CERTIFICATE

OF PARTICIPATION

This certificate is awarded to

Siddhika shukla

For participating in the event “ROADMAP TO WEB DEVELOPMENT” by
IEEE GTBIT SB CS Chapter held on **10TH January 2022.**

MR. MUKESH SAHU

BRANCH COUNSELLOR, IEEE GTBIT

CERTIFICATE

OF PARTICIPATION

This certificate is awarded to

Siddhika shukla

For participating in the event **"BASICS OF PYTHON"** by **IEEE GTBIT SB CS Chapter** held on **26TH December 2021.**

MR. MUKESH SAHU

BRANCH COUNSELLOR, IEEE GTBIT

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
P  BT  WT  TAT
1  10  0   10
2  5  10   15
3  8  15   23
Average waiting time = 8.333333
Average turn around time = 16.000000
PS C:\college programs>
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
Enter number of process: 5
Enter Burst Time:
P1: 01
P2: 02
P3: 03
P4: 04
P5: 05
P       BT      WT      TAT
P1      1       0       1
P2      2       1       3
P3      3       3       6
P4      4       6       10
P5      5       10      15
Average Waiting Time= 4.000000
Average Turnaround Time= 7.000000
PS C:\college programs>
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
Enter Number of Processes: 5
Enter Burst Time and Priority Value for Process 1: 1 3
Enter Burst Time and Priority Value for Process 2: 2 2
Enter Burst Time and Priority Value for Process 3: 3 1
Enter Burst Time and Priority Value for Process 4: 4 5
Enter Burst Time and Priority Value for Process 5: 5 4
Order of process Execution is
P4 is executed from 0 to 4
P5 is executed from 4 to 9
P1 is executed from 9 to 10
P2 is executed from 10 to 12
P3 is executed from 12 to 15

Process Id     Burst Time   Wait Time    TurnAround Time
P4          4          0          4
P5          5          4          9
P1          1          9          10
P2          2          10          12
P3          3          12          15
PS C:\college programs>
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
 Total number of process in the system: 2

 Enter the Arrival and Burst time of the Process[1]
 Arrival time is:       1

Burst time is:  8

 Enter the Arrival and Burst time of the Process[2]
 Arrival time is:       2

Burst time is:  4
Enter the Time Quantum for the process:         3

 Process No              Burst Time              TAT             Waiting Time
Process No[2]           4                               8                       4
Process No[1]           8                               11                      3
 Average Turn Around Time:      9.500000
 Average Waiting Time:  3.500000
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
Enter no of pages:10
Enter the reference string:7 8 9 3 2 4 7 4 6 1
Enter no of frames:3

        7
        7       8
        7       8       9
        3       8       9
        3       2       9
        3       2       4
        7       2       4
        7       6       4
        1       6       4

The no of page faults is 9
PS C:\college programs>
```

```
 Incoming  t Frame 1  t Frame 2  t Frame 3
4                       4                       -                       -
1                       4                       1                       -
2                       4                       1                       2
4                       4                       1                       2
5                       5                       1                       2
Total Page Faults:      4
PS C:\college programs>
```

```
 PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
 Enter number of frames: 3
 Enter number of pages: 10
 Enter page reference string: 7 8 9 3 2 1 6 5 4 9

 7       -1      -1
 7       8       -1
 7       8       9
 3       8       9
 2       8       9
 1       8       9
 6       8       9
 5       8       9
 4       8       9
 4       8       9

 Total Page Faults = 9
 PS C:\college programs>
```

```
        Memory Management Scheme - Worst Fit
Enter the number of blocks:3
Enter the number of files:3

Enter the size of the blocks:-
Block 1:5
Block 2:2
Block 3:7
Enter the size of the files :-
File 1:1
File 2:4
File 3:5

File_no:        File_size :     Block_no:       Block_size:     Fragement
1               1               3               7               6
2               4               1               5               1
3               5               0               8               0
```

```
        Memory Management Scheme - First Fit
Enter the number of blocks:3
Enter the number of files:2

Enter the size of the blocks:-
Block 1:5
Block 2:2
Block 3:7
Enter the size of the files :-
File 1:1
File 2:4

File_no:        File_size :     Block_no:       Block_size:     Fragement
1               1               1               5               4
2               4               3               7               3
PS C:\college programs>
```

```
Enter the number of blocks:3
Enter the number of files:2

Enter the size of the blocks:-
Block 1:5
Block 2:7
Block 3:2
Enter the size of the files :-
File 1:4
File 2:3

File No File Size       Block No        Block Size      Fragment
1               4               1               5               1
2               3               2               7               4
PS C:\college programs>
```

```
1 reader is inside
1 Reader is leaving
Writer is trying to enter
Writer has entered
Writer is leaving
1 reader is inside
1 Reader is leaving
Writer is trying to enter
Writer has entered
Writer is leaving
1 reader is inside
1 Reader is leaving
Writer is trying to enter
Writer has entered
Writer is leaving
1 reader is inside
1 Reader is leaving
Writer is trying to enter
Writer has entered
Writer is leaving

...Program finished with exit code 0
Press ENTER to exit console.
```

```
Enter the number of Producers:2
Enter the number of Consumers:2
Enter buffer capacity:2
Successfully created producer 1
Producer 1 produced 29
Successfully created producer 2
Producer 2 produced 11
Successfully created consumer 1
Buffer:29 11
Consumer 3 consumed 11
Current buffer len: 1
Buffer:29
Consumer 2 consumed 29
Current buffer len: 0
Successfully created consumer 2
Producer 1 produced 3
Buffer:3
Consumer 2 consumed 3
Current buffer len: 0
Producer 2 produced 31
Producer 1 produced 27
Producer 1 produced 7
Buffer:31 27
```

```
Enter the number of process and resources
5 3
enter allocation of resource of all process 5x3 matrix
1 2 3
4 5 6
0 6 7
0 8 9
9 5 4
enter the max resource process required 5x3 matrix
0 1 0
1 2 3
2 3 4
3 4 5
4 5 6
enter the  available resource 3 4 2

 need resources matrix are
-1      -1      -3
-3      -3      -3
2       -3      -3
3       -4      -4
-5      0       2

 available resource after completion
17      30      31
 safe sequence are
p0      p1      p2      p3      p4
```

```
Enter the directory name:siddhika
Enter the number of files:3
Enter file name to be created:sid
Do you want to enter another file(yes - 1 or no - 0):1
Enter file name to be created:shukla
Do you want to enter another file(yes - 1 or no - 0):1
Enter file name to be created:ss
Do you want to enter another file(yes - 1 or no - 0):1
Enter file name to be created:sk
Do you want to enter another file(yes - 1 or no - 0):0
Directory name is:siddhika
Files names are:
sid
shukla
ss
sk
PS C:\college programs>
```

```
1. Create Directory     2. Create File  3. Delete File
4. Search File          5. Display      6. Exit
Enter your choice -- 1

Enter name of directory -- siddhika
Directory created

1. Create Directory     2. Create File  3. Delete File
4. Search File          5. Display      6. Exit
Enter your choice -- 2

