

ITSC 3146-001 Introduction to Operating Systems and Networking Spring 2018

Course Catalog Description

ITSC 3146. Introduction to Operating Systems and Networking. (3 credits)

Introduces the fundamentals of operating systems together with the basics of networking and communications. Topics include: processes, threads, scheduling, cache, memory management, file systems, interprocess communication, network architecture and protocols, HTTP, MAC, IP, TCP/UDP, internet routing. (Fall, Spring).

3 credit hours

Prerequisites

ITSC 1213 and ITSC 1213L

Lectures

Monday & Wednesday, 8:00AM – 9:15AM
Woodward Hall, Room 130

Attendance is required.

Instructor

Julio César Bahamón, Ph.D.
Email: jbahamon@uncc.edu

Office Location: Woodward Hall, 210C

Office Hours: Tuesday, Thursday and Friday, 10:00AM – 12:00PM
*Appointments are **not** necessary, walk-ins welcome.*

In the event that none of the times listed work due to a scheduling conflict, check the instructor's Google calendar [URL: <https://tinyurl.com/yb6wjnb9>] and email him with a set of suggested times to meet.

Course Objectives

Operating systems and networks are fundamental components of modern technological systems. Today systems cannot work in isolation. The operating system is the key software layer that manages the device hardware and the network stack that allows multiple devices to communicate. The aim of this course is to provide computer science undergraduate students with fundamental concepts in operating systems such as process, file and memory management and interprocess communication. Similarly, a major aspect of the course is to understand key network components and protocols such as the OSI Model, MAC, IP routing and TCP/UDP, HTTP protocols. Students learn through several hands-on activities how to setup and configure infrastructure focusing on the use of the command line terminals in Linux,

writing shell scripts, access control rules as well as configuring common network services such as DNS, SSH and firewalls.

Course Textbook

Modern Operating Systems, Fourth Edition. (Prentice Hall, 2014. ISBN 978-0133591620) by Andrew S. Tanenbaum, 2014

The textbook is required. The access code is not needed; hence, a used or rented copy is sufficient.

Additional References

- *Operating System Concepts*, Seventh Edition (ISBN 978-0471694663) By Abraham Silberschatz , Peter B. Galvin and Greg Gagne, 2004
- *Operating Systems: Principles and Practice*, 2nd Edition (ISBN 978-0985673529) By Thomas Anderson and Michael Dahlin, 2014
- *Computer Networking: A Top-Down Approach*, Sixth Edition. (Addison Wesley, 2012. ISBN 978-0132856201) by Jim Kurose and Keith Ross, 2012
- *Computer Networks, Fifth Edition*, by Andrew S. Tanenbaum and David J. Wetherall, Pearson, 2010. ISBN-13: 978-0132126953 | ISBN-10: 0132126958
- *UNIX Systems Programming*, by K. A. Robins, S. Robins, Prentice Hall, 2003.
- *Advanced Linux Programming*, by Mark Mitchell, Sams Publishing, 2001, ISBN0735710430, 9780735710436
- *Linux Kernel Development (Third Edition)* by Robert Love, Publication Date: June 22, 2010 | ISBN-10: 0672329468 | ISBN-13: 978-0672329463
- *UNIX for Programmers and Users (3rd Edition)* by Graham Glass, King Ables, Publication Date: February 16, 2003 | ISBN-10: 0130465534 | ISBN-13: 978-0130465535

Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Use operating system interfaces: interrupts and system calls
2. Program run-time environments: processes, threads, synchronization primitives
3. Implement elementary networking (TCP, IP, client / server) and use inter-process communication
4. Implement a simple client-server socket-based application
5. Understand and apply concepts of memory management (e.g. partitioning, paging)
6. Contrast Kernel and user mode in an operating system
7. Understand the potential threats to an operating system

Course Topics

- **Operating Systems**

- Intro to Operating Systems and logical layers
- Process Management, Threads and Scheduling
- Memory Management
- Interprocess Communication and Pipes
- File Systems
- Kernel and Device Drivers
- Virtual Machines
- Domain separation, process isolation, interrupt processing, resource encapsulation, least privilege

- **Networks**

- OSI Layers
- L2 and MAC
- IP and Routing
- Subnetting
- TCP/UDP
- DNS, HTTP and the Web
- Firewalls

- **System Administration**

- Working with the Command Line Terminal
- Editing using Vi/EMACS
- Bash and Shell Scripting
- Access Control Lists, sandbox
- SSH
- Network Configuration

Grading

Learning outcomes will be assessed through tests, quizzes, exercises, coding assignments and group activities. **For all assignments, it is expected that the deadlines posted in the course schedule will be met.** Circumstances such as computer crashes, unexpected software incompatibilities, various equipment failures and so forth will be taken into consideration, but only those that were unanticipated and occurred at the last minute will be considered reasons for mercy. **Beyond hardware and software issues, no excuses for missed examinations and any other assignments will be accepted other than those approved by the University.** All requests for exceptions must be submitted in writing (via email) within a week of the deadline and must be approved by the instructor.

