



C Library  
Functions

OS

Disk

# Data Files

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# Introduction

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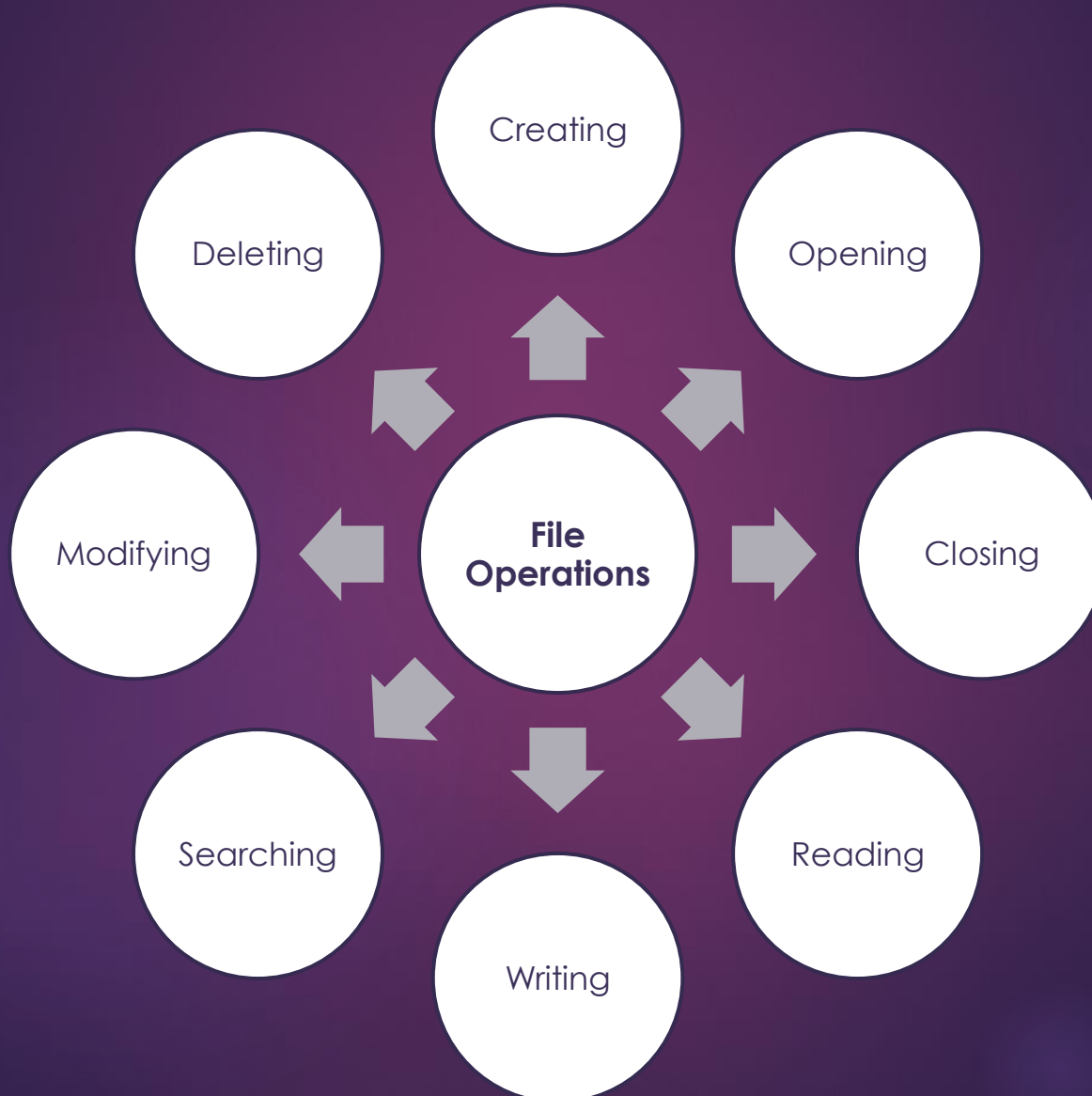


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2019-02-11

	Record I/O	Formatted I/O	String I/O	Character I/O
Standard I/O	fread()	fscanf()	fgets()	fgetc()
	fwrite()	fprintf()	fputs()	fputc()
System I/O	fread()	-	-	-
	fwrite()	-	-	-