Enter name of the directory -- siddhika
Enter name of the file -- sid
File created

1. Create Directory     2. Create File  3. Delete File
4. Search File          5. Display      6. Exit
Enter your choice -- 5

Directory       Files
siddhika        sid

1. Create Directory     2. Create File  3. Delete File
4. Search File          5. Display      6. Exit
Enter your choice -- 6
PS C:\college programs>
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc hierarchical.c -o hierarchical } ; if ($?) { .\hierarchical }
Enter number of users: 1
Enter name: siddhika
Enter dir(1) or file(0): sid

Hierarchical
```

GURU TEGH BAHADUR INSTITUTE OF TECHNOLOGY

COMPILER DESIGNE LAB FILE

NAME: SIDDHIKA SHUKLA

ENROLLMENT NO.: 05113203121

BRANCH: IT-1, 5TH SEM

TITLE TABLE

S.NO.	TITLE	PAGE NO.	SIGNATURE

PRACTICAL – 1

Introduction to Compiler Design.

The compiler is software that converts a program written in a high-level language (Source Language) to a low-level language (Object/Target/Machine Language/0, 1's).

A translator or language processor is a program that translates an input program written in a programming language into an equivalent program in another language. The compiler is a type of translator, which takes a program written in a high-level programming language as input and translates it into an equivalent program in low-level languages such as machine language or assembly language.

The program written in a high-level language is known as a source program, and the program converted into a low-level language is known as an object (or target) program. Without compilation, no program written in a high-level language can be executed. For every programming language, we have a different compiler; however, the basic tasks performed by every compiler are the same. The process of translating the source code into machine code involves several stages, including lexical analysis, syntax analysis, semantic analysis, code generation, and optimization.

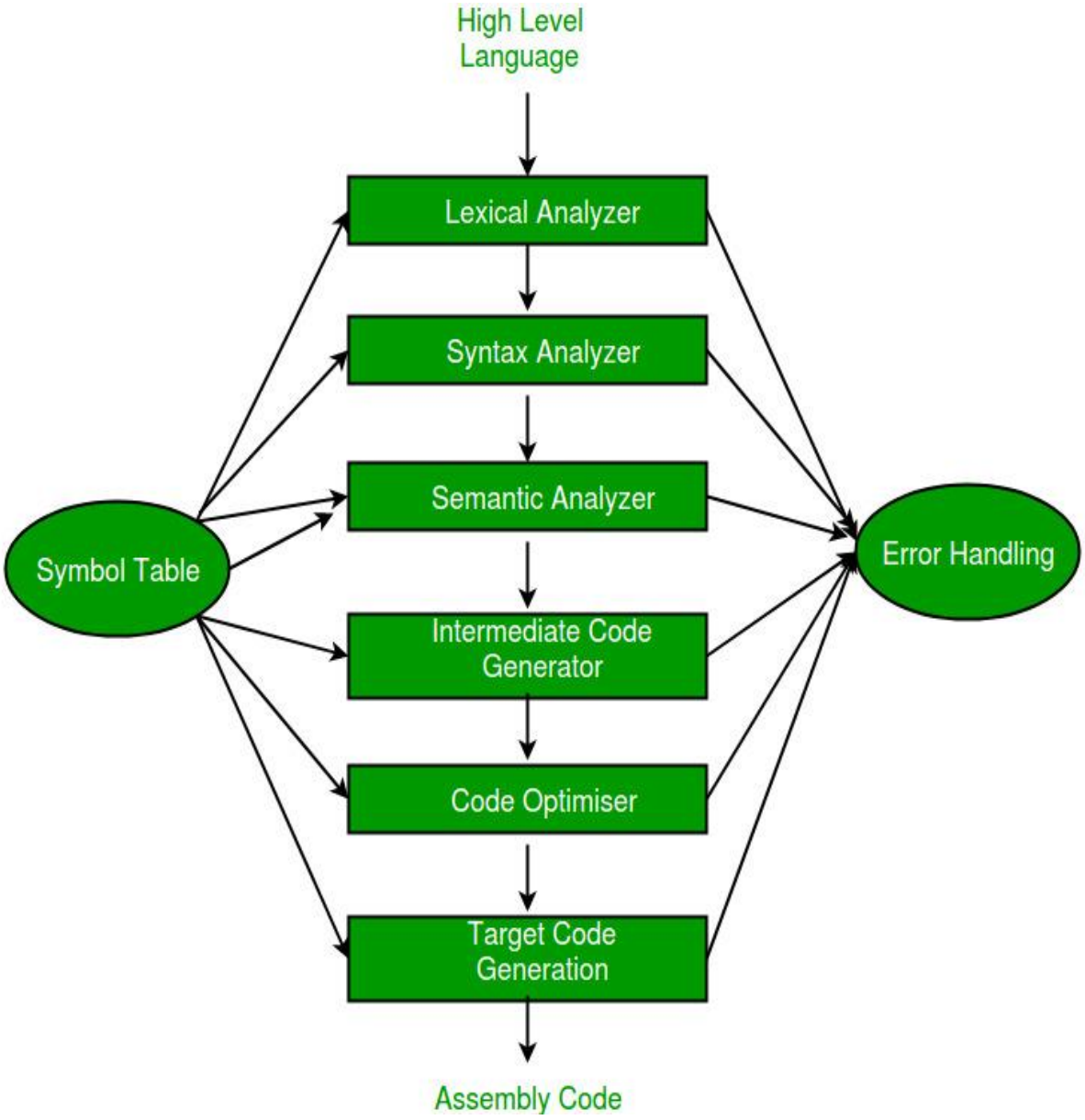
Compiler is an intelligent program as compare to an assembler. Compiler verifies all types of limits, ranges, errors, etc. Compiler program takes more time to run and it occupies huge amount of memory space. The speed of compiler is slower than other system software. It takes time because it enters through the program and then does translation of the full program. When compiler runs on same machine and produces machine code for the same machine on which it is running. Then it is called as self-compiler or resident compiler. Compiler may run on one machine and produces the machine codes for other computer then in that case it is called as cross compiler.

Stages of Compiler Design

- Lexical Analysis: The first stage of compiler design is lexical analysis, also known as scanning. In this stage, the compiler reads the source code character by character and breaks it down into a series of tokens, such as keywords, identifiers, and operators. These tokens are then passed on to the next stage of the compilation process.
- Syntax Analysis: The second stage of compiler design is syntax analysis, also known as parsing. In this stage, the compiler checks the syntax of the source code to ensure that it conforms to the rules of the programming language. The compiler builds a parse tree, which is a hierarchical representation of the program's structure, and uses it to check for syntax errors.
- Semantic Analysis: The third stage of compiler design is semantic analysis. In this stage, the compiler checks the meaning of the source code to ensure that it makes sense. The compiler performs type checking, which ensures that variables are used correctly and that operations are performed on compatible data types. The compiler also checks for other semantic errors, such as undeclared variables and incorrect function calls.
- Code Generation: The fourth stage of compiler design is code generation. In this stage, the compiler translates the parse tree into machine code that can be executed by the computer. The code generated by the compiler must be efficient and optimized for the target platform.
- Optimization: The final stage of compiler design is optimization. In this stage, the compiler analyses the generated code and makes optimizations to improve its performance. The compiler may perform optimizations such as constant folding, loop unrolling, and function inlining.

Overall, compiler design is a complex process that involves multiple stages and requires a deep understanding of both the programming language and the target platform. A well-designed compiler can

greatly improve the efficiency and performance of software programs, making them more useful and valuable for users.



PRACTICAL – 2

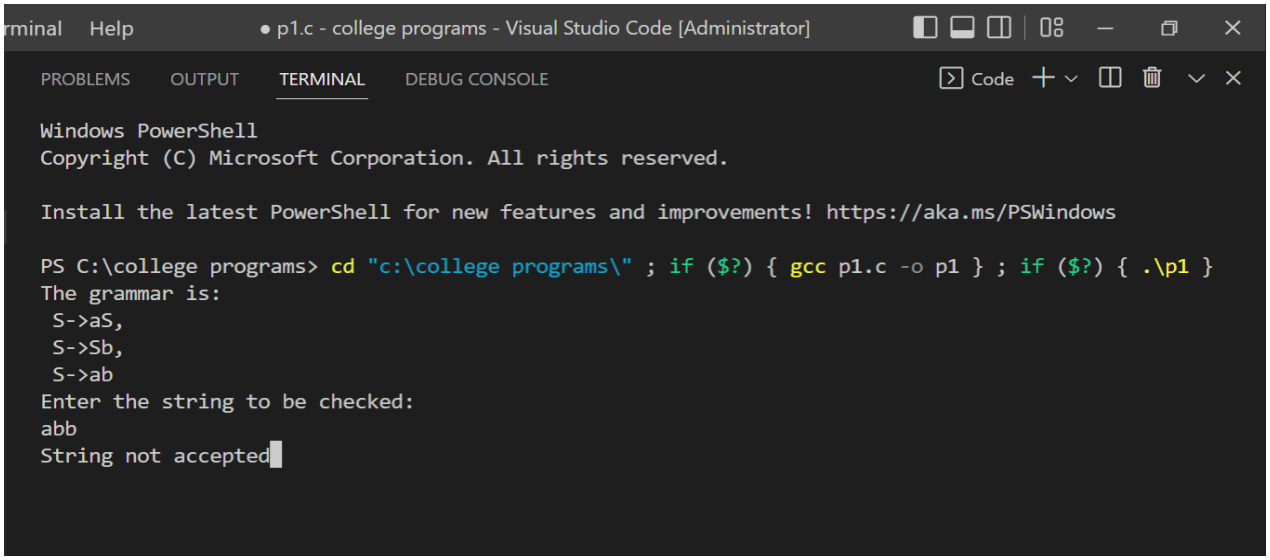
Write a program to check whether a string belong to the grammar or not.

Program:

```
#include<stdio.h>
#include<conio.h>
#include<string.h>
void main() {
        char string[50];
        int flag,count=0;
        printf("The grammar is:\n S->aS,\n S->Sb,\n S->ab\n");
        printf("Enter the string to be checked:\n");
        gets(string);
        if(string[0]=='a') {
                flag=0;
                for (count=1;string[count-1]!='\0';count++) {
                        if(string[count]=='b') {
                                flag=1;
                                continue;
                        }
                        else if((flag==1)&&(string[count]=='a')) {
                                printf("The string does not belong to the specified
grammar");
                                break;
                        }
                        else if(string[count]=='a'){
```

```
            continue;
        }
        else if((flag==1)&&(string[count]='\0')) {
            printf("String accepted…..!!!!");
            break;
        }
        else {
            printf("String not accepted");
        }
    }
}
    getch();
}
```

Output:



PRACTICAL – 3

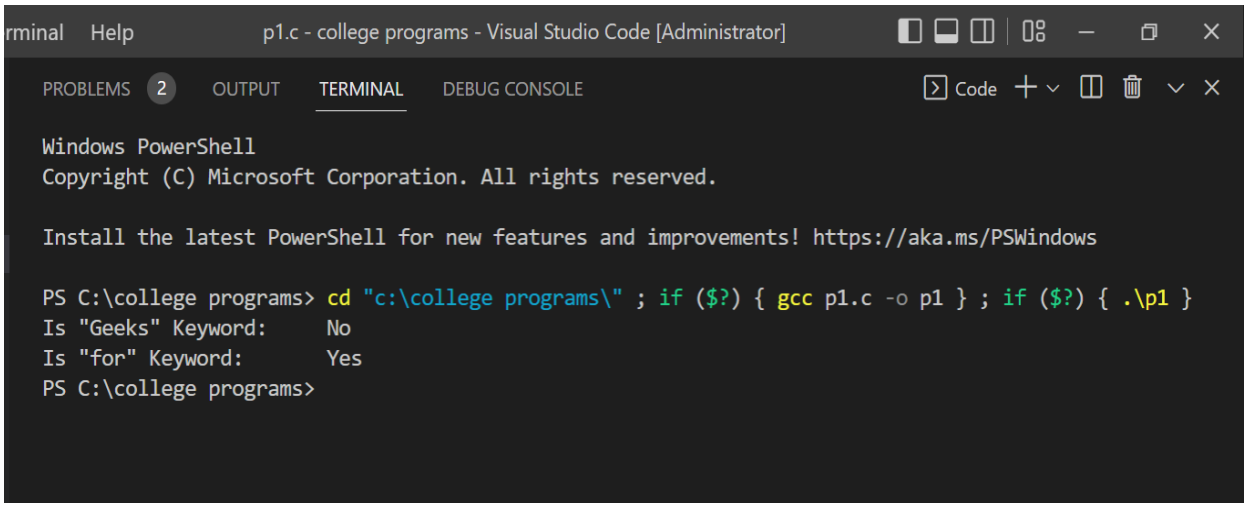
Write a program to check whether a string include keyword or not.

Program:

```
#include <stdbool.h>
#include <stdio.h>
#include <string.h>
bool isKeyword(char* str)
{
   if (!strcmp(str, "auto") || !strcmp(str, "default")
      || !strcmp(str, "signed") || !strcmp(str, "enum")
      || !strcmp(str, "extern") || !strcmp(str, "for")
      || !strcmp(str, "register") || !strcmp(str, "if")
      || !strcmp(str, "else") || !strcmp(str, "int")
      || !strcmp(str, "while") || !strcmp(str, "do")
      || !strcmp(str, "break") || !strcmp(str, "continue")
      || !strcmp(str, "double") || !strcmp(str, "float")
      || !strcmp(str, "return") || !strcmp(str, "char")
      || !strcmp(str, "case") || !strcmp(str, "const")
      || !strcmp(str, "sizeof") || !strcmp(str, "long")
      || !strcmp(str, "short") || !strcmp(str, "typedef")
      || !strcmp(str, "switch")
      || !strcmp(str, "unsigned") || !strcmp(str, "void")
      || !strcmp(str, "static") || !strcmp(str, "struct")
      || !strcmp(str, "goto") || !strcmp(str, "union")
      || !strcmp(str, "volatile"))
```