Students with excused absences must arrange to make up work with the instructor. **Unless an explicit excuse is granted, no assignments will be accepted late, no exceptions.**

All work is due **before midnight on the due date**. **Any work submitted late will receive an automatic grade of zero**. All work must be submitted using Canvas. **No work will be accepted via email, no exceptions**.

Grade Distribution

- Prep Work: 10%
 - Includes all pre-class activities, such as content quizzes, videos, readings, surveys, pre-class assignments, etc.
 - Includes group Poll Everywhere quizzes
- Engagement 10%
 - Includes class attendance and participation, team work, etc.
- Exercises & Assignments: 40%
- Tests: 40%

This Course uses Standard UNC Charlotte Letter Grading. If X is the overall weighted average accumulated on all course components, then the final course grade will be guaranteed as follows:

Range	Letter Grade
$X \geq 90$	A
$80 \leq X < 90$	B
$70 \leq X < 80$	C
$60 \leq X < 70$	D
$X < 60$	F

Course Structure

Lecture and Exercises: The course is structured using the flipped classroom pedagogical model. Lectures consist primarily of in-class activities, discussions, and question & answer sessions. **You will be expected to read course materials and watch videos before coming to class**. The in-class exercises provide the opportunity to explore recently covered materials with peers, i.e. the members of your lightweight teams. The exercises are submitted so the instructor can assess the class' comprehension of materials in a timely manner and to help you master the course content. We will also have Poll Everywhere surveys and other survey-based activities. **Please note that in-class activities constitute a significant portion of your final grade.**

Group Work: Most of the work done in this class will be in the form of in-class group assignments. **You are expected to collaborate with your teammates during class**, i.e., you cannot simply split the work, instead **you are to work together on a solution** and then submit individually. We will cross-check attendance records to ensure that points are only given for

activities that you participated in. Finally, **note that a portion of your grade will be based on an evaluation of your performance given by your teammates.**

Students will be placed in Lightweight teams, which are **assigned by the instructor**. A lightweight team consists of three (3) students who must seat together for the entire semester and complete one or more low-stakes activities each class period. Activities are designed to have a low direct impact on a student's course grade.

Homework: Homework assignments will be completed outside of class. Homework consists of larger programming assignments or exercises that require students to incorporate several of the topics covered in class. Homework will typically be given one to two weeks for completion. Homework assignments are designed to require several hours of focused effort. Please plan accordingly and start your work early.

Exams: Exams test each student's knowledge of specific modules of information. Exam problems are similar in length to the exercises done in class.

The final exam for the course will be on Monday, May 7, 2018 from 8:00AM to 10:30AM.

Time Commitment: **You are expected to spend, on average, 4 to 8 hours per week outside of class preparing for class and working on assignments.** This includes reading the textbook and/or other course materials and watching the course videos before coming to class. In some weeks, especially those around homework deadlines or exams, you may spend more than 12 hours on course work. Please plan ahead and use your time wisely. Do NOT wait until the last minute to complete homework assignments or prepare for a test!!!

Writing Quality: Please make note of the fact that any text that you provide as part of your assignments will be graded for spelling, grammar and formatting and well as clarity, coherence and completeness. Effective written communication is a central part of professional interactions, whether you are describing game design, software design, product design, algorithms, etc. If you need help improving the quality of your writing, you may schedule an appointment at the **UNCC Writing Resources Center** (<https://writing.uncc.edu/writing-resources-center>).

Course Policies

Academic Integrity: **Students are required to know and abide by the UNC Charlotte Code of Student Academic Integrity.** Students are expected to submit their own work, and fully cite any sources used. Assignments or projects that are not appropriate in an academic setting, subject to the instructor's discretion, will not be accepted for a grade. Please review the following link for details: <http://legal.uncc.edu/policies/up-407>.

Note that all students will be required to sign and submit both an *Academic Integrity Compliance Agreement* and a *Limited Copyright Permission and FERPA Disclosure Consent*. No work will be graded until these documents are received by the instructor. The deadline to submit the agreement and disclosure is 48 hours after the last day to add/drop, which is January 18, 2018.

