CSC3320 System Level Programming
Lab Assignment 4 - Part 1 (In- Lab)
Instructor: Fil Rondel

Purpose: Practices on the grep family commands to process texts in files.

Note: Please follow the instructions below, and write a report by answering the questions and upload the report (named as Lab4_P1_FirstNameLastName.pdf or Lab4_P1_FirstNameLastName.doc) to Google Classroom.

Please add the lab assignment NUMBER and your NAME at the top of your file sheet.

Open your terminal and connect to the snowball server. Change your directory to your home directory (cd ~), and then create a new directory named as "Lab4" (mkdir Lab4). After that, go to directory Lab4 (cd Lab4) and please download the file "CSC_Course.txt" by the following command (internet access required):

cp /home/frondel/Public/CSC_Course.txt CSC_Course.txt Be sure it succeeds using "ls" to see the file name "CSC_Course.txt" listed.

Try the following commands step by step and finish the required tasks from step 4) to step 16).

Note: marks a single space.
1) $more CSC_Course.txt

Check the content of "CSC_Course.txt" using more.
Note: When viewing the file, you may need to use command f (forward one screen), b (backward one screen) and q(quit).

2) $grep 'CSC 3320' CSC_Course.txt
Note: there is a single space between "CSC" and "3320" Output the lines containing the string "CSC 3320"(search the course the number of which is "CSC 3320")

3) $grep -i 'CSC 3320' CSC_Course.txt
Output the lines containing the string "CSC 3320" via ignoring case (search the information related to CSC3320)

4) $ grep 'CSC█ 3' CSC_Course.txt
Attach a screenshot of the output and describe what this does.

```
[[rshaon1@gsuad.gsu.edu@snowball Lab4]$ grep 'CSC 3' CSC_Course.txt
CSC 3210      Computer Organization and Programming
[CSC 3320      System-Level Programming
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3210 with a C or higher
Prerequisites   CSC 3210 with grade of C or higher
Prerequisites   CSC 3320 and either MATH 3020 or MATH 3030 with a C or higher
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher.Students must meet the Computer Science Major Eligibility Requirement in order to enroll in this course
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 2720 Data Structure and CSC 3320 System-Level Programming with grades of C or better
Prerequisites   CSC 3210 Computer Organization and Programming, CSC 2720 Data Structure
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 3210 and CSC 3320 with grades of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 2720, CSC 3210, and CSC 3320 with a C or higher
Prerequisites   CSC 2720 and CSC 3210 with grades of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a C or higher
Prerequisites   CSC 3320 with grade of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
[rshaon1@gsuad.gsu.edu@snowball Lab4]$
```

-> Output the lines containing the string "CSC 3".

5) $ grep 'CSC█ 3|CSC█ 1' CSC_Course.txt
Attach a screenshot of the output and describe what this command does.

```
[[rshaon1@gsuad.gsu.edu@snowball Lab4]$ grep 'CSC 3|CSC 1' CSC_Course.txt        ]
 [rshaon1@gsuad.gsu.edu@snowball Lab4]$
```

-> Output the lines containing the string either "CSC 3" or "CSC 1".

-> It didn't output, because the input is for Basic Regular Expression.

6) $ grep -E 'CSC▮3|CSC▮1' CSC_Course.txt

Attach a screenshot of the output and describe what this command does. Use extend regular expression

```
[rshaon1@gsuad.gsu.edu@snowball Lab4]$ grep -E 'CSC 3|CSC 1' CSC_Course.txt
CSC 1010        Computers and Applications
CSC 1301        Principles of Computer Science I
CSC 1302        Principles of Computer Science II
Prerequisites   CSC 1301 with a "C" or higher
Prerequisites   CSC 1301 or CSC 2301 with a C or higher, or permission of instructor
Prerequisites   (CSC 1301 or DSCI 1301) and (MATH 1113 or MATH 2211) with a C or higher.
Prerequisites   CSC 1302, MATH 2211, and CSC 2510 or MATH 2420 with grades of "C" or higher
Prerequisites   CSC 1301 and CSC 1302 with a C or higher or permission of the department
CSC 3210        Computer Organization and Programming
Prerequisites   CSC 1302, and CSC 2510 or MATH 2420 with A C or higher
CSC 3320        System-Level Programming
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3210 with a C or higher
Prerequisites   CSC 3210 with grade of C or higher
Prerequisites   CSC 3320 and either MATH 3020 or MATH 3030 with a C or higher
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher.Students must meet the Computer Science Major Eligibility Requirement in order to enroll in this course
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 2720 Data Structure and CSC 3320 System-Level Programming with grades of C or better
Prerequisites   CSC 3210 Computer Organization and Programming, CSC 2720 Data Structure
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 3210 and CSC 3320 with grades of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 2720, CSC 3210, and CSC 3320 with a C or higher
Prerequisites   CSC 2720 and CSC 3210 with grades of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a C or higher
Prerequisites   CSC 3320 with grade of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
[rshaon1@gsuad.gsu.edu@snowball Lab4]$ 
```

-> Output the lines containing the string either "CSC 3" or "CSC 1".