```
        return (true);
    return (false);
}
int main()
{
    printf("Is \"Geeks\" Keyword: \t");
    isKeyword("geeks") ? printf("Yes\n") : printf("No\n");
    printf("Is \"for\" Keyword: \t");
    isKeyword("for") ? printf("Yes\n") : printf("No\n");
    return 0;
}
```

Output:



PRACTICAL – 4

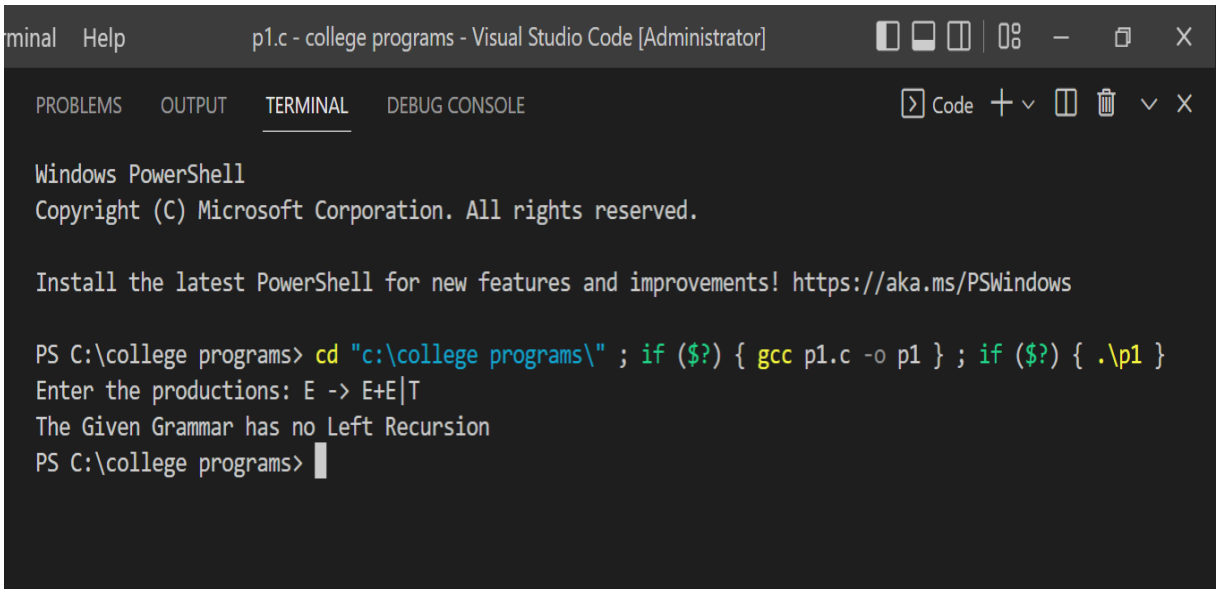
Write a program to remove left recursion from a grammar.

Program:

```
#include<stdio.h>
#include<string.h>
void main()  {
   char input[100],l[50],r[50],temp[10],tempprod[20],productions[25][50];
   int i=0,j=0,flag=0,consumed=0;
   printf("Enter the productions: ");
   scanf("%1s->%s",l,r);
   printf("%s",r);
   while(sscanf(r+consumed,"%[^|]s",temp) == 1 && consumed <= strlen(r))  {
      if(temp[0] == l[0])  {
         flag = 1;
         sprintf(productions[i++],"%s->%s%s'\0",l,temp+1,l);
      }
      else
         sprintf(productions[i++],"%s'->%s%s'\0",l,temp,l);
      consumed += strlen(temp)+1;
   }
   if(flag == 1)  {
      sprintf(productions[i++],"%s->ε\0",l);
      printf("The productions after eliminating Left Recursion are:\n");
      for(j=0;j<i;j++)
         printf("%s\n",productions[j]);
   }
```

```
    else
        printf("The Given Grammar has no Left Recursion");
}
```

Output:



PRACTICAL – 5

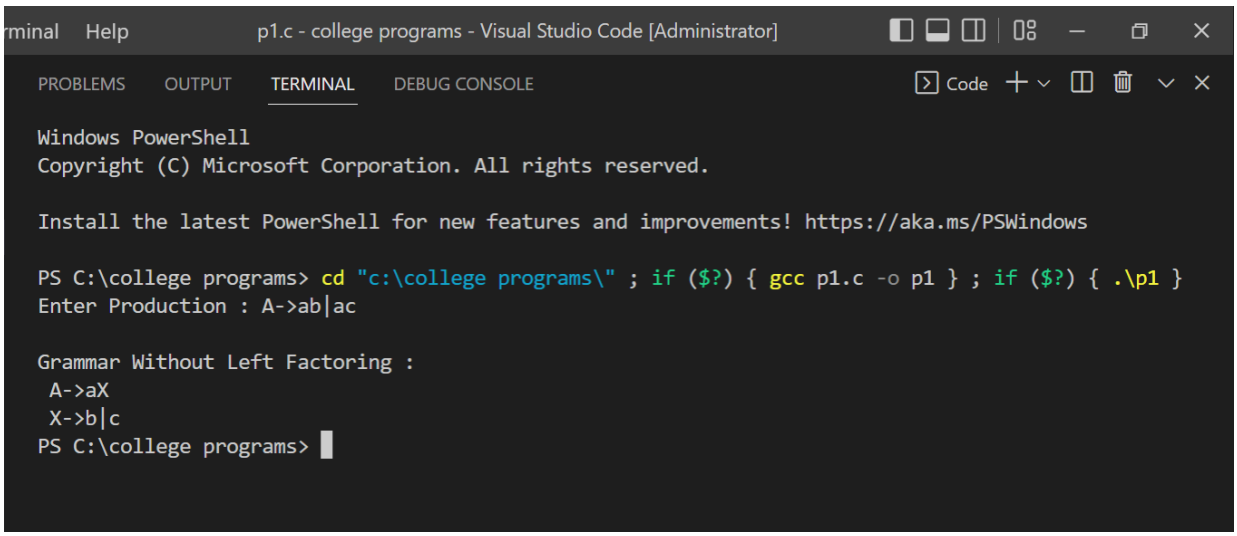
Write a program to perform left factoring on a grammar.

Program:

```
#include<stdio.h>
#include<string.h>
int main()
{
   char
gram[20],part1[20],part2[20],modifiedGram[20],newGram[20],tempGram[20];
   int i,j=0,k=0,l=0,pos;
   printf("Enter Production : A->");
   gets(gram);
   for(i=0;gram[i]!='|';i++,j++)
      part1[j]=gram[i];
   part1[j]='\0';
   for(j=++i,i=0;gram[j]!='\0';j++,i++)
      part2[i]=gram[j];
   part2[i]='\0';
   for(i=0;i<strlen(part1)||i<strlen(part2);i++){
      if(part1[i]==part2[i]){
         modifiedGram[k]=part1[i];
         k++;
         pos=i+1;
      }
   }
   for(i=pos,j=0;part1[i]!='\0';i++,j++){
```

