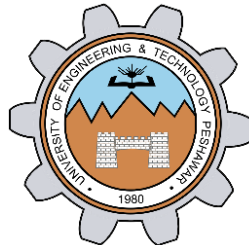# FILES AND DIRECTORIES

LAB # 08

Fall 2023

CSE-302L

Systems Programming Lab

Submitted by: **AIMAL KHAN**

Registration No.: **21PWCSE1996**

Class Section: **A**

"On my honor, as student of University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work."

Student Signature: _____

Submitted to:

Engr. Abdullah Hamid

Sunday, January 28, 2024

Department of Computer Systems Engineering

University of Engineering and Technology, Peshawar

CSE 302L: SYSTEMS PROGRAMMING LAB

LAB ASSESSMENT RUBRICS

Criteria & Point Assigned	Outstanding 2	Acceptable 1.5	Considerable 1	Below Expectations 0.5	Score
Attendance and Attentiveness in Lab PLO08	Attended in proper Time and attentive in Lab	Attended in proper Time but not attentive in Lab	Attended late but attentive in Lab	Attended late not attentive in Lab	
Capability of writing Program/Algorithm/Drawing Flow Chart PLO1, PLO2, PLO3, PLO5	Right attempt/ no errors and well formatted	Right attempt/ no errors but not well formatted	Right attempt/ minor errors and not well formatted	Wrong attempt	
Result or Output/ Completion of target in Lab PLO9	100% target has been completed and well formatted.	75% target has been completed and well formatted.	50% target has been completed but not well formatted.	None of the outputs are correct.	
Overall, Knowledge PLO10,	Demonstrates excellent knowledge of lab	Demonstrates good knowledge of lab	Has partial idea about the Lab and procedure followed	Has poor idea about the Lab and procedure followed	
Attention to Lab Report PLO4,	Submission of Lab Report in Proper Time i.e., in next day of lab, with proper documentation.	Submission of Lab Report in proper time but not with proper documentation.	Late Submission with proper documentation.	Late Submission very poor documentation	

Instructor:

Name: _____   Signature: _____

FILES AND DIRECTORIES

Objectives:

The objectives of this lab are to gain a practical understanding of key system programming concepts, including

- ➢ Directory Access
- ➢ Accessing file status information

Tasks:

Task 1: Implement ls command

Code in C:

```c
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <dirent.h>
#include <sys/stat.h>
#include <time.h>
#include <grp.h>
#include <pwd.h>

int displayFileStatistics(struct dirent *directoryEntry)
{
    struct stat entryStatistics;
    struct group *g;
    struct passwd *p;
    char *ctime_no_newline;

    if (stat(directoryEntry->d_name, &entryStatistics) == -1)
    {
        perror("Error in statistics of the directory contents.\n");
        return -1;
    }

    if (!strcmp(directoryEntry->d_name, ".") ||
!strcmp(directoryEntry->d_name, ".."))
        return 0;

    printf("\t");
    // print if entry is a directory or a file
    S_ISDIR(entryStatistics.st_mode) ? printf("d ") : printf("- ");

    // printing permissions by taking bitwise and of permission bit
with mode.
    S_IRUSR & entryStatistics.st_mode ? printf("r") : printf("-");
    S_IWUSR & entryStatistics.st_mode ? printf("w") : printf("-");
    S_IXUSR & entryStatistics.st_mode ? printf("x") : printf("-");
```

```c
    S_IRGRP & entryStatistics.st_mode ? printf("r") : printf("-");
    S_IWGRP & entryStatistics.st_mode ? printf("w") : printf("-");
    S_IXGRP & entryStatistics.st_mode ? printf("x") : printf("-");
    S_IROTH & entryStatistics.st_mode ? printf("r") : printf("-");
    S_IWOTH & entryStatistics.st_mode ? printf("w") : printf("-");
    S_IXOTH & entryStatistics.st_mode ? printf("x") : printf("-");

    // No of links pointing to file or directory
    printf(" %ld", entryStatistics.st_nlink);

    // User Name from uid
    p = getpwuid(entryStatistics.st_uid);
    printf(" %s", p->pw_name);

    // Group Name from gid
    g = getgrgid(entryStatistics.st_gid);
    printf(" %s", g->gr_name);

    // Time and date of last access
    ctime_no_newline = strtok(ctime(&entryStatistics.st_ctime),
"\n");
    printf(" %s", ctime_no_newline);

    // Entry name
    printf(" %s\n", directoryEntry->d_name);
    return 0;
}

int main(int argc, char *argv[])
{
    if (argc > 3)
    {
        fprintf(stderr, "Need at most three args. Usage:\n%s
[OPTIONAL] [-l | FILE_NAME]\n", argv[0]);
        return 1;
    }
    DIR *thisDirectory = opendir(".");
    struct dirent *directoryEntries;

    // ls
    if (argc == 1)
    {
        printf("Directory Content:\n");
        while ((directoryEntries = readdir(thisDirectory)) != NULL)
        {
            if (!strcmp(directoryEntries->d_name, ".") ||
!strcmp(directoryEntries->d_name, ".."))
                continue;
            printf("\t%s\n", directoryEntries->d_name);
        }
    }

    // ls -l
    else if ((argc == 2) && (!strcmp(argv[1], "-l")))
```

```
    {
        printf("Directory Content Statistics:\n");
        while ((directoryEntries = readdir(thisDirectory)) != NULL)
            if (displayFileStatistics(directoryEntries) == -1)
                return 1;
    }
    // ls file.xyz
    else if (argc == 2)
    {
        while ((directoryEntries = readdir(thisDirectory)) != NULL)
            if (!strcmp(directoryEntries->d_name, argv[1]))
            {
                printf("File Found:\n\t%s\n", directoryEntries-
>d_name);

                break;
            }
    }

    // ls -l file.xyz
    else if ((argc == 3) && (!strcmp(argv[1], "-l")))
    {
        while ((directoryEntries = readdir(thisDirectory)) != NULL)
            if (!strcmp(argv[2], directoryEntries->d_name))
            {
                printf("File Found. Statistics:\n");
                if (displayFileStatistics(directoryEntries) == -1)
                    return 1;
                break;
            }
    }

    return 0;
}
```

Output:

Reference:

To view my codes, please refer to my GitHub account:
https://github.com/aimalexe/DCSE/tree/main/semester_5_(fall-23)/systems_programming_lab/lab_reports .

Conclusion:

In summary, this laboratory experience has provided a comprehensive exploration of various fundamental system programming concepts, including files in UNIX, file directories and accessing file status information.

The End.