# File Operations

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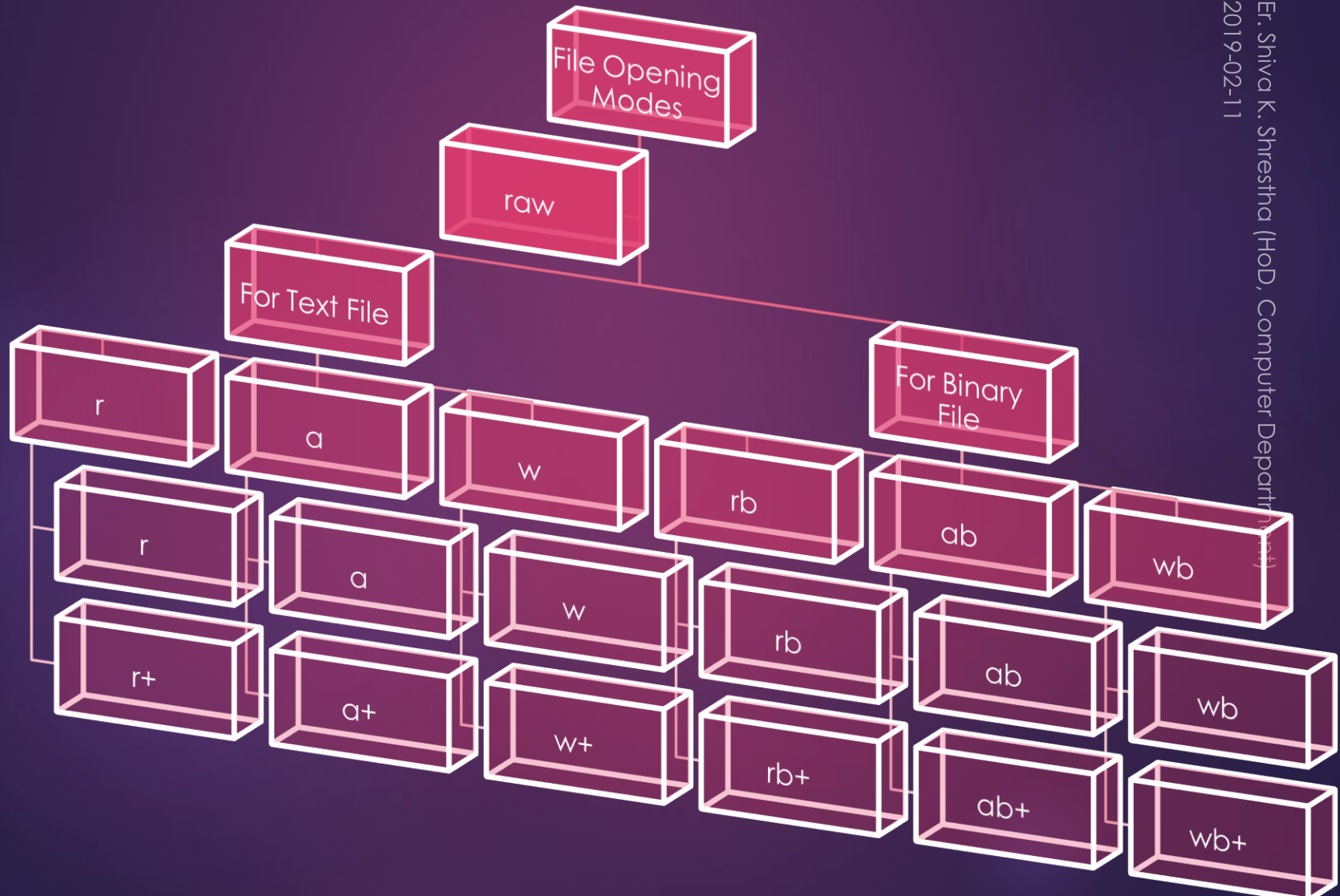
# Library Functions for Reading/Writing from/to a File