```
        newGram[j]=part1[i];
    }
    newGram[j++]='|';
    for(i=pos;part2[i]!='\0';i++,j++){
        newGram[j]=part2[i];
    }
    modifiedGram[k]='X';
    modifiedGram[++k]='\0';
    newGram[j]='\0';
    printf("\nGrammar Without Left Factoring :  \n");
    printf(" A->%s",modifiedGram);
    printf("\n X->%s\n",newGram);
}
```

Output:



PRACTICAL – 6

Write a program to show all the operations of a stack.

Program:

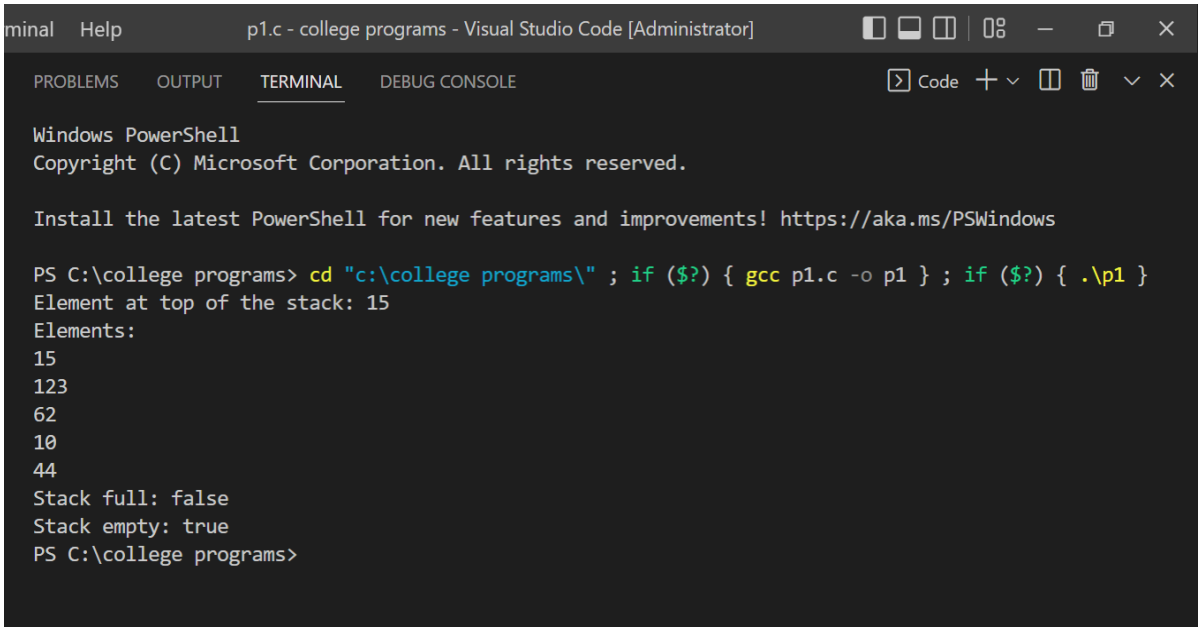
```
#include <stdio.h>
int MAXSIZE = 8;
int stack[8];
int top = -1;
int isempty(){
   if(top == -1)
      return 1;
   else
      return 0;
}
int isfull(){
   if(top == MAXSIZE)
      return 1;
   else
      return 0;
}
int peek(){
   return stack[top];
}
int pop(){
   int data;
   if(!isempty()) {
      data = stack[top];
```

```
      top = top - 1;
      return data;
   } else {
      printf("Could not retrieve data, Stack is empty.\n");
   }
}
int push(int data){
   if(!isfull()) {
      top = top + 1;
      stack[top] = data;
   } else {
      printf("Could not insert data, Stack is full.\n");
   }
}
int main(){
   push(44);
   push(10);
   push(62);
   push(123);
   push(15);
   printf("Element at top of the stack: %d\n" ,peek());
   printf("Elements: \n");

   // print stack data
   while(!isempty()) {
      int data = pop();
      printf("%d\n",data);
```

```
    }
    printf("Stack full: %s\n" , isfull()?"true":"false");
    printf("Stack empty: %s\n" , isempty()?"true":"false");
    return 0;
}
```

Output:



PRACTICAL – 7

Write a program to find out the leading of the non-terminals in a grammar.

Program:

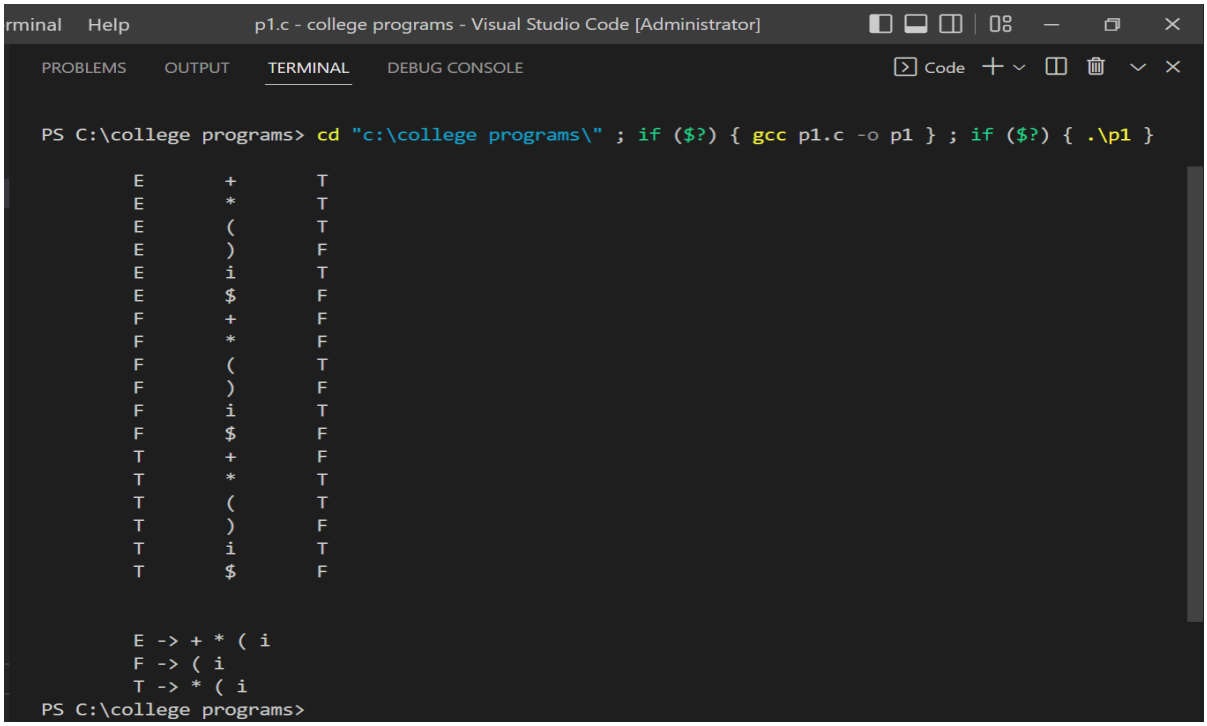
```
#include<conio.h>
#include<stdio.h>
char arr[18][3] ={{'E', '+', 'F'},{'E', '*', 'F'},{'E', '(', 'F'}, {'E', ')', 'F'},{'E', 'i', 'F'},{'E', '$', 'F'},
{'F', '+', 'F'},{'F', '*', 'F'},{'F', '(', 'F'},{'F', ')', 'F'},{'F', 'i', 'F'},{'F', '$', 'F'}, {'T', '+', 'F'},
{'T', '*', 'F'}, {'T', '(', 'F'},{'T', ')', 'F'},{'T', 'i', 'F'},{'T', '$', 'F'}};
char prod[6] = "EETTFF";
char res[6][3] ={ {'E', '+', 'T'}, {'T', '\0'}, {'T', '*', 'F'},  {'F', '\0'}, {'(', 'E', ')'}, {'i', '\0'}};
char stack [5][2];
int top = -1;
void install(char pro, char re) {
   int i;
   for (i = 0; i < 18; ++i) {
      if (arr[i][0] == pro && arr[i][1] == re) {