7) $ egrep 'CSC▮3|CSC▮1' CSC_Course.txt

Attach a screenshot of the output and describe what this command does.

```
[rshaon1@gsuad.gsu.edu@snowball Lab4]$ egrep 'CSC 3|CSC 1' CSC_Course.txt
CSC 1010        Computers and Applications
CSC 1301        Principles of Computer Science I
CSC 1302        Principles of Computer Science II
Prerequisites   CSC 1301 with a "C" or higher
Prerequisites   CSC 1301 or CSC 2301 with a C or higher, or permission of instructor
Prerequisites   (CSC 1301 or DSCI 1301) and (MATH 1113 or MATH 2211) with a C or higher.
Prerequisites   CSC 1302, MATH 2211, and CSC 2510 or MATH 2420 with grades of "C" or higher
Prerequisites   CSC 1301 and CSC 1302 with a C or higher or permission of the department
CSC 3210        Computer Organization and Programming
Prerequisites   CSC 1302, and CSC 2510 or MATH 2420 with A C or higher
CSC 3320        System-Level Programming
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3210 with a C or higher
Prerequisites   CSC 3210 with grade of C or higher
Prerequisites   CSC 3320 and either MATH 3020 or MATH 3030 with a C or higher
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher.Students must meet the Computer Science Major Eligibility Requirement in order to enroll in this course
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 2720 Data Structure and CSC 3320 System-Level Programming with grades of C or better
Prerequisites   CSC 3210 Computer Organization and Programming, CSC 2720 Data Structure
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 3210 and CSC 3320 with grades of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 2720, CSC 3210, and CSC 3320 with a C or higher
Prerequisites   CSC 2720 and CSC 3210 with grades of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a C or higher
Prerequisites   CSC 3320 with grade of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
[rshaon1@gsuad.gsu.edu@snowball Lab4]$ 
```

-> Output the lines containing the string either "CSC 3" or "CSC 1".
-> egrep is the same as grep -E .

8) $ fgrep '3.000 ▢ Credit ▢ hours' CSC_Course.txt Attach a screenshot of the output and describe what this command does.

```
[rshaon1@gsuad.gsu.edu@snowball Lab4]$ fgrep '3.000 Credit hours' CSC_Course.txt
[rshaon1@gsuad.gsu.edu@snowball Lab4]$
```

-> Output the lines containing the string " 3.000 Credit hours". fgrep is the same as grep - f.

9) $ fgrep -x '3.000 ▢ Credit ▢ hours' CSC_Course.txt Attach a screenshot of the output and describe what this command does.

-x : Print only lines matched entirely

```
[rshaon1@gsuad.gsu.edu@snowball Lab4]$ fgrep —x '3.000 Credit hours' CSC_Course.txt
[rshaon1@gsuad.gsu.edu@snowball Lab4]$
```

-> Output the lines matching the entire string "3.000 Credit hours".

10) $ grep 'CSC.*Programming' CSC_Course.txt Attach a screenshot of the output and describe what this command does.

```
[rshaon1@gsuad.gsu.edu@snowball Lab4]$ grep 'CSC.*Programming' CSC_Course.txt
CSC 2301        Introduction to Python Programming
CSC 2302        Python Programming for Data Science
CSC 3210        Computer Organization and Programming
CSC 3320        System-Level Programming
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
CSC 4225        Internetwork Programming
Prerequisites   CSC 2720 Data Structure and CSC 3320 System-Level Programming with grades of C or better
Prerequisites   CSC 3210 Computer Organization and Programming, CSC 2720 Data Structure
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
CSC 4330        Programming Language Concepts
CSC 4370        Web Programming
CSC 4380        Windowing Systems Programming
CSC 4760        Big Data Programming
Students must meet the Computer Science Major Eligibility Requirement in order to enroll in this course. Crosslisted with CSC 6760. This course will cover the technologies, tools, frameworks and languages
 that are most commonly used in Big Data Programming. Focus will be on algorithms for analyzing and mining massive datasets, graphs and social network data. Topics include the storage, management, process
ing and analysis of massive datasets, as well as Big Data governance, security, and privacy issues.
CSC 4840        Advanced Computer Graphics Programming
[rshaon1@gsuad.gsu.edu@snowball Lab4]$
```

-> Output the lines having strings with "CSC" and ending with "PROGRAMMING" with anything in between.

