Network, Server, and Cloud Administration

Fall 2020

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| C:\Users\ahughes\Desktop\Dr. Alan Hughes.jpg​  Instructor: Dr. Alan Hughes | **Office:** | AL76  Alternatively, MB2 (CS lab in library) |
| **Office Hours:** | M-F 10am electronic; alternatively in CS Lab by appointment |
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​Course Description:

This course deals with administration issues that affect the planning, setup, and maintenance of computer servers and networks. Issues such as account policies, storage management, security, licensing, performance monitoring, providing support for a large user community, providing network services, etc.  You will gain experience setting up a network with Linux servers, as well as network switches and routers. You will also set up a cloud infrastructure in Amazon’s AWS.

Course Reading(s):

Effective DevOps with AWS, Raheja, Borgese, Felsen, 2nd Ed, ISBN 978-1-78953-997-4

Optional: Beginning Ubuntu LTS Server Administration, Sander van Vugt, Apress, 2nd Ed or higher, ISBN 978-1-4302-1082-5

Optional: Network Warrior, Donahue, OReilly, any edition since 2011

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Context:  
The faculty of the Computer Science department has aligned the computer science program with the goals of the Mathematical Sciences Division, BJU Bible and liberal arts core objectives, and the BJU institutional goals. The goal of the Computer Science department is to align all courses in the Computer Science and Information Technology majors to support one or more of the following departmental goals:

1. Design and implement solutions to practical problems.
2. Use appropriate technology as a tool to solve problems in various domains.
3. Create efficient solutions at the appropriate abstraction level.
4. Demonstrate an ability to work effectively in teams.
5. Demonstrate an ability to communicate technological information effectively both in written and oral forms.
6. Demonstrate an ability to acquire new knowledge in the computing discipline.
7. Demonstrate an understanding of social, professional and ethical considerations related to computing.
8. Demonstrate understanding of fundamental concepts in the student's discipline.
9. Prepare students for graduate school or to secure employment in a related area.

Course Goals:

1. Design and implement solutions to practical problems.
2. Demonstrate an ability to work effectively in teams.
3. Demonstrate an ability to communicate technological information effectively both in written and oral forms.
4. Demonstrate an ability to acquire new knowledge in the computing discipline.
5. Demonstrate understanding of fundamental concepts in the discipline
6. Provide the student a platform for continued learning and development of his or her God-given abilities.
7. Instill in the student a desire to use his abilities in service to Christ.

Learning Objectives:

At the end of the course, students should be able to:

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| **Learning Objective** | **Assessment Tools** |
| Understand the role and responsibilities of a system administrator. | Lab Projects; Quizzes; Tests |
| Understand private and public cloud infrastructures, advantages, disadvantages, and security concerns | Research Papers; Lab Projects, Quizzes; Tests |
| Install, configure and understand the operations of a Linux server. | Lab Projects; Quizzes; Tests |
| Install, configure and understand the operations of a Windows server. | Lab Projects; Quizzes; Tests |
| Set up and manage user accounts and groups in both Linux and Windows. | Lab Projects; Quizzes; Tests |
| Set up and perform basic configuration of representative Ethernet switches and routers. | Lab Projects; Quizzes; Tests |
| Set up a basic cloud-like server infrastructure | Lab Projects |
| Migrate a basic infrastructure to AWS | Lab Projects |
| Understand Biblical ethics required of a faithful Christian working as a system and network administrator or manager | Writing assignments |

Course Policies:

Qualifications

CpS 433 is for students who have completed CpS 335 and (CpS 202 or CpS 320).

Absences, lateness, and makeup opportunities

1. The overarching guide for class attendance is the [BJU Class Attendance Policy](http://home.bju.edu/life/policies/class-attendance-policy.php).
2. For planned absences, please email me one week in advance.
3. Written assignments should be submitted before your planned absence.
4. Scheduled tests and quizzes should be taken before your planned absence; please contact me to make arrangements for doing so.
5. For absences due to incapacitating illness or emergency, you should contact me as soon as you are able to return to class in order to make arrangements for making up any graded work without penalty.
6. In other circumstances, tests and quizzes may be made up within one week of your return, with a 10 percent grade penalty for that test or quiz.
7. Leaving class early without prior arrangement will constitute an absence.