All work that you turn in for grading must be your own! This means that all work must be an independent and individual creation by you. **Any attempt to gain an unfair advantage in grading, whether for yourself or another, is a violation of academic integrity.** You may only work on an assignment with another student(s) in the class if explicitly stated in the assignment. **Students who cheat on a homework, exercise, or exam will receive a -100 for the assignment and will be reported to the Dean of Students Office.** Cheating is worse than not turning in the assignment. Here is a non-exhaustive list of recommendations:

- Do not use other student's code, answers, or electronic artifacts (e.g. game artwork).
- Do not share your code, answers, or electronic artifacts by any physical or electronic means.
- Do not copy or use code, answers, or electronic artifacts from someone who took the class X semesters ago.
- Do not copy or use code, answers, or electronic artifacts from someone in another section of the course or in a similar course at another institution.
- Do not use code, answers, or electronic artifacts found online.
- **The only people that you may receive help from are your instructor and the TA(s) for this course.** *The only exception to this rule are group assignments and exercises.*
- You MAY use any of the resources provided by the teaching staff on the course website.
- You MAY also reference your textbook, the textbook website, standard documentation, such as the C Standard Library, the Java API or the GameMaker on-line documentation, and the C Standard Library documentation. You MAY NOT receive help from anyone or anything else.
- If you have any doubts whether an action is appropriateness or ethical, please ask the instructor.

Examples of Cheating (this list is NOT exhaustive):

- To give any student access to any of your work which you have completed for class assignments, exercises or exams.
- It is cheating AND plagiarism to use another person's work and claim it as your own. You are expected to complete all assignments, exercises and exams on your own, unless otherwise specified in the assignment.
- To interfere with another student's use of computing resources or to circumvent system security.

- To email, ftp, post on the Internet, bulletin boards, message boards, etc. your work for others to obtain. Do NOT use sites that allow you to "anonymously" post code. Those sites are searchable, and others may find your code (like the teaching staff).
- To ask or pay another person or persons to complete an assignment for you.
- It is cheating AND plagiarism to decompile any compiled code and use the decompiled source code as your own. You may also break the law by decompiling code.
- It is cheating AND plagiarism to use code, answers and/or materials that you find online.
- To give another student access to your account (UNCC account or others that you use for university work) or to give them your account password.
- For you and another student to work collaboratively on an assignment, unless otherwise specified by the assignment. For example, working in your lightweight teams and submitting one program for all group members is expected.
- To circumvent the intention of the assignment and/or the automated grading system (e.g., by hardcoding test case solutions).

Examples of NOT Cheating (this list is NOT exhaustive):

- Using the code from the class website (with citations in the comments).
- Using code from other programs YOU wrote.
- Using code from other programs that YOU and a partner wrote as part of assigned exercises.
- Help from TA or instructor (with citations in the comments).
- Using code from the textbook or textbook website (with citations in the comments).
- Using code from the C Standard Library, Java API or GameMaker documentation (with citations in the comments).

Example Citations:

```

/*      (In file or function level comments)
 *      I received help from Dr. Bahamon on [date] during
 *      his office hours. We discussed X.
 */

/*
 *      The code for this method is based on Exercise Y
 *      that I completed with Z on date.
 */

```

Protecting Yourself:

- Do not leave papers lying around your workstation.
- Do not dispose of important papers in the lab recycling bins and trash cans until after the assignment is graded.
- Do not give out your password.

- Use a strong password.
- Do not leave your workstation unattended or forget to log yourself out.
- Do not leave your laptop unattended.
- Do not give other students access to any of your workspace or email them any code.
- Do not give other students access to your course materials or your personal computer.
- Do not email, ftp, or post your code on the Internet, message boards, etc.
- Keep all copies of final and intermediate work until after the assignment is graded.
- Keep all graded assignments until after you receive the final grade for the course.
- Do not discuss implementation details of the assignment with your peers.

Poll Everywhere and Other In-Class Activities: **You are required to have a laptop computer or mobile device for this class.** We will use the Poll Everywhere software for quizzes and other in-class activities. Information collected from Poll Everywhere will be used to track student attendance and to assign a significant part of your engagement grade. Detailed information on the use of this software will be posted on Canvas. For more information on Poll Everywhere and to download the mobile app, go to the following link: <https://www.poll everywhere.com/>

Laptop Computer Requirement: **Students are expected to bring a laptop or notebook computer to class.** If you do not have a laptop, you may borrow one from the Atkins Library or from the CCI Help Desk.