11) $ grep '^CSC.*Programming$' CSC_Course.txt Attach a screenshot of the output and describe what this command does.

```
[rshaon1@gsuad.gsu.edu@snowball Lab4]$ grep '^CSC.*Programming$' CSC_Course.txt
CSC 2301        Introduction to Python Programming
CSC 3210        Computer Organization and Programming
CSC 3320        System-Level Programming
CSC 4225        Internetwork Programming
CSC 4370        Web Programming
CSC 4380        Windowing Systems Programming
CSC 4760        Big Data Programming
CSC 4840        Advanced Computer Graphics Programming
[rshaon1@gsuad.gsu.edu@snowball Lab4]$
```

-> **Output the lines starting with "CSC" and ending with "PROGRAMMING" with anything in between.**

12) $ grep --color 'CSC[^3]*3{2}' CSC_Course.txt Attach a screenshot of the output and describe what this command does.

No result, {} is not a special character

```
[rshaon1@gsuad.gsu.edu@snowball Lab4]$ grep --color 'CSC[^3]*3{2}' CSC_Course.txt
[rshaon1@gsuad.gsu.edu@snowball Lab4]$
```

-> **Output the lines with highlighted matching words and it outputs the lines with substring starting with "CSC" and except "3" after "CSC". And end the line with "3" 2 times.**

13) $ egrep --color -w 'CSC[^3]*3{2}[^3]*' CSC_Course.txt Attach a screenshot of the output and describe what this command does.

-w : Select only those lines containing matches that form whole words.

```
[rshaon1@gsuad.gsu.edu@snowball Lab4]$ egrep --color -w 'CSC[^3]*3{2}[^3]*' CSC_Course.txt
CSC 3320        System-Level Programming
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 and either MATH 3020 or MATH 3030 with a C or higher
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher.Students must meet the Computer Science Major Eligibility Requirement in order to enroll in this course
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 2720 Data Structure and CSC 3320 System-Level Programming with grades of C or better
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 3210 and CSC 3320 with grades of C or higher
Prerequisites   CSC 3320 with grade of C or higher
CSC 4330        Programming Language Concepts
Prerequisites   CSC 2720, CSC 3210, and CSC 3320 with a C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a C or higher
Prerequisites   CSC 3320 with grade of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
[rshaon1@gsuad.gsu.edu@snowball Lab4]$
```

-> Output the lines with highlighted matching words and it outputs the lines having exact string starting with "CSC" and except "3"after" CSC". And end with "3" 2 times then except "3".

14) $ grep 'CSC.*C++' CSC_Course.txt

Attach a screenshot of the output and describe what this command does. + is not a special character in basic regular expression

```
[rshaon1@gsuad.gsu.edu@snowball Lab4]$ grep 'CSC.*C++' CSC_Course.txt          ]
[rshaon1@gsuad.gsu.edu@snowball Lab4]$
```

-> Output the lines containing the string starting with "CSC" and ends with "C++".

-> You can get an output if you change grep to egrep .

15) $ egrep 'CSC.*C\+\+' CSC_Course.txt

Attach a screenshot of the output and describe what this command does. Convert +

```
[rshaon1@gsuad.gsu.edu@snowball Lab4]$ egrep 'CSC.*C\+\+' CSC_Course.txt          ]
[rshaon1@gsuad.gsu.edu@snowball Lab4]$
```

-> **Output the lines containing the string starting with "CSC" and ends with "C++".**