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<code>fopen()</code>	• Opens a file
<code>fclose()</code>	• Closes a file
<code>putc()</code>	• Writes a character to a file
<code>fputc()</code>	• Same as <code>putc()</code>
<code>getc()</code>	• Reads a character from a file
<code>fgetc()</code>	• Same as <code>getc()</code>
<code>fgets()</code>	• Reads a string from a file
<code>fputs()</code>	• Writes a string from a file
<code>fseek()</code>	• Seeks to a specified byte in a file
<code>ftell()</code>	• Returns the current file position
<code>fprintf()</code>	• Is to a file what <code>printf()</code> is to the console
<code>fscanf()</code>	• Is to a file what <code>scanf()</code> is to the console
<code>feof()</code>	• Return true if end-of-file is reached
<code>ferror()</code>	• Return true if an error has occurred
<code>rewind()</code>	• Resets the file position indicator to the beginning
<code>remove()</code>	• Erases a file
<code>fflush()</code>	• Flushes a file

# File Opening Modes

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# File Opening Modes

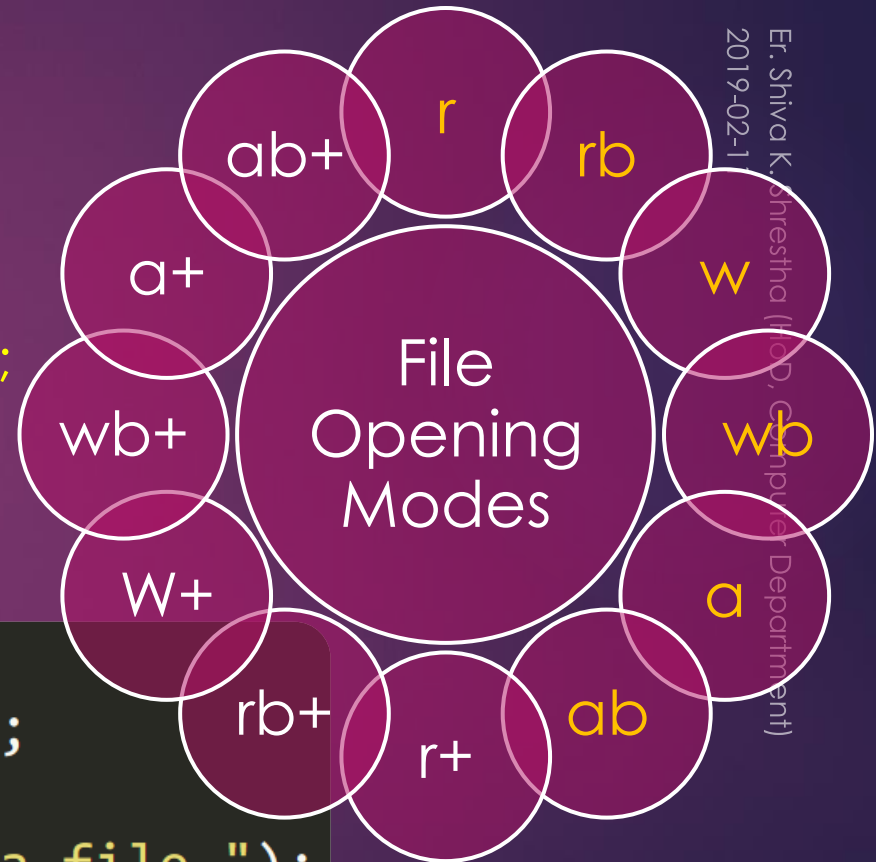
File Mode	Meaning of Mode	During Inexistence of file
<b>r</b>	Open for reading.	If the file does not exist, fopen() returns NULL.
<b>rb</b>	Open for reading in binary mode.	If the file does not exist, fopen() returns NULL.
<b>w</b>	Open for writing.	If the file exists, its contents are overwritten. If the file does not exist, it will be created.
<b>wb</b>	Open for writing in binary mode.	If the file exists, its contents are overwritten. If the file does not exist, it will be created.
<b>a</b>	Open for append. i.e, Data is added to end of file.	If the file does not exists, it will be created.
<b>ab</b>	Open for append in binary mode. i.e, Data is added to end of file.	If the file does not exists, it will be created.
<b>r+</b>	Open for both reading and writing.	If the file does not exist, fopen() returns NULL.
<b>rb+</b>	Open for both reading and writing in binary mode.	If the file does not exist, fopen() returns NULL.
<b>w+</b>	Open for both reading and writing.	If the file exists, its contents are overwritten. If the file does not exist, it will be created.
<b>wb+</b>	Open for both reading and writing in binary mode.	If the file exists, its contents are overwritten. If the file does not exist, it will be created.
<b>a+</b>	Open for both reading and appending.	If the file does not exists, it will be created.
<b>ab+</b>	Open for both reading and appending in binary mode.	If the file does not exists, it will be created.

