
2	1/18	Chapter 1: Introduction to GUI Programming
3	1/25	Chapter 2: Frames
4	2/1	Chapter 3 Event Handling
5	2/8	Chapter 4: Window Basics
6	2/15	Chapter 5: Drawing and Printing
7	2/22	Review/Midterm
8	3/1	Chapter 6: Handling Input
9	3/8	Chapter 7: Sizers
10	3/15	Chapter 8: Standard Dialogs and Chapter 9: Custom Dialogs
11	3/22	Chapter 10: Images
12	3/29	Chapters 13 & 14: GUI data Structures and Files
13	4/4	Chapter 17: Multithreading
14	4/12	Chapter 18: Programming with Sockets
15	4/21	Final Exam 7:30am – 9:30am

Assignments:

Assignment 1 Tutorial - Tutorial – IDE Installation:

Install CodeBlocks and wxWidgets with wxSmith
http://wiki.codeblocks.org/index.php/User_documentation

and complete both CLI and GUI assignments -

Assign1 -

Install CodeBlocks + WxWidgets (as described in class)

Visit wiki.codeblocks.org (see Documentation)

http://wiki.codeblocks.org/index.php/Basic_Tutorial

Read Basic Tutorial

Create a Native Console Application (Do create a new project)

Submit a screenshot of the IDE with the App running

Assign2 –

Visit wiki.codeblocks.org (see Documentation)

http://wiki.codeblocks.org/index.php/WxSmith_tutorials

Read WxSmith Tutorial

http://wiki.codeblocks.org/index.php/WxSmith_tutorial:_Hello_world

Do Tutorial 1 – Create a wxSmith Application

Submit a screenshot of the IDE with the App running

Assignment 2A - Pointer – 3-dim dynamic Array of integers:

Upload zipped complete project

Develop a console program to build dynamically a three dimensional array of integers.

(x,y,z are obtained from the user on every iteration of building, initializing, displaying and destroying)

The application must be capable of receiving its input from:

- a) the user interactively
- b) from data file using I/O redirection
- c) from a data file specified as a command-line argument using the option -if

The output will be sent to the display as a sequence of 2-dim arrays (x and Y) for as many z. If an outfile is specified at the command-line then the output should be sent to the file. The -of option will indicate the output file if available.

The 3-dim arrays are to be initialized with random numbers from 1 - 9 and displays the array

elements. It must allow the user to continue this process until "N" is entered.

Assignment 2B - Dynamic Array of pointers to functions:

Upload zipped complete project

Develop a program that creates a dynamic array of function pointers that return void and takes an integer parameter. It will then initialize the array with values as addresses of f1, f2, f3 in sequence. It will also, produce a call sequence array of N (entered by user) element to hold the index number for the function array and shuffle it 100 time and then pass these two arrays to a function that will call the functions in the first array according to the sequence in the second array, which terminates with an -1 terminator. Each function should print out "I am fx, my value is, where x is 1, 2, or 3 and the value is a random number between 1 - 100.

Assignment 3 - Dynamic 3-Dim Array of pointers to Objects:

Develop a program that builds a three dimensional array (dynamically) to point to Cell Objects. Make sure the Cell object's keep track of their (x,y,z) location and contains a dynamic array (3 elements) to function pointers. Use a tick function to animate the array, printing the cells location and call a function from the array. The function can be static functions of the class. Make sure you exercise the creating and deleting of the array. You must use separate files for the Cell header and implementation files and where main is located. Make sure to include appropriate pragmas for conditional compilation of code.

Assignment 4 - Drawing Application:

The drawing assignment as described in class.

Two modes - Click and Draw Modes - in Click mode every click is recorded as an x,y (wxPoint) in a fix size array of 100 points, more points then that are dropped. Once the user clicks twice, you enter Draw Mode - here you will connect the points (not a polygon) and any other clicks are ignored. Once the mouse is clicked twice again, the drawing is cleared and you are back into Click mode. Please use a wxPanel as the draw surface.

The display required two areas (panels) one for drawing and the other to maintain the controls of the application (buttons to provide functionality), like "End" button.

Assignment 5 - Basic I/O and Structured Input Format:

This assignment expands the Drawing Application assignment by adding two new buttons one called Save and Load that will Save the current (pen size, points on the drawing panel) need to later load a previous drawn image. The file extension should be .val.

The save and restore capabilities, with color selections. Using XML or JSON.

Assignment 6 -Port Drawing Application to Embedded Platform:

Take the complete Drawing Application (previous assignment) and have it execute on the BBB. This will require that you obtain the wxwidget source code and compile it for the ARM processor. **(Use the approach of compiling the wxwidget library on the BBB - cross**

compilation has changed given the upgrade to 64/32 systems incompatibilities)

Turn-in a step-by-step instruction on how you got your application to run on the BBB, indicating location of download, commands, etc. In addition, submit a picture of the application running on the BBB.

Assignment 7 - Web Spider:

Web scanner for match words found in a set of Urls.

Program accepts a Url file and a word file used to download the webpage at the url and conduct a word search, then display in a scrolling panel each url with the associated word count of found words in the webpage.

Assignment 8 - Multithreaded version of Web Spider:

Enhance the Web Spider assignment by incorporating an elevator widget that lets you select at runtime from 1 to 10 threads, show statistics on the amount of total time, the number of urls to process. The X-number of Urls are divided equally among the Y-threads selected at runtime.

Assignment 9 - Multex and Semaphores:

Please upload your adjustments to Producer/Consumer program that makes sure they operate correctly based on any order of accessing the circular buffer. You are provided with a project consumer/producer without synchronization - please add required code to make it operate correctly coordinating the actions of the producer and consumer threads.

Assignment 10 - Socket Application, new protocol:

Please find the framework for assignment 10 uploaded - implement the virtual remote motor protocol as specified in class. Video Explanation (Links to an external site.)

The uploaded ServerSocketConsole is the implementation of the server-side Motor.

The virtual motor respond to the following commands:

0 - No Command

1 - Start

2 - Stop

3 - Rotate Left

4 - Rotate Right

5 - Speed

Response from server

OK or Error:ErrorDescription

packet format and size for bidirectional communications is size(1) command(1)
optionalContent(#)

ELF investigation:

Please view the following video and make sure you can perform many of these steps.

<https://www.youtube.com/watch?v=mB79rNrpOhg>