-> **You can get an output if you change egrep to grep .**

16) $ egrep 'CSC.*C++' CSC_Course.txt

Please only describe what this command does.

```
[rshaon1@gsuad.gsu.edu@snowball Lab4]$ egrep 'CSC.*C++' CSC_Course.txt
CSC 1010        Computers and Applications
CSC 1301        Principles of Computer Science I
CSC 1302        Principles of Computer Science II
Prerequisites   CSC 1301 with a "C" or higher
Prerequisites   CSC 1301 or CSC 2301 with a C or higher, or permission of instructor
CSC 2510        Theoretical Foundations of Computer Science
Prerequisites   (CSC 1301 or DSCI 1301) and (MATH 1113 or MATH 2211) with a C or higher.
Prerequisites   CSC 1302, MATH 2211, and CSC 2510 or MATH 2420 with grades of "" or higher
CSC 2920        Ethical and Social Issues in Computing
Prerequisites   CSC 1301 and CSC 1302 with a C or higher or permission of the department
CSC 3210        Computer Organization and Programming
Prerequisites   CSC 1302, and CSC 2510 or MATH 2420 with A C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3210 with a C or higher
CSC 4210        Computer Architecture                                                       ]
Prerequisites   CSC 3210 with grade of C or higher
CSC 4220        Computer Networks
Prerequisites   CSC 3320 and either MATH 3020 or MATH 3030 with a C or higher
CSC 4221        Wireless Networks & Mobile Computing
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher.Students must meet the Computer Science Major Eligibility Requirement in order to enroll in this course
CSC 4222        Cyber Security
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher
Prerequisites   CSC 2720 and either MATH 3020 or MATH 3030 with a C or higher
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 4220 with grade of C or higher
Prerequisites   CSC 2720 Data Structure and CSC 3320 System-Level Programming with grades of C or better
Prerequisites   CSC 3210 Computer Organization and Programming, CSC 2720 Data Structure
CSC 4251        Computer Forensics
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 2720 or DSCI 2720 with a C or higher. Students must meet the Computer Science Major Eligibility Requirement in order to enroll in this course.
Prerequisites   CSC 4210 with grade of C or higher
CSC 4310        Parallel and Distributed Computing
Prerequisites   CSC 3210 and CSC 3320 with grades of C or higher
CSC 4311        Cloud Computing
Prerequisites   CSC 2720 or DSCI 2720 with a C or higher. Students must meet the Computer Science Major Eligibility Requirement in order to enroll in this course.
Prerequisites   CSC 3320 with grade of C or higher
CSC 4330        Programming Language Concepts
Prerequisites   CSC 2720, CSC 3210, and CSC 3320 with a C or higher
CSC 4340        Compilers
Prerequisites   CSC 2720 and CSC 3210 with grades of "C" or higher
CSC 4350        Software Engineering - CTW
Prerequisites   CSC 4520 with a C or higher                                                 ]
Prerequisites   CSC 2720 with a grade of C or higher                                        ]
Prerequisites   CSC 3320 with grade of C or higher                                          ]
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 2720 with a C or higher
Prerequisites   (CSC 2720 or DSCI 2720) and either MATH 3020 or MATH 3030 with a C or higher. Students must meet the Computer Science Major Eligibility Requirement in order to enroll in this course.
Prerequisites   CSC 2720, BIOL 1103K, [or BIOL 1103 and BIOL 1103L] and CHEM 1211K [or CHEM 1211 and CHEM 1211L] with grades of "C" or higher.Students must meet the Computer Science Major Eligibility Requ
irement in order to enroll in this course
CSC 4720        Human-Computer Interaction
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a C or higher
Prerequisites   CSC 2720 with grade of C or higher
Prerequisites   CSC 2720 or DSCI 2720 with a C or higher. Students must meet the Computer Science Major Eligibility Requirement in order to enroll in this course.
Prerequisites   CSC 2720 with grade of C or higher
Prerequisites   CSC 2720 with a C or better
Prerequisites   CSC 2720 with a C or higher
CSC 4820        Interactive Computer Graphics
Prerequisites   CSC 3320 with grade of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
CSC 4840        Advanced Computer Graphics Programming
Prerequisites   CSC 3320 with a grade of C or higher


CSC 4841        Computer Animation
Prerequisites   CSC 3320 with a grade of C or higher
Prerequisites   CSC 4520 with a grade of C or better
Prerequisites   CSC 4850 or DSCI 4850 with a C or higher. Students must meet the Computer Science Major Eligibility Requirement in order to enroll in this course.
CSC 4940        Computer Science Internship
CSC 4980        Topics in Computer Science
CSC 4982        Undergraduate Research in Computer Science
CSC 4995        Directed Readings B.I.S.-CTW
[rshaon1@gsuad.gsu.edu@snowball Lab4]$
```

-> **Output the lines containing the string with "CSC" and end with "C++".**

Optional Part:

1) $ sed -E -n 's/(CSC□ 3[0-9]{3})(.*)/\1/p' CSC_Course.txt Attach a screenshot of the output and describe what this command does.

2) $ awk -F'-' '/(CSC 3[0-9]{3})(.*)/{print $1}' CSC_Course.txtAttach a screenshot of the output and describe what this command does.

3) $ sed -E -n 's/(CSC□ [0-9]{4})(□-□)(.*)/\3/p' CSC_Course.txt Attach a screenshot of the output and describe what this command does.

4) $ sed -E -n 's/(CSC□ [0-9]{4})(□-□)(.*)/\3/p' CSC_Course.txt| sort
Attach a screenshot of the output and describe what this command does.