# Error Handling

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```
FILE *fp; // fp is file_pointer
fp=fopen(file_name, mode);
if(fp == NULL){
    printf("Cannot open a file.");
    fclose(fp);
}
```

```
FILE *fp;
fp=fopen("kce.txt", "a+");
if(fp == NULL){
    printf("Cannot open a file.");
    fclose(fp);
}
```



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# Writing to a Text File

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```
FILE_1.C x
1  #include <stdio.h>
2  #include <conio.h>
3  int main(){
4      int num;
5      FILE *fptr;
6      fptr = fopen("program.txt","w");
7
8      if(fptr == NULL){
9          printf("Error!");
10     }
11     printf("Enter num: ");
12     scanf("%d",&num);
13
14     fprintf(fptr,"%d",num);
15     fclose(fptr);
16     getch();
17     return 0;
18 }
```

DOSBox 0.74, Cpu  
Enter num: 777

program.txt x  
1 777



# Reading from a Text File

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2019-02-11

```
FILE_2.C
1 #include <stdio.h>
2 #include <conio.h>
3 int main(){
4     int num;
5     FILE *fptr;
6     if ((fptr = fopen("program.txt","r")) == NULL){
7         printf("Error! opening file");
8     }
9     fscanf(fptr,"%d", &num);|
10
11     printf("Value of n=%d", num);
12     getch();
13     return 0;
14 }
```

D:\[C]\Ch10\_Data\_Files\FILE\_2.exe

Value of n=777\_

program.txt

```
1 777|
```

# Writing to a Binary File

10

`fwrite(address_data, size_data, numbers_data, pointer_to_file);`

```
FILE_3.C
1 #include <stdio.h>
2 #include <conio.h>
3 struct Num{
4     int n1, n2, n3;
5 };
6 int main(){
7     int i;
8     struct Num n;
9     FILE *fptr;
10    if ((fptr=fopen("program.bin","wb")) == NULL){
11        printf("Error! opening file");
12    }
13    for(i=1; i<5; i++){
14        n.n1 = i;
15        n.n2 = i*i;
16        n.n3 = i*i*i;
17        fwrite(&n, sizeof(struct Num), 1, fptr);
18    }
19    fclose(fptr);
20    getch(); return 0;
21 }
```

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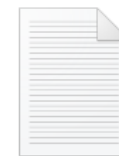
FILE\_9.C



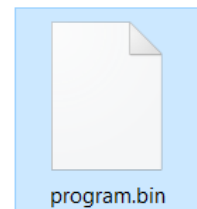
FILE\_9.exe



FILE\_10.C



myname.txt



program.bin



program.txt

# Reading from a Binary File

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`fread(address_data, size_data, numbers_data, pointer_to_file);`

```
FILE_4.C
1 #include <stdio.h>
2 #include <conio.h>
3 struct Num{
4     int n1, n2, n3;
5 };
6 int main(){
7     int i;
8     struct Num n;
9     FILE *fptr;
10    if ((fptr=fopen("program.bin","rb")) == NULL){
11        printf("Error! opening file");
12    }
13    for(i=1; i<5; ++i){
14        fread(&n, sizeof(struct Num), 1, fptr);
15        printf("n1: %d\tn2: %d\tn3: %d\n", n.n1, n.n2, n.n3);
16    }
17    fclose(fptr);
18    getch();
19    return 0;
20 }
```

D:\[C]\Ch10\_Data\_Files\FILE\_4.exe

n1: 1	n2: 1	n3: 1
n1: 2	n2: 4	n3: 8
n1: 3	n2: 9	n3: 27
n1: 4	n2: 16	n3: 64

program.bin

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# End of File (EOF)

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## EOF

```
char ch;
FILE *fp;
fp=fopen("kce.txt","r");

if(fp == NULL){
    printf("Cannot open a file.");
    fclose(fp);
}

while((ch=getc(fp)) != EOF){
    printf("%c",ch);
}
```

## feof()

- ▶ The function feof() determines when the end of the file has been encountered. The feof() function has this prototype:
  - ▶ int feof(FILE \*fp);
- ▶ feof() returns true(1) if the end of the file has been reached; otherwise, it returns 0
- ▶ e.g. while(!feof(fp))

# Using rewind() Function

- ▶ The `rewind()` function resets the file position indicator to the beginning of the file specified as its arguments. That is, it "rewinds" the file. Its prototype is
  - ▶ `void rewind(FILE *fp);`
- ▶ where, `fp` is a valid file pointer.