Late Work

1. Assignments must be submitted using the electronic submission system before midnight on the day due.
2. The use of the submission system will be explained during the first week of class.
3. Only work missed for legitimate reasons may be made up without penalty.  Legitimate reasons include illness, a death in the family, or a BJU sanctioned tour.
4. You must make up late work according to the number of days missed - that is, missing one day of class gives you one extra day to turn in your work.
5. Any other late work will receive a 20% grade penalty.
6. All late work must be made up within one week in order to receive a non-zero grade.

Grade appeals

1. Grading appeals must be made by email only no later than one week after the grade was assigned.
2. Appeals will be automatically denied if the student attempts to make the appeal verbally.
3. Email grading appeals should be made respectfully and logically ("My grade should be increased because...").

Academic Integrity

1. The overarching guide for academic integrity is the [BJU Academic Integrity Policy](http://home.bju.edu/academics/integrity.pdf).
2. Cheating on assignments and tests is a form of deception and stealing, and as such, is prohibited by Scripture and will incur academic penalties.
3. All work is to be done individually unless Dr. Hughes gives permission for group work.
4. In general students are encouraged to assist one another in the lab environment, but must exercise care when seeking assistance while completing labs.
5. **The goal is for each student to become familiar with network, server, and cloud administration, and be able to work effectively on his or her own. Therefore, please do not copy work from another person, as this constitutes cheating.  Group projects will be specifically assigned.**

Class Participation

1. Compliance with student handbook policies, including the dress code, is expected during class.
2. Class participation grades are based upon actively participating in lecture class discussions, working diligently on course assignments in lab classes and being respectful to the rest of the class and the instructor.
3. Class participation grade will include in-class assignments throughout the semester that will be individually graded.
4. Playing games, electronic messages, working on other subjects, etc. is a demonstration of disrespect for both the instructor and other students, and is not allowed during lecture and lab classes.
5. Dress for presentations should be professional, above normal class dress.

Instructor Help outside of class

You are encouraged to use **email** or the telephone to ask Dr. Hughes for assistance.

Copyright Policy

Copyright 2009-2020 Alan Hughes as to this syllabus and all lectures. Students are prohibited from selling (or being paid for taking) notes during the course to, or by any person, or commercial firm without the express written permission of the professor teaching the course.

COVID Disclaimer

In the event of a COVID outbreak (or other similar event), students will be apprised as to how we will continue/finish the course over the remainder of the semester.

