

New York University

Tandon School of Engineering

Department of Electrical & Computer Engineering

Introduction to Operating Systems (CS-GY6233)

Fall 2021

Assignment 2

(10 points)

In this assignment, you shall develop a very simple Linux kernel module that runs on your virtual machine.

Please consult the freely available O'Reilly book "Linux Device Drivers, 3rd Edition" (<https://lwn.net/Kernel/LDD3/>), in particular p.16, as well as your text book p.96 to get you started. Note that even though the book is written for kernel version 2.6, most mechanisms are applicable with minor or no changes. The relevant function is copied below as a starting point.

```
#include <linux/init.h>
#include <linux/module.h>
MODULE_LICENSE("Dual BSD/GPL");
static int hello_init(void)
{
    printk(KERN_ALERT "Hello, world\n");
    return 0;
}
static void hello_exit(void)
{
    printk(KERN_ALERT "Goodbye, cruel world\n");
}
module_init(hello_init);
module_exit(hello_exit);
```

The `hello_init()` function is invoked when you insert your module (using the `insmod` shell command), whereas the `hello_exit()` is called when you unload your module (using the `rmmmod` shell command).

Modify this module such that the `init` function prints the tick time (as we defined it in lecture 2) after the `hello` message, whereas the `exit` function prints the time between the insertion and removal of the module, after the goodbye message. You shall print the tick time in milliseconds and the time difference in `seconds.milliseconds` format.

Use the `dmesg` shell command to view messages printed by `printk()`.

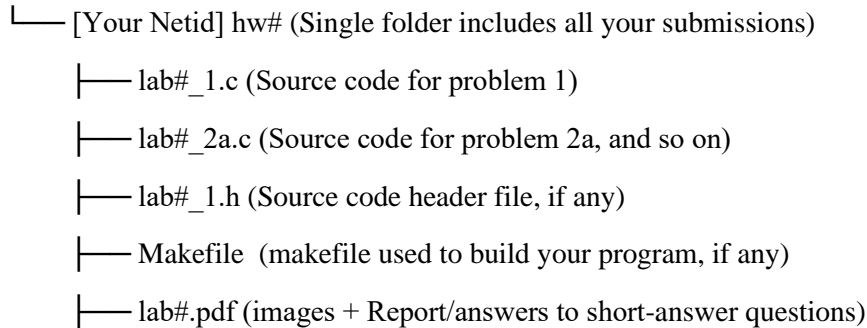
You may use the Makefile provided in the O'Reilly book, but you may need to install the kernel headers prior to using it if not already installed:

```
sudo apt-get install linux-headers-$(uname -r)
```

Hint: Search for "jiffies" and "HZ" in the O'Reilly book.

Submission file structure:

Please submit a **single .zip file** named **[Your Netid]_lab#.zip**. It shall have the following structure (replace # with the actual assignment number):



What to hand in (using Brightspace):

- A source file named **“lab2.c”** (with appropriate comments). Do not attach project or make files.
- Your Makefile
- A .pdf file named **“lab2.pdf”**, containing:
 - Screen shot(s) of your terminal window showing the current directory, the command used to compile your program, the command used to run your program and the output of your program.

RULES:

- You shall **use kernel version 4.x.x or above**. You shall not use kernel version 3.x.x.
- You may consult with other students about GENERAL concepts or methods but copying code (or code fragments) or algorithms is NOT ALLOWED and is considered cheating (whether copied from other students, the internet or any other source).
- If you are having trouble, please ask your teaching assistant for help.
- You must submit your assignment prior to the deadline.