# Character I/O Functions in File getc(), putc(), fgetc(), & fputc()

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```
FILE_5.C
1  #include<stdio.h>
2  #include<conio.h>
3  #include<stdlib.h>
4  #include<ctype.h>
5  int main(){
6      char ch; FILE *fp;
7      fp=fopen("kce.txt","a+");
8      if(fp==NULL){
9          printf("cannot open file"); fclose(fp);
10     }
11     do{
12         ch=toupper(getchar());
13         putc(ch,fp);
14     }while(ch!='\n');
15     printf("\nText from file kce.txt ...\n");
16     rewind(fp);
17     while((ch=getc(fp)) != EOF){
18         printf("%c",ch);
19     }
20     fclose(fp); getch(); return 0;
21 }
```

kce.txt - Notepad

File Edit Format View Help

Welcome!  
Dept. of Computer Engg.  
Khwopa College of Engineering

D:\[C]\Ch10\_Data\_Files\FILE\_5.exe

Namaste World!

Text from file kce.txt ...  
Welcome!  
Dept. of Computer Engg.  
Khwopa College of Engineering

NAMASTE WORLD!

kce.txt - Notepad

File Edit Format View Help

Welcome!  
Dept. of Computer Engg.  
Khwopa College of Engineering

NAMASTE WORLD!

# File Copy Program

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```
FILE_6.C
1  #include<stdio.h>
2  #include<conio.h>
3  #include<stdlib.h>
4  #include<ctype.h>
5  int main(){
6      char ch;
7      FILE *fs,*ft;
8      fs=fopen("file1.txt","r");
9      if(fs==NULL){
10         printf("Cannot open source file."); fclose(fs);
11     }
12     ft=fopen("file2.txt","w");
13     if(ft==NULL){
14         printf("Cannot open target file."); fclose(ft);
15     }
16     while((ch=fgetc(fs))!=EOF){
17         fputc(ch,ft);
18     }
19     fclose(fs); fclose(ft);
20     getch(); return 0;
21 }
```

file1.txt - Notepad

File Edit Format View Help

Khwopa College of Engineering  
Libali - 8, Bhaktapur

file2.txt - Notepad

File Edit Format View Help

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# String I/O Function in File: fputs() & fgets()

FILE\_7.C

```
1 #include<stdio.h>
2 #include<string.h>
3 int main(){
4     char s[50]; FILE *fp;
5     fp=fopen("console2file.txt","a+");
6
7     do{
8         printf("Enter String:");
9         gets(s); strcat(s,"\n"); fputs(s,fp);
10    }while(*s!='\n');
11    rewind(fp);
12    while(!feof(fp)){
13        fgets(s,50,fp); puts(s);
14    }
15    fclose(fp);
16    return 0;
17 }
```

C:\Users\ErSKS\Google Drive (c.khwopa@gmail.com...

```
Enter String:Khwopa College of Engineering
Enter String:
Khwopa College of Engineering
```

```
-----
Process exited after 10.12 seconds with return value 0
Press any key to continue . . .
```

console2file.txt

```
1 Khwopa College of Engineering
2
3
```



# Formatted Disk I/O Functions in File fscanf() & fprintf()

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```
FILE_8.C
1 #include<stdio.h>
2 #include<conio.h>
3 #include<stdlib.h>
4 int main(){
5     char choice; char name[40]; int age; float height; FILE *fp;
6     fp=fopen("student.txt","w+");
7     do{
8         printf("Enter Name: "); scanf("%s",name); fflush(stdin);
9         printf("Enter Age: "); scanf("%d",&age); fflush(stdin);
10        printf("Enter Height: "); scanf("%f",&height); fflush(stdin);
11        printf("\nDo you wish to continue ('y/n')? ");
12        scanf("%c",&choice);
13        fprintf(fp,"%s\t%d\t%f",name,age,height);
14    }while(choice=='Y' || choice=='y');
15    rewind(fp);
16    while(!feof(fp)){
17        fscanf(fp,"%s%d%f",name,&age,&height);
18        printf("\n%s\t%d\t%.2f",name,age,height);
19    }
20    fclose(fp); getch(); return 0;
21 }
```

student.txt - Notepad

Kareena	18	5.700000	Sushant	17	5.800000
---------	----	----------	---------	----	----------

D:\[C]\Ch10\_Data\_Files\FILE\_8.exe