         arr[i][2] = 'T';
         break;
      }
   }
   ++top;
   stack[top][0] = pro;
```

```
    stack[top][1] = re;
}
void main() {
    int i = 0, j;
    char pro, re, pri = ' ';
    for (i = 0; i < 6; ++i) {
        for (j = 0; j < 3 && res[i][j] != '\0'; ++j) {
            if (res[i][j] == '+' || res[i][j] == '*' || res[i][j] == '(' || res[i][j] == ')' ||
res[i][j] == 'i' || res[i][j] == '$') {
                install(prod[i], res[i][j]);
                break;
            }
        }
    }
    while (top >= 0) {
        pro = stack[top][0];
        re = stack[top][1];
        --top;
        for (i = 0; i < 6; ++i) {
            if (res[i][0] == pro && res[i][0] != prod[i]) {
                install(prod[i], re);
            }
        }
    }
    for (i = 0; i < 18; ++i) {
        printf("\n\t");
        for (j = 0; j < 3; ++j)
            printf("%c\t", arr[i][j]);
```

```
    }
    getch();
    printf("\n\n");
    for (i = 0; i < 18; ++i) {
        if (pri != arr[i][0]) {
            pri = arr[i][0];
            printf("\n\t%c -> ", pri);
        }
        if (arr[i][2] == 'T')
            printf("%c ", arr[i][1]);
    }
    getch();
}
```

Output:



PRACTICAL – 8

Write a program to implement shift reduce parsing for a string.

Program:

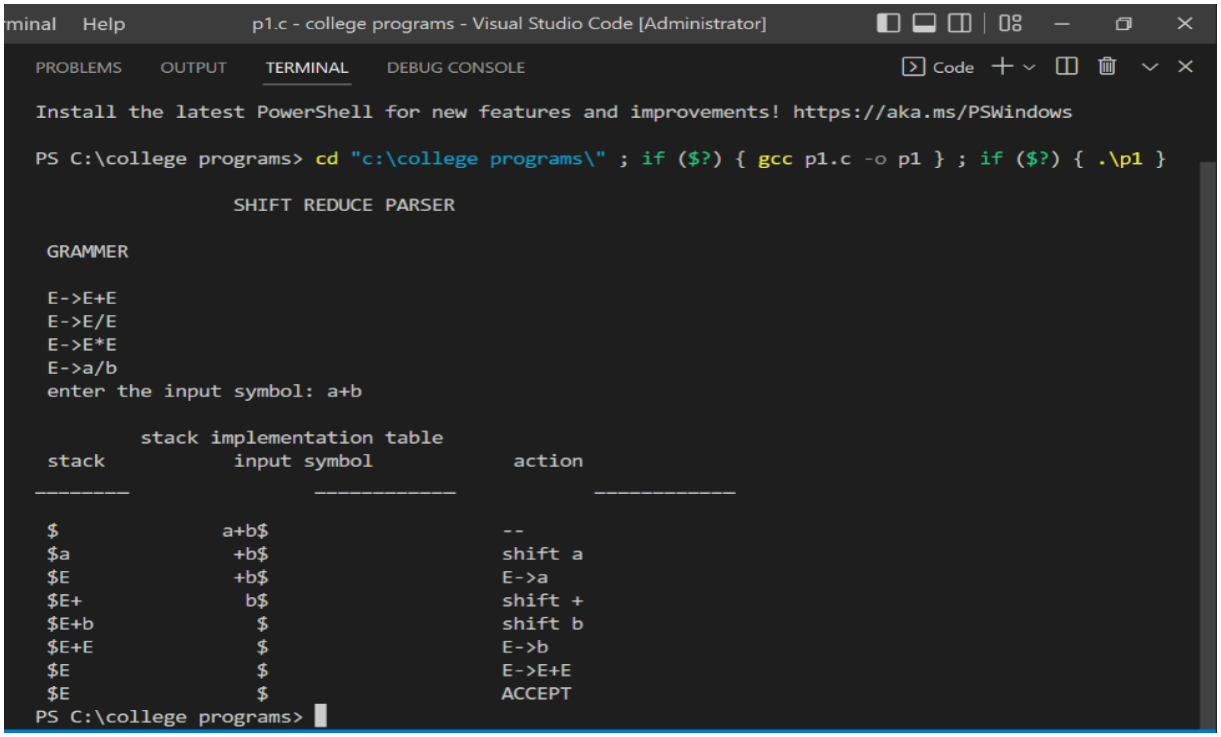
```
#include<stdio.h>
#include<stdlib.h>
#include<conio.h>
#include<string.h>
char ip_sym[15],stack[15];
int ip_ptr=0,st_ptr=0,len,i;
char temp[2],temp2[2];
char act[15];
void check();
void main()
{
printf("\n\t\t SHIFT REDUCE PARSER\n");
printf("\n GRAMMER\n");
printf("\n E->E+E\n E->E/E");
printf("\n E->E*E\n E->a/b");
printf("\n enter the input symbol: ");
gets(ip_sym);
printf("\n\t stack implementation table");
printf("\n stack \t\t input symbol\t\t action");
printf("\n________\t\t_____________\t\t_____________\n");
printf("\n $\t\t%s$\t\t\t--",ip_sym);
strcpy(act,"shift ");
```

```
temp[0]=ip_sym[ip_ptr];
temp[1]='\0';
strcat(act,temp);
len=strlen(ip_sym);
for(i=0;i<=len-1;i++)
{
stack[st_ptr]=ip_sym[ip_ptr];
stack[st_ptr+1]='\0';
ip_sym[ip_ptr]=' ';
ip_ptr++;
printf("\n $%s\t\t%s$\t\t\t%s",stack,ip_sym,act);
strcpy(act,"shift ");
temp[0]=ip_sym[ip_ptr];
temp[1]='\0';
strcat(act,temp);
check();
st_ptr++;
}
st_ptr++;
check();
}
void check()
{
int flag=0;
temp2[0]=stack[st_ptr];
temp2[1]='\0';
if((!strcmpi(temp2,"a"))||(!strcmpi(temp2,"b")))
```