The teaching staff asks that students respect their neighbors and keep their focus on course materials rather than games, Facebook, Snapchat, etc. Electronic devices are required for submission of exercises. Additionally, **you may not use headphones during class.**

Final Exam Policy: **All students are required to take the final exam for this course at the time and location appointed by the University. Any exceptions to this rule must be approved by the instructor no later than one (1) week prior to the last day of classes.** This includes DS accommodations, having more than two final exams on the same day, jury duty summons, University athletics, and any other University-approved excuses. **For the Spring 2018 term, you must submit your request to the instructor no later than April 25, 2018.**

No Recording Policy: **You may NOT record the lecture without express written permission from the instructor.** You must obtain written permission from the instructor before you are allowed to record the lecture or any conversation with the instructor. This is regardless of any accommodations that you may have on file with the Office of Disability Services.

Discussion Forum Use: The forum (or message board) is available to ask questions about assignments and tests. **Do NOT post any code or exercise solutions to the forums!** The teaching staff reserves the right to edit any student's forum post for inappropriate content. Note that students are expected to conduct themselves in a respectful manner in all communications.

Electronic Communications: The teaching staff looks forward to receiving emails and message board posts about any questions you have about the class, materials, exams, and assignments. Below are several rules for electronic communication.

Higher education provides you with a training ground prior to entry into the work environment for your chosen career. You will use many of the following rules of "netiquette" when you are communicating with colleagues, your supervisor, or clients once you are in the work world. Although many of the rules of etiquette for electronic communication will be similar in the work environment, we have some rules that are specific to this course.

Please observe the following etiquette when communicating with the teaching staff and your peers and keep in mind that the teaching staff receives several email messages on a daily basis. Please note that a member of the teaching staff will respond to an email or message board within 24 hours on a business day and within 48 hours on a weekend or holiday. Most of the time, we will respond more quickly, but it is not guaranteed.

Also, **before sending an email, try to find the answer to the question by using various references already available to you:**

- If the question is related to class administration, check the syllabus.
- If the question is related to recent information, check previous emails and announcements from the teaching staff.
- If the question is homework or exam related, check the message board to see if it has already been answered. Also, read your textbook and check the online resources suggested by the instructor.
- If the question is about material covered during your absence from class. Do NOT ask the instructor, ask your classmates. Note that all course activities are posted on Canvas.
- **If you have a general question about homework, post your question to the message board;** however, if your question is more specific or involves snippets of code or portions of assignments, email it to the TA and copy the instructor.
- **Always use the prefix [ITSC 3146] on all of your email messages related to this course.** Messages that do not use the required course prefix run the risk of never receiving a reply.
- Always include a short description in the subject line of your messages. For example: **"[ITSC 3146] Question about Homework 1"**.
- Email should include a salutation to identify the recipients of the email. For example, begin an email to your instructor with a salutation such as "Hi Dr. Bahamon," or "Dr. Bahamon".

- **The tone of the email message should be professional.** Re-read your email before you press Send and make a judgment as to how you would respond if you were a recipient of the email you are planning to send.
- If you have a question that is beyond the scope of an email, consider coming to office hours or scheduling an appointment with a member of the teaching staff.
- **If you have several questions or items, please number them for ease of reading. The response will also be easier to understand.**
- Please spell check and correct mechanical/grammar errors. Avoid emails written only in lowercase and lacking punctuation, and close your email with your name.

We will have a class mailing list and several discussion forums set up using Canvas. Often, timely news will be sent out to the class both via the course mailing list and via Canvas announcement. **You are expected to check your email at least once a day to read any important messages.** Make certain that you regularly read the email sent to your UNCC Gmail email address. **You are also expected to read the announcements that are posted on Canvas and sent to your UNCC Gmail account.** Finally, note that due to FERPA rules I can only respond to messages sent from your student account, i.e., UNCC's Gmail or Canvas.

Office Hours: Note that **you are expected to perform the due diligence on all assigned course work.** This includes reviewing course materials and references, carefully going over the instructions, and completing all prep work given for the topic associated with the assignment. Once you exhaust all these resources, you should try to meet with the TA or visit the CCI tutoring center. In the event that meeting with the instructor becomes necessary, you should plan on doing so during the times scheduled for this purpose. The necessary information is listed at the beginning of this syllabus and posted on Canvas. **Please come prepared with specific questions and/or your work.** Note that due to the size of the class, the length of the meeting may be limited in order to accommodate multiple students. You should always come prepared with specific questions and/or issues that you need to discuss.

Grade Appeals: If at any time you feel an assignment was graded improperly, write a request (email) for regrade and explain why you believe the assignment was graded improperly. First discuss the grade with the TA who graded the assignment. If you are still unsatisfied with the answer, submit the assignment to the instructor for a regrade. **All regrade requests must be submitted no later than one (1) week after the assignment was returned to you.** Please speak with the TA who graded the assignment FIRST and have the written regrade explanation.