```
Enter Name: Kareena
Enter Age: 18
Enter Height: 5.7

Do you wish to continue ('y/n')? y
Enter Name: Sushant
Enter Age: 17
Enter Height: 5.8

Do you wish to continue ('y/n')? n

Kareena 18      5.70
Sushant 17      5.80
```

# Record I/O Functions in File fread() & fwrite()

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```
FILE_9.C
1 #include<stdio.h>
2 #include<conio.h>
3 #include<stdlib.h>
4 struct Employee{
5     char name[40]; int age; float sal;
6 };
7 int main(){
8     struct Employee e;
9     FILE *fp; char choice;
10    fp=fopen("employee.txt","a+b");
11    if(fp==NULL){ printf("Cannot open the file!"); }
12    do{
13        printf("Enter Name, Age, & Basic Salary:\n");
14        scanf("%s%d%f", e.name, &e.age, &e.sal);
15        fwrite(&e, sizeof(e), 1, fp);
16        fflush(stdin); printf("Add another record(y/n)? ");
17        scanf("%c", &choice);
18    }while(choice=='Y' || choice=='y');
19    rewind(fp); //Moves file pointer to starting
20    while(!feof(fp)){
21        fread(&e, sizeof(e), 1, fp);
22        printf("\n%s\t%d\t%f", e.name, e.age, e.sal);
23    }
24    fclose(fp); getch(); return 0;
25 }
```

D:\[C]\Ch10\_Data\_Files\FILE\_9.exe

Enter Name, Age, & Basic Salary:  
Ramesh 27 40000  
Add another record(y/n)? y  
Enter Name, Age, & Basic Salary:  
Udaya 34 80000  
Add another record(y/n)? n

Ramesh	27	40000.000000
Udaya	34	80000.000000

Why?

employee.txt - Notepad

File Edit Format View Help

Ramesh y" " %%%@ " "

@GUdaya y" " %%%@ " "

@æG

# Reading & writing arrays with record I/O functions

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```
FILE_10.C
1  #include<stdio.h>
2  #include<conio.h>
3  #include<stdlib.h>
4  int a[10]={1,2,3,4,5,6,7,8,9,10}, b[10];
5  int main(){
6      FILE *ftp;
7      int i;
8      ftp=fopen("integer.txt","wb+");
9      if(ftp==NULL){
10         printf("Cannot open a file.");
11     }else{
12         fwrite(a,sizeof(a),1,ftp);
13     }
14     printf("Data has been written on a file.\n");
15     rewind(ftp);
16     while(!feof(ftp))
17         fread(b,sizeof(b),1,ftp);
18
19     for(i=0;i<10;i++){
20         printf("%-4d",b[i]);
21     }
22     fclose(ftp);
23     getch(); return 0;
24 }
```

D:\[C]\Ch10\_Data\_Files\FILE\_10.exe

Data has been written on a file.

1 2 3 4 5 6 7 8 9 10

integer.txt - Notepad

File Edit Format View Help

0 0 0 0 0 0

FILE\_10.C integer.txt

```
1 0100 0000 0200 0000 0300 0000 0400 0000
2 0500 0000 0600 0000 0700 0000 0800 0000
3 0900 0000 0a00 0000
```

# Using ftell() Function

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2019-02-11

```
FILE_11.C
1  #include<stdio.h>
2  #include<conio.h>
3  int main(){
4      FILE *stream;
5      stream = fopen("khwopa.txt", "w+");
6      fprintf(stream, "This is a test ...");
7      printf("The file pointer is at byte %ld\n", ftell(stream));
8      fclose(stream);
9      getch();
10     return 0;
11 }
```

D:\[C]\Ch10\_Data\_Files\FILE\_11.exe

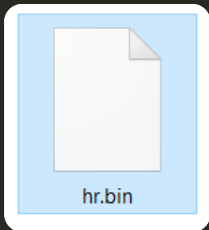
The file pointer is at byte 18

khwopa.txt - Notepad

File Edit Format View Help

This is a test ...

