CS11 Laboratory 1
Introduction to the CS Laboratory

Overview: *Welcome to the CS 11 Laboratory! Throughout the course, this weekly laboratory will provide you with the opportunity to get your hands dirty on some interesting computer science problems. As you work through the lab, you may wonder how or why something works. The best way to discover the answer is to <u>try things out</u>. The goal of the laboratory is to have you learn by firsthand experiences while also having fun.*

Objective: *This particular lab will orient you to the equipment and the procedures that we will use in the weeks to come. It will help you understand the idea of organizing files into a hierarchy using directories, and navigating through the hierarchy. Finally, you will learn how to enter, compile and run a simple C++ program and begin to understand all relevant terminology.*

1. Format of the laboratories

As you enter the lab there will normally be a handout; please take one if present and perform any additional lab setup activities described there. Part of the lab handout will normally be a check-off sheet for that day's experiments. This sheet enables me to track your progress during the lab. Each time you reach the check-off symbol √ (other than this one) you should call me over to examine your work for correctness and to check-off your completion of lab to that point. Do *not* check off the item yourself, since if you do not have proper results you will want me to help you correct the error before it fouls up the remainder of the experiment. At the end of the lab, be sure to hand in the check-off sheet as it serves as our official record of your attendance and progress in the lab.

You should carefully read the handouts and follow the instructions in it. If you ever have a question, flag me down! I am here to help.

2. Getting set up

As part of each week's laboratory set-up you will need to *log on* to the personal computer. The log-on process will create the proper environment for you to perform the required lab activities. The log-on process will have two parts. One part is making sure the machine is turned on and ready to accept commands. This is the *boot* step. The other part is connecting to the CS network server so that you can access class files and run certain commands.

a. Make sure the monitor is turned on — the on/off switch is on the lower front. If it is on, there will be a lit green LED (light emitting diode).

b. If the machine is turned off, turn it on — the on/off switch is on the front of the machine.

c. The machine will be setting itself up for the first thirty seconds or so after you turn it on. Eventually, it will stop and ask you to enter any key. Do that. Then a window called "Domain Logon" will appear that will ask you for a password. In lab, I will tell you the password to enter at this point.

     The system will then finish its setup process, and you will see the Microsoft Windows *Desktop*. This is the operating system interface that allows you to give commands to the computer easily and efficiently.

3. Using Microsoft Windows

     Along the left side of the desktop, you should typically see a collection of *icons* that represent commonly used programs or files. (Anytime you wish to access something whose icon is not present, you need to find it by first selecting the Start button in the lower left corner of the screen.) In Windows, we communicate our selections by using the mouse. The mouse has a left and a right button. Whenever the directions say to "click" the mouse, this means you should click the **left** mouse button, unless the directions specifically say to click the right button.

a. Move the mouse, and notice that an arrow moves on the screen. This arrow is called the *cursor*. Move the cursor over the icon labeled "My Computer" and click the left mouse button rapidly twice. This procedure is called *double-clicking*, and allows a new window to open on your screen. If this does not happen, you are either not double-clicking in the right place, or you are not double-clicking quickly enough. When it appears, "My Computer" becomes the *active window*. In cases when you have multiple windows open on the screen, the active window is the one whose top bar is purple unlike the others, and it appears to overlay on top of the other windows.

b. At this time, put one of your new 3.5" diskettes in the disk drive, which is located immediately above the power switch. Push the disk in all the way; you will hear a click sound when the disk is completely inside the drive. We shall now format the disk, which means we're going to set up the disk so that the computer can use it.

c. Notice the words File, Edit, View, etc. underneath the words "My Computer". Each word represents a menu of things you can do with the computer files. We will make use of some of these particular menus later.

d. Inside the My Computer window, you should see another collection of icons. These represent *drives*, which are actually just huge sections of memory used by the computer. The drives are always named by a single letter followed by a colon, such as A:, C:, D:, E:, etc. The A: drive represents the floppy disk drive, while most of the other drives are internal computer memory. Move the mouse so that the cursor is

over the icon for the A: drive, and then click the *right* mouse button. You will see a menu appear. Click on the word "Format".

e. A box titled "Format – 3½ Floppy" should now be on your screen. This window is an example of a *dialog box*. Format your disk by clicking once on the "Start" button. When the formatting is finished, you will need to click on "Close" in the Format Result box, and click on "Close" in the Format box. If you want to format more disks, feel free to do so.

f. When you are done formatting disks, *minimize* the My Computer window by clicking once on the minimize button, which is leftmost one of the three little squares in the upper right-hand corner of the window. Notice that the My Computer window has moved to the bottom of the screen, and has become a small icon along the *taskbar*.

You can conveniently get certain programs "out of your way" using this method. The advantage is that the program is <u>still running</u> in the computer's RAM, and can easily be accessed again.

g. Restore My Computer by double-clicking on the small File Manager icon on the bottom of your screen.