```
{
stack[st_ptr]='E';
if(!strcmpi(temp2,"a"))
printf("\n $%s\t\t%s$\t\t\tE->a",stack,ip_sym);
else
printf("\n $%s\t\t%s$\t\t\tE->b",stack,ip_sym);
flag=1;
}
if((!strcmpi(temp2,"+"))||(strcmpi(temp2,"*"))||(!strcmpi(temp2,"/"))) { flag=1;
}
if((!strcmpi(stack,"E+E"))||(!strcmpi(stack,"E\E"))||(!strcmpi(stack,"E*E")))
{
strcpy(stack,"E");
st_ptr=0;
if(!strcmpi(stack,"E+E"))
printf("\n $%s\t\t%s$\t\t\tE->E+E",stack,ip_sym);
else
if(!strcmpi(stack,"E\E"))
printf("\n $%s\t\t%s$\t\t\tE->E\E",stack,ip_sym);
else if(!strcmpi(stack,"E*E"))
printf("\n $%s\t\t%s$\t\t\tE->E*E",stack,ip_sym);
else
printf("\n $%s\t\t%s$\t\t\tE->E+E",stack,ip_sym);
flag=1;
}
if(!strcmpi(stack,"E")&&ip_ptr==len)
{
```

```
printf("\n $%s\t\t%s$\t\t\tACCEPT",stack,ip_sym);
getch();
exit(0);
}
if(flag==0)
{
printf("\n%s\t\t\t%s\t\t reject",stack,ip_sym);
exit(0);
}
return;
}
```

Output:



PRACTICAL – 9

Write a program to find out the FIRST of the non-terminals in a grammar.

Program:

```
#include<stdio.h>
#include<conio.h>
char array[10][20],temp[10];
int c,n;
void fun(int,int[]);
int fun2(int i,int j,int p[],int );
void main()
{
  int p[2],i,j;
  printf("Enter the no. of productions :");
  scanf("%d",&n);
  printf("Enter the productions :\n");
  for(i=0;i<n;i++)
  scanf("%s",array[i]);
  for(i=0;i<n;i++)
  {
   c=-1,p[0]=-1,p[1]=-1;
   fun(i,p);
   printf("First(%c) : [ ",array[i][0]);
   for(j=0;j<=c;j++)
   printf("%c,",temp[j]);
   printf("\b ].\n");
```

```
    getch();
   }
}
int fun2(int i,int j,int p[],int key)
{
  int k;
  if(!key)
  {
    for(k=0;k<n;k++)
    if(array[i][j]==array[k][0])
    break;
    p[0]=i;p[1]=j+1;
    fun(k,p);
    return 0;
  }
  else
  {
    for(k=0;k<=c;k++)
    {
    if(array[i][j]==temp[k])
    break;
    }
    if(k>c)return 1;
    else return 0;
  }
}
 void fun(int i,int p[])
```

```
{
int j,k,key;
for(j=2;array[i][j] != NULL; j++)
{
if(array[i][j-1]=='/')
{
if(array[i][j]>= 'A' && array[i][j]<='Z')
{
key=0;
fun2(i,j,p,key);
}
else
{
key = 1;
if(fun2(i,j,p,key))
temp[++c] = array[i][j];
if(array[i][j]== '@'&& p[0]!=-1)
{
if(array[p[0]][p[1]]>='A' && array[p[0]][p[1]] <='Z')
{
key=0;
fun2(p[0],p[1],p,key);
}
else
if(array[p[0]][p[1]] != '/'&& array[p[0]][p[1]]!=NULL)
{
if(fun2(p[0],p[1],p,key))
```

```
temp[++c]=array[p[0]][p[1]];
}
}
}
}
}
}
```

Output:

```
Enter the no. of productions :6
Enter the productions :
S/aBDh
B/cC
C/bC/e
E/g/e
D/E/F
F/f/e
First(S) : [ a ].
First(B) : [ c ].
First(C) : [ b,e ].
First(E) : [ g,e ].
First(D) : [ g,e,f ].
First(F) : [ f,e ].
PS C:\college programs>
```

PRACTICAL – 10

Write a program to check whether a grammar is operator precedent.

Program:

```
#include<stdio.h>
#include<string.h>
char *input;
int i=0;
char lasthandle[6],stack[50],handles[][5]={")E(","E*E","E+E","i","E^E"};
int top=0,l;
char prec[9][9]={
            '>', '>','<','<','<','<','<','>','>',
            '>', '>','<','<','<','<','<','>','>',
            '>', '>','>','>','<','<','<','>','>',
            '>', '>','>','>','<','<','<','>','>',
            '>', '>','>','>','<','<','<','>','>',
            '>', '>','>','>','>','e','e','>','>',
            '<', '<','<','<','<','<','<','>','e',
            '>', '>','>','>','>','e','e','>','>',
            '<', '<','<','<','<','<','<','<','>',
           };
int getindex(char c)
{
switch(c)
   {
   case '+':return 0;
```

```
    case '-':return 1;
    case '*':return 2;
    case '/':return 3;
    case '^':return 4;
    case 'i':return 5;
    case '(':return 6;
    case ')':return 7;
    case '$':return 8;
    }
}
int shift()
{
stack[++top]=*(input+i++);
stack[top+1]='\0';
}
int reduce()
{
int i,len,found,t;
for(i=0;i<5;i++)
    {
    len=strlen(handles[i]);
    if(stack[top]==handles[i][0]&&top+1>=len)
        {
        found=1;
        for(t=0;t<len;t++)
            {
            if(stack[top-t]!=handles[i][t])
```

```
            {
            found=0;
            break;
            }
          }
        if(found==1)
            {
            stack[top-t+1]='E';
            top=top-t+1;
            strcpy(lasthandle,handles[i]);
            stack[top+1]='\0';
            return 1;
            }
        }
   }
return 0;
}
void dispstack()
{
int j;
for(j=0;j<=top;j++)
    printf("%c",stack[j]);
}
void dispinput()
{
int j;
for(j=i;j<l;j++)
```

```
    printf("%c",*(input+j));
}
void main()
{
int j;
input=(char*)malloc(50*sizeof(char));
printf("\nEnter the string\n");
scanf("%s",input);
input=strcat(input,"$");
l=strlen(input);
strcpy(stack,"$");
printf("\nSTACK\tINPUT\tACTION");
while(i<=l)
                                        {
                                        shift();
                                        printf("\n");
                                        dispstack();
                                        printf("\t");
                                        dispinput();
                                        printf("\tShift");
                                        if(prec[getindex(stack[top])][getindex(input[i])]=='>
')
                                             {
                                             while(reduce())
                                                  {
                                                  printf("\n");
                                                  dispstack();
                                                  printf("\t");
```