```
FILE_12.C x
1 #include<stdio.h>
2 #include<conio.h>
3 struct HR{
4     char name[10]; char address[15];
5     long int phone; char qualification[10];
6 }e,h[5]={
7     {"Ramesh","Samjur",9849761940,"SLC"},
8     {"Dinesh","Majhgaun",9801061940,"SEE"},
9     {"Harish","Pokhara",9811111111,"ME"},
10    {"Pawan","Bandipur",9822222222,"MSc"},
11    {"Sushmita","Dumre",9833333333,"PhD"},
12 };
13 int main(){
14     int end_pos, current_pos, total, n, i;
15     char choice;
16     FILE *f;
17     f = fopen("hr.bin","ab+");
18     for(i=0;i<5;i++){
19         fwrite(&h[i],sizeof(struct HR),1,f);
20     }
21     rewind(f);
22     fseek(f,0,SEEK_END);
23     end_pos=ftell(f);
24     total=end_pos/sizeof(struct HR);
25     do{
26         printf("There are %d structures, which you want to view? ",total);
27         scanf("%d",&n);
28         current_pos=(n-1)*sizeof(struct HR);
29         fseek(f,current_pos,SEEK_SET);
30         fread(&e,sizeof(struct HR),1,f);
31         printf("\nThe name is %s.\n",e.name);
32         printf("The address is %s.\n",e.address);
33         printf("The phone no is %ld.\n",e.phone);
34         printf("The qualification is %s.\n",e.qualification);
35         fflush(stdin);
36         printf("Do you want to see some other records(y/n)? ");
37         scanf("%c",&choice);
38     }while(choice=='Y' || choice=='y');
39     fclose(f); getch(); return 0;
40 }
```



```
D:\[C]\Ch10_Data_Files\FILE_12.exe
There are 5 structures, which you want to view? 1
The name is Ramesh.
The address is Samjur.
The phone no is 1259827348.
The qualification is SLC.
Do you want to see some other records(y/n)? y
There are 5 structures, which you want to view? 3
The name is Harish.
The address is Pokhara.
The phone no is 1221176519.
The qualification is ME.
Do you want to see some other records(y/n)? y
There are 5 structures, which you want to view? 5
The name is Sushmita.
The address is Dumre.
The phone no is 1243398741.
The qualification is PhD.
Do you want to see some other records(y/n)? n
```

FILE_12.C		hr.bin
1	5261 6d65 7368 0000 0000 5361 6d6a 7572	
2	0000 0000 0000 0000 0000 0000 9470 174b	
3	534c 4300 0000 0000 0000 0000 4469 6e65	
4	7368 0000 0000 4d61 6a68 6761 756e 0000	
5	0000 0000 0000 0000 3456 3048 5345 4500	
6	0000 0000 0000 0000 4861 7269 7368 0000	
7	0000 506f 6b68 6172 6100 0000 0000 0000	

hr.bin - Notepad		
File	Edit	Format View Help
1	Ramesh	Samjur "pKSLC
1	Dinesh	Majhgaun 4VOHSEE
1	Harish	Pokhara Ç-ÉHME
1	Pawan	Bandipur Ž7sIMSc
1	Sushmita	Dumre UÂJPhD

# Task

- Modify Program# 12 to take input from user using structure to store information of HR. User should view any information of saved HRs.

```
15     for(i=0;i<5;i++){
16         printf("Enter Name: ");
17         scanf("%s",h[i].name);
18         printf("Enter Address: ");
19         scanf("%s",h[i].address);
20         printf("Enter Phone No.: ");
21         scanf("%ld",&h[i].phone);
22         printf("Enter Qualification: ");
23         scanf("%s",h[i].qualification);
24         fwrite(&h[i],sizeof(struct HR),1,fptr);
25         //clrscr();
26     }
```

D:\[C]\Ch10\_Data\_Files\FILE\_12\_2.exe