Helpful Windows hint: The "ALT-TAB" keystroke sequence (holding down the ALT and TAB keys together), causes you to *toggle* between all programs you have running at one time. This is another easy way to switch easily between programs that you want to keep running, but don't want to have in your way when you're not using them.

4. Getting more comfortable with Windows

We are first going to create a directory on your disk. Directories are useful for organizing similar files (and even other directories) into one place. You might have a directory for programs, one for English term papers, and another for personal letters. The fact that directories can contain other directories as well as files allows you to organize your material in a *hierarchical* fashion, from general (at the top of the hierarchy) to specific (at the bottom). The very top of the hierarchy is called the *root directory*. This contains everything on your disk, and is represented in Windows by a letter such as *C:* (representing the internal hard disk) or *A:* (representing the floppy disk drive).

The way lab will work each week is that you will create one or more directories to store the materials for the current lab. This week we will need to create two subdirectories in the root directory of your diskette, and an additional subdirectory <u>within</u> one of these subdirectories. Note that in Windows, a directory is also called a *folder*.

a. Open the A (floppy disk) drive by double-clicking on its icon. When the A drive window comes up, note that it is empty (there are no icons in it).

b. The first two new directories we want are *TEMP* and *LABS*. We want to create them on your diskette, which should be in drive A. Click once on the word **File** on the menu bar. Inside the File menu, click on "New", then click on "Folder". At this time, a folder icon appears, and the cursor is below it, waiting for you to give the new folder a name. Replace "New Folder" with "temp", and then hit enter. This will be the name of the new folder.

c. Use the same procedure to create a *labs* directory.

d. To create a *lab01* directory inside the *labs* directory, first we must go inside the *labs* directory by double-clicking on it. A window appears for the *labs* directory, and notice that this directory is empty. Follow the same procedure used above to create a new directory here called *lab01*. This will be a directory within *labs*, which in turn is a directory within your floppy disk in the A drive. The following tree diagram shows the relationship of the three directories you have just made:

e. Let me check your file hierarchy on your disk. √

5. Using the Internet to access class files

The Internet is the so-called "information superhighway". It consists of millions of computers that are loosely connected. Any computer is capable of talking to any other computer on the Internet. The files you will be using for today's lab are available on a machine elsewhere in Riley Hall.

a. Within the desktop, find the "Netscape" icon and open the window by double-clicking it. After a few seconds, a World Wide Web "home page" should appear. (This will typically be the Netscape Corp. home page, but it's often re-set to another page in Riley 201.)

b. Look at the "Location" box. This box contains the Internet address of the currently displayed page. To change pages, you can follow *hypertext links* (the colored, underlined text), or enter a specific new address. Click in the location box, and hit

backspace to erase the address that is already there. Now, type in the following address (and hit the enter key):

```
http://s9000.furman.edu/healy/cs11/
```

c. Click on "hello.cpp". That will cause a computer file to be displayed. Save it to your diskette by opening Netscape's **File** menu and selecting the option *Save As*. When the *Save As* dialog box comes up, replace "hello.cpp" in the "File Name" box with:

```
A:\labs\lab01\hello.cpp
```

Click "OK". When the dialog box goes away, HELLO.CPP will be on your floppy disk

d. Go back to the previous page by clicking on Netscape's "Back" button.

e. Once you've finished copying the files, go back to the *lab01* window to make sure that *hello.cpp* is there. Click on the disk icon with "a:" beside it to make sure you're looking at your floppy disk drive, and then click on the icon for the folder that has *labs* beside it, and on the icon for the folder that has *lab01* beside it.

f. Have me check your progress to this point. √

6. Starting Borland C++

Much of your time this term will be spent in the Borland programming tools that run under Microsoft Windows. This environment will allow you to create and edit program and other text files; compile and run the programs, and perform debugging activities. Today we'll get a first look at it.

a. From the desktop, double-click on the "Borland C++ 4.5" icon. This will start up the programming environment.

b. You should now see a large "Borland C++" window on your screen. Notice the words **File**, **Edit**, **Search** and so on just under the Title Bar. These are the Borland C++ menus. If there is a white inner window already containing some program (e.g. hello.c), then delete this window by clicking on the close (X) button in the top right corner. Be careful – all windows have a close button: when you close any window, make sure you're closing the right one.

c. Move the cursor to the word **File** and click on it. In the **File** menu, click on the word *Open*. This will allow you to open a C++ *source file*—a program written in C++.

d. You will now see the "Open a File" dialog box. Notice that the "Drive" field in the lower right corner is not pointing to the *A:* drive. To move over to the *A:* drive, click on "a:" in the menu of drives.

e. Check the "Path" field again. Are you working in the *lab01* directory? If so, proceed to the next step. If not, type "\labs\lab01" into the "File Name" field and hit enter. (Or click on the *labs* and *lab01* icons in turn.)

f. In the "Files" section of the "Open File" dialog box, you should now see a list of *.cpp* files in the *lab01* directory of your diskette. The file you want is *hello.cpp*. Double-click on this file name. This will open a new window within Borland C++ that contains a short C++ program (which you just downloaded from the Internet).