Schedule **(subject to modification during the semester as necessary):**

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| **Date** | **Day** | **Class** | **Assignment** **Due** |
| **Week 1** |  |  |  |
| Aug 18 | T​ | [**The Cloud and DevOps Revolution**](https://bju.instructure.com/courses/13571/modules/items/329770) |  |
| Aug 20 | Th | [**Thinking in Terms of the Cloud, and not Infrastructure**](https://bju.instructure.com/courses/13571/modules/items/329771) |  |
| **Week 2** |  |  | ​ |
| Aug 25 | T | [**Adopting a DevOps Culture**](https://bju.instructure.com/courses/13571/modules/items/329772) | **Lab 1** |
| Aug 27 | Th | [**Deploying in AWS**](https://bju.instructure.com/courses/13571/modules/items/329773) | ​ |
| **Week 3** |  |  |  |
| Sep 1 | T | [**Deploying Your First Web Application**](https://bju.instructure.com/courses/13571/modules/items/329775) |  |
| Sep 3 | Th | [**Creating and Configuring Your Account**](https://bju.instructure.com/courses/13571/modules/items/329777) | ​ |
| **Week 4** |  |  |  |
| Sep 8 | T | [**Creating Your First Web Server**](https://bju.instructure.com/courses/13571/modules/items/329778) | **Lab 2** |
| Sep 10 | Th | [**CpS 433 - Lab 2**](https://bju.instructure.com/courses/13571/modules/items/342973) | ​ |
| **Week 5** |  |  |  |
| Sep 15 | T | [**Treating Your Infrastructure as Code**](https://bju.instructure.com/courses/13571/modules/items/329780) |  |
| Sep 17 | Th | [**Managing Your Infrastructure with CloudFormation**](https://bju.instructure.com/courses/13571/modules/items/329782) |  |
| **Week 6** |  |  |  |
| Sep 22 | T | [**Managing Your Infrastructure with CloudFormation (cont'd)**](https://bju.instructure.com/courses/13571/modules/items/329783) | **Lab 3** |
| Sep 24 | Th | [**Adding a Configuration Management System**](https://bju.instructure.com/courses/13571/modules/items/329784) |  |
| **Week 7** |  |  |  |
| Sep 29 | T | [**Infrastructure as Code with Terraform**](https://bju.instructure.com/courses/13571/modules/items/329785) |  |
| Oct 1 | Th | [**Integrating AWS, Terraform, and Ansible**](https://bju.instructure.com/courses/13571/modules/items/329789)  **Creating our Terraform Repository** |  |
| **Week 8** |  |  |  |
| Oct 6 | T | [**Adding Continuous Integration and Continuous Deployment**](https://bju.instructure.com/courses/13571/modules/items/329795) | **Lab 4** |
| Oct 8 | Th | [**Building a Continuous Deployment Pipeline**](https://bju.instructure.com/courses/13571/modules/items/329798) | ​ |
| **Week 9** |  |  |  |
| Oct 13 | T | **Test 1 – Ch 1-3;**  [**Scaling Your Infrastructure**](https://bju.instructure.com/courses/13571/modules/items/329799) | **Test 1** |
| Oct 15 | Th | **Day of Rest**  [**A Monolithic Application**](https://bju.instructure.com/courses/13571/modules/items/329801) | ​ |
| **Week 10** |  |  |  |
| Oct 20 | T | [**Elastic Load Balancer (ELB)**](https://bju.instructure.com/courses/13571/modules/items/329806)  [**Moving the State Outside the EC2 Machine**](https://bju.instructure.com/courses/13571/modules/items/329807) | **Lab 5** |
| Oct 22 | Th | [**Using Microservices and Serverless**](https://bju.instructure.com/courses/13571/modules/items/329809) | ​​ |
| **Week 11** |  |  |  |
| Oct 27 | T | [**Running Containers in AWS**](https://bju.instructure.com/courses/13571/modules/items/329810) |  |
| Oct 29 | Th | [**Dockerizing our Hello World Application**](https://bju.instructure.com/courses/13571/modules/items/329813) | ​ |
| **Week 12** |  |  |  |
| Nov 3 | T | [**Using the EC2 Container Service**](https://bju.instructure.com/courses/13571/modules/items/329814) | **Lab 6** |
| Nov 5 | Th | [**Creating a CI/CD Pipeline to Deploy to ECS**](https://bju.instructure.com/courses/13571/modules/items/329815) | ​ |
| **Week 13** |  |  |  |
| Nov 10 | T | [**Hardening the Security of Your AWS Environment**](https://bju.instructure.com/courses/13571/modules/items/329816) |  |
| Nov 12 | Th | [**IAM Security**](https://bju.instructure.com/courses/13571/modules/items/329818) |  |
| **Week 14** |  |  |  |
| Nov 17 | T | **Test 2 (Ch 4-6)** | **Test 2; Lab 7** |
| Nov 19 | Th | **Presentations** | ​**Final Lab Document and Presentation PPT** |
| **Final Exam** |  |  |  |
| Nov 23 | M | **Final Exam – 2:00-3:10pm (Ch 7-8)** | **If you pass either the CompTIA Cloud+ Exam or the AWS Practitioner Exam before the final, assuming you have a B- or better in the class, you are exempt from the final exam.** |

​Grading

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| **#** | **Item** | **Pts.** | **Total** |
| 8 | Quizzes | 20 | 160 |
| 7 | Labs/Checkpoints | 50 | 350 |
| 1 | AWS Cloud Project Document | 200 | 200 |
| 1 | AWS Cloud Project Presentation | 100 | 100 |
| 1 | Research Paper (Administrator Ethics) | 100 | 100 |
| 1​ | Final Exam | 150 | 150 |
| ​ | Class Participation (peer-evaluated) | 100 | 100 |
| ​ | ​ | ​ | ​ |
|  | **TOTAL​** |  | **1160** |

Scale

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| --- | --- |
| A | 90-100 |
| B | 80-89 |
| C | 70-79 |
| D | 60-69 |
| F | < 60​ |

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