```
Enter Name: Sundar
Enter Address: Bandipur
Enter Phone No.: 9849761940
Enter Qualification: ISc
Enter Name: Laxmi
Enter Address: Chitwan
Enter Phone No.: 9801061940
Enter Qualification: SLC
Enter Name: Shiva
Enter Address: Samjur
Enter Phone No.: 9849761940
Enter Qualification: ME
Enter Name: Abinash
Enter Address: Pokhara
Enter Phone No.: 9811111111
Enter Qualification: BBS
Enter Name: Rajin
Enter Address: Kathmandu
Enter Phone No.: 9822222222
Enter Qualification: BEd
There are 10 structures, which you want to view? 8
```

```
The name is Shiva.
The address is Samjur.
The phone no is 1259827348.
The qualification is ME.
Do you want to see some other records(y/n)? y
There are 10 structures, which you want to view? 10
```

```
The name is Rajin.
The address is Kathmandu.
The phone no is 1232287630.
The qualification is BEd.
Do you want to see some other records(y/n)? y
There are 10 structures, which you want to view? 1
```

```
The name is Ramesh.
The address is Samjur.
The phone no is 1259827348.
The qualification is SLC.
Do you want to see some other records(y/n)? y
There are 10 structures, which you want to view? 5
```

```
The name is Sushmita.
The address is Dumre.
The phone no is 1243398741.
The qualification is PhD.
Do you want to see some other records(y/n)?
```



- Q. Display stored employee info. By name (asc order). Use the concept of array, structure & file.

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EMP\_SortBy\_Name.C

```
1  #include<stdio.h>
2  #include<conio.h>
3  #include<string.h>
4  typedef struct{
5      char name[30]; int id; float salary;
6  }employee;
7  int main(){
8      int n,i,j; FILE *fptr; employee e[10], temp; char fileName[30];
9      /* Opening file in write-binary read mode */
10     printf("Enter file name to save the Employee info: ");
11     gets(fileName);
12     printf("Enter how many records: "); scanf("%d",&n);
13     fptr = fopen(fileName,"wb+");
14     if(fptr == NULL){ printf("File error!"); /*exit(1);*/ getch();}
15     /* Reading from console and storing them in structure array */
16     for(i=0;i < n;i++){
17         printf("Employee%d - Enter Name, ID & Salary: ", i+1);
18         scanf("%s%d%f",e[i].name, &e[i].id, &e[i].salary);
19         fwrite(&e[i],sizeof(e[i]),1, fptr); //Writing info. to File
20     }
```

```

EMP_SortBy_Name.C
21  rewind(fptr);
22  /* Reading from file and storing them in structure array */
23  for(i=0;i < n;i++){
24      fread(&e[i],sizeof(e[i]),1, fptr);
25  }/* Sorting */
26  for(i=0;i< n-1;i++){
27      for(j=i+1;j< n;j++){
28          if(strcmp(e[i].name,e[j].name)>0){
29              temp = e[i];
30              e[i] = e[j];
31              e[j] = temp;
32          }
33      }
34  }/* Displaying sorted list */
35  printf("\nSorted (by Name) List:\n");
36  for(i=0;i< n;i++){
37      printf("Name = %-20sID = %-8dSalary = %.2f\n",e[i].name, e[i].id, e[i].salary);
38  }
39  fclose(fptr); getch(); return 0;
40  }

```

```

C:\Users\ErSKS\Google Drive (c.khwopa@gmail.com)\C_Slides\...
Enter how many records: 3
Enter Name, ID & Salary of Employee#1: Amit 401 34000
Enter Name, ID & Salary of Employee#2: Zunu 404 46000
Enter Name, ID & Salary of Employee#3: Hari 403 45000

Sorted (by Salary) List:
Name = Amit           ID = 401       Salary = 34000.00
Name = Hari           ID = 403       Salary = 45000.00
Name = Zunu           ID = 404       Salary = 46000.00

-----
Process exited after 60.29 seconds with return value 0
Press any key to continue . . .

```



# Revision

## Common Programming Errors

- ▶ Missing Semicolons
  - ▶ `a=x+y`
  - ▶ `b=m/n;`
- ▶ Missing Parentheses in Pointer Expressions
  - ▶ `x = *p1+1;`
  - ▶ `x = *(p1+1)`
- ▶ Omitting Parentheses around Arguments in Macro Definitions
  - ▶ `#define f(x) x*x+1`
- ▶ Unwanted/Unseen Semicolon
  - ▶ `void main();`
  - ▶ `for(i=0; i<5; i++);`

# Q/A?

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## Thank You!

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