Late Assignments: **All homework assignments are required to be submitted by the specified due date.** Late work will not be accepted under any circumstances, unless you have a documented and University-approved excused absence. **No late submissions will be accepted through email. Submissions that are past the deadline will receive an automatic grade of zero.**

In-class exercises will not be accepted after class.

Attendance: Class attendance is a responsibility of everyone. If a student chooses not to attend class, he/she is responsible for any handouts, announcement, and contents of missed lectures. Note that the course schedule and lecture materials will be posted on Canvas. **Attendance to class is mandatory. Note that a significant portion of your grade is based on in-class activities.** These activities may include group assignments, exercises, Poll Everywhere quizzes, and random attendance checks.

- **Documentation of an absence is required for it to be excused.**
- **Makeup exams will only be given with a documented excused absence.**
- **Homework extensions will only be given with a documented excused absence.** Extensions requests related to activities such as conference/work travel or university athletics must be discussed in advance and no later than one week before the assignment due date.
- In-class exercise waivers will only be given with a documented excused absence.

All anticipated absences must be presented to the instructor no later than one week before the absence. All emergency absences must be turned in no later than one week after the student's return date. All other absences will be unexcused.

Please see <http://provost.uncc.edu/policies/classroom-attendance> for more details.

Makeup Work Policy: **All homework assignments and exams must be made up within one to two weeks of the absence and the timeframe will be determined through discussion between the instructor and student.** If a homework assignment has already been returned, the instructor may request the student to complete an alternative assignment. No in-class exercises or activities will be made up.

Incomplete Grades: An unfinished incomplete grade will automatically change to an F after either (a) the end of the next regular semester in which the student is enrolled (not including summer sessions), or (b) the end of 12 months if the student is not enrolled, whichever is shorter. Incompletes that change to F will count as an attempted course on transcripts. The burden of fulfilling an incomplete grade is the responsibility of the student. The university policy on incomplete grades is located at <http://provost.uncc.edu/policies/grading>.

Course Materials Use: Lectures and course materials, including presentations, tests, exams, outlines, and similar materials, are protected by copyright law. Students make take notes and make copies of course materials for their own educational use; however, you may not, nor may you knowingly allow others to reproduce or publicly distribute any course materials without the express written consent of the instructor. This includes providing materials to commercial course material suppliers, on-line knowledge bases and other similar services. Students who publicly distribute or display or help others publicly distribute

or display copies or modified copies of an instructor's course materials may be in violation of University Policy 406, The Code of Student Responsibility.

Accommodations for Disabilities

UNC Charlotte is committed to access to education. **If you have a disability and need academic accommodations, please provide a letter of accommodation from Disability Services early in the semester.** For more information on accommodations, contact the Office of Disability Services at 704-687-0040 or visit their office in Fretwell 230.

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, student must comply with the policies set by the Office of Disability Services (<http://ds.uncc.edu/>), 704-687-0040 (tty/v), or disability@uncc.edu.

Non-discrimination in the Classroom

All students and the instructor are expected to engage with each other respectfully.

Unwelcome conduct directed toward another person based upon that person's actual or perceived race, actual or perceived gender, color, religion, age, national origin, ethnicity, disability, or veteran status, or for any other reason, may constitute a violation of University Policy 406, The Code of Student Responsibility. Any student suspected of engaging in such conduct will be referred to the Office of Student Conduct.

Course Materials Use

Lectures and course materials, including presentations, tests, exams, outlines, and similar materials, are protected by copyright law. Students make take notes and make copies of course materials for their own educational use; however, you may not, nor may you knowingly allow others to reproduce or publicly distribute any course materials without the express written consent of the instructor. This includes providing materials to commercial course material suppliers, on-line knowledge bases and other similar services. Students who publicly distribute or display or help others publicly distribute or display copies or modified copies of an instructor's course materials may be in violation of University Policy 406, The Code of Student Responsibility.

Important Dates

All dates for assignments, exercises, mid-term exams and other course-related activities and/or deadlines will be posted on Canvas. The list below is a summary of key dates you should keep in mind.

Description	Date
Dr. Martin Luther King Jr. Day – No Classes	January 15, 2018
Spring Break – No Classes	March 5-10, 2018, 2018
Last day to withdraw from course; grade subject to Withdrawal Policy	March 19, 2018
Last Day of Classes	May 1, 2018

Reading Day	May 2, 2018
Final Exam The exam may include all topics covered in the course.	Monday, May 7, 2018 8:00AM to 10:30AM

Please note that the contents of this document may change in order to address errors or to adjust for course progress.