g. Put the cursor on the *title bar* that runs across the top of the new window. Press and hold down the left mouse button and move the cursor down one inch. This is called *dragging* (as opposed to clicking), and dragging the title bar should **move** the entire window. Now, place the cursor on the bottom right-hand corner of the window. You need to move to the actual corner of the window, not the square box below the vertical scroll bar. When your cursor is in the right place, it will change into a different type of arrow. Drag this corner up and to the left one inch. This should change the size of your window.

h. Sometimes the windows you are working in are not as large as they could be. The larger the window, the more text you can see at one time. Look at your Borland C++ window now. Does it cover the entire screen? There a maximize button (middle one of the three little squares) in the upper right hand corner of every window. Click on the maximize button if your windows do not cover the entire screen.

i. The file *hello.cpp* is a source file containing C++ code. At the top of the source file is *header information* for the program. Modify the heading to include all information relevant to you (your name, the class section, today's date, etc.). If you click somewhere in this window, you should see a blinking horizontal line called the *insertion point*. When you start typing, what you type will appear here. You can move the insertion point with the mouse or the arrow keys.

j. When you are done typing the program in, *save* your program by selecting the *Save* option from the Borland C++ **File** menu. If you do not save the program you are putting yourself in a position to lose all that you typed.

Warning: If you have more than one file open, only the file that is the active window (currently receiving your keystrokes) will be saved with this menu option.

k. *Compile* and *link* your program by selecting the *Build All* option from the Borland C++ **Project** menu. Your program's window must be the active window with the title bar highlighted with color. When compilation and linking are complete, click on the **OK** button of the "Compile Status" dialog box.

l. Once you get a successful compilation—creating an *object file,* you can close the Message window. Next, choose the *Run* option from the **Debug** menu. Once you have examined the output and it is satisfactory, you can close the output window. Call me over to check your program's compiling and execution. √

m. Remove the semicolon from the end of the *cout* line in *hello.cpp* and attempt to *Build* the program again. The compilation will end with errors, and you should see a "Messages" window with various complaints about the *syntax* of your program. Click on the first error message and press *F1*. You should see a help screen that explains the meaning of the error message.

n. Let's write a second C++ program. At the top of the Borland window, click on the word *File*, and within the File menu, click on "Open". A box called "Open a File" will appear. In the white box under "File Name", type in the name of the new program: *second.cpp*. Then click the "OK" button on the right (or hit enter). Note that Borland permits you to work on multiple programs simultaneously. The window for *second.cpp* will be active while *hello.cpp* is in the *background*.

o. In the empty window for *second.cpp*, type in the following program:

```
// This second program is similar to the first.

#include <iostream.h>
int main()
{
   cout << "Your Name" << endl;
   cout << "CS 11, Lab #1 << endl;
   cout << "Sept. 14, 1999" << endl;

   return 0;
}
```

Compile and run this program just like you did for the hello program earlier. If the compiler detects any errors, you will need to correct them first. Make sure you type in your program exactly as it appears above, including punctuation.

p. Experiment with this new programming by adding more *cout* statements before the return statement. Compile and run the program again. Now interchange the first and second *cout* statements. You should notice that the program's output depends directly on what modifications you make to the program. Save the program *second.cpp*. Call me over to see both your programs. √

q. Select the *Exit* option from the Borland C++ **File** menu. Now, look at the contents of the *lab01* directory. Notice that there are several new files that have been created by the compiler. For example, *hello.exe*, is an executable file. Double-click on its icon.

Using the File Manager some more

One routine skill we need is to know how to copy and delete files and directories in Windows. This is an important skill for programmers so that they can make backups

of their work. Now we'll learn how to make backups of files by copying *hello.cpp* to *myhello.cpp*. Backing up files is a good idea, just in case something goes wrong that you didn't expect, and you would like to go back to an older version of a file and start again.

a. In the *lab01* window, right-click once on the *hello.cpp* file.

b. When the menu appears, select (left mouse button) "Copy".

c. Right-click on any empty space in the A drive window.

d. When the menu appears, select "Paste". Click the name of the "Copy of hello.cpp" icon once, and then edit the name of this copied file to be "myhello.cpp".

e. Delete *myhello.cpp* by right-clicking once on it icon, and then select the *Delete* option from the menu.

e. When the operating system asks for confirmation of the deletion, click **Yes**.

f. You can reinstate the *myhello.cpp* copy by repeating steps a-d above. Directories can be copied and deleted the same way as files. Experiment by making a copy of the TEMP directory, and then deleting it.

g. When you feel comfortable with the copying and deleting steps, call me over so I can see a quick demonstration. √

h. Now we are done with the lab, so it is time to log out of the machine. Click on the Start button in the lower left corner of the screen. Select the "Log Off Csdept" option at the bottom of the menu. A box will appear in the middle of the screen. Click on "Yes" to log yourself out.