```
                                    dispinput();
                                    printf("\tReduced: E->%s",lasthandle);
                                    }
                                }
                            }
if(strcmp(stack,"$E$")==0)
   printf("\nAccepted;");
else
  printf("\nNot Accepted;");
}
```

Output:

```
Enter the string
i*(i+i)*i

STACK   INPUT   ACTION
$i      *(i+i)*i$       Shift
$E      *(i+i)*i$       Reduced: E->i
$E*     (i+i)*i$        Shift
$E*(    i+i)*i$ Shift
$E*(i   +i)*i$  Shift
$E*(E   +i)*i$  Reduced: E->i
$E*(E+  i)*i$   Shift
$E*(E+i )*i$    Shift
$E*(E+E )*i$    Reduced: E->i
$E*(E   )*i$    Reduced: E->E+E
$E*(E)  *i$     Shift
$E*E    *i$     Reduced: E->)E(
$E      *i$     Reduced: E->E*E
$E*     i$      Shift
$E*i    $       Shift
$E*E    $       Reduced: E->i
$E      $       Reduced: E->E*E
$E$             Shift
$E$             Shift
Accepted;
PS C:\college programs>
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
P  BT  WT  TAT
1  10  0   10
2  5  10   15
3  8  15   23
Average waiting time = 8.333333
Average turn around time = 16.000000
PS C:\college programs>
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
Enter number of process: 5
Enter Burst Time:
P1: 01
P2: 02
P3: 03
P4: 04
P5: 05
P       BT      WT      TAT
P1      1       0       1
P2      2       1       3
P3      3       3       6
P4      4       6       10
P5      5       10      15
Average Waiting Time= 4.000000
Average Turnaround Time= 7.000000
PS C:\college programs>
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
Enter Number of Processes: 5
Enter Burst Time and Priority Value for Process 1: 1 3
Enter Burst Time and Priority Value for Process 2: 2 2
Enter Burst Time and Priority Value for Process 3: 3 1
Enter Burst Time and Priority Value for Process 4: 4 5
Enter Burst Time and Priority Value for Process 5: 5 4
Order of process Execution is
P4 is executed from 0 to 4
P5 is executed from 4 to 9
P1 is executed from 9 to 10
P2 is executed from 10 to 12
P3 is executed from 12 to 15

Process Id     Burst Time   Wait Time    TurnAround Time
P4          4          0          4
P5          5          4          9
P1          1          9          10
P2          2          10          12
P3          3          12          15
PS C:\college programs>
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
 Total number of process in the system: 2

 Enter the Arrival and Burst time of the Process[1]
 Arrival time is:       1

Burst time is:  8

 Enter the Arrival and Burst time of the Process[2]
 Arrival time is:       2

Burst time is:  4
Enter the Time Quantum for the process:         3

 Process No              Burst Time              TAT             Waiting Time
Process No[2]           4                               8                       4
Process No[1]           8                               11                      3
 Average Turn Around Time:      9.500000
 Average Waiting Time:  3.500000
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
Enter no of pages:10
Enter the reference string:7 8 9 3 2 4 7 4 6 1
Enter no of frames:3

        7
        7       8
        7       8       9
        3       8       9
        3       2       9
        3       2       4
        7       2       4
        7       6       4
        1       6       4

The no of page faults is 9
PS C:\college programs>
```

```
 Incoming  t Frame 1  t Frame 2  t Frame 3
4                       4                       -                       -
1                       4                       1                       -
2                       4                       1                       2
4                       4                       1                       2
5                       5                       1                       2
Total Page Faults:      4
PS C:\college programs>
```

```
 PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
 Enter number of frames: 3
 Enter number of pages: 10
 Enter page reference string: 7 8 9 3 2 1 6 5 4 9

 7       -1      -1
 7       8       -1
 7       8       9
 3       8       9
 2       8       9
 1       8       9
 6       8       9
 5       8       9
 4       8       9
 4       8       9

 Total Page Faults = 9
 PS C:\college programs>
```

```
        Memory Management Scheme - Worst Fit
Enter the number of blocks:3
Enter the number of files:3

Enter the size of the blocks:-
Block 1:5
Block 2:2
Block 3:7
Enter the size of the files :-
File 1:1
File 2:4
File 3:5

File_no:        File_size :     Block_no:       Block_size:     Fragement
1               1               3               7               6
2               4               1               5               1
3               5               0               8               0
```

```
        Memory Management Scheme - First Fit
Enter the number of blocks:3
Enter the number of files:2

Enter the size of the blocks:-
Block 1:5
Block 2:2
Block 3:7
Enter the size of the files :-
File 1:1
File 2:4

File_no:        File_size :     Block_no:       Block_size:     Fragement
1               1               1               5               4
2               4               3               7               3
PS C:\college programs>
```

```
Enter the number of blocks:3
Enter the number of files:2

Enter the size of the blocks:-
Block 1:5
Block 2:7
Block 3:2
Enter the size of the files :-
File 1:4
File 2:3

File No File Size       Block No        Block Size      Fragment
1               4               1               5               1
2               3               2               7               4
PS C:\college programs>
```

```
1 reader is inside
1 Reader is leaving
Writer is trying to enter
Writer has entered
Writer is leaving
1 reader is inside
1 Reader is leaving
Writer is trying to enter
Writer has entered
Writer is leaving
1 reader is inside
1 Reader is leaving
Writer is trying to enter
Writer has entered
Writer is leaving
1 reader is inside
1 Reader is leaving
Writer is trying to enter
Writer has entered
Writer is leaving

...Program finished with exit code 0
Press ENTER to exit console.
```

```
Enter the number of Producers:2
Enter the number of Consumers:2
Enter buffer capacity:2
Successfully created producer 1
Producer 1 produced 29
Successfully created producer 2
Producer 2 produced 11
Successfully created consumer 1
Buffer:29 11
Consumer 3 consumed 11
Current buffer len: 1
Buffer:29
Consumer 2 consumed 29
Current buffer len: 0
Successfully created consumer 2
Producer 1 produced 3
Buffer:3
Consumer 2 consumed 3
Current buffer len: 0
Producer 2 produced 31
Producer 1 produced 27
Producer 1 produced 7
Buffer:31 27
```

```
Enter the number of process and resources
5 3
enter allocation of resource of all process 5x3 matrix
1 2 3
4 5 6
0 6 7
0 8 9
9 5 4
enter the max resource process required 5x3 matrix
0 1 0
1 2 3
2 3 4
3 4 5
4 5 6
enter the  available resource 3 4 2

 need resources matrix are
-1      -1      -3
-3      -3      -3
2       -3      -3
3       -4      -4
-5      0       2

 available resource after completion
17      30      31
 safe sequence are
p0      p1      p2      p3      p4
```

```
Enter the directory name:siddhika
Enter the number of files:3
Enter file name to be created:sid
Do you want to enter another file(yes - 1 or no - 0):1
Enter file name to be created:shukla
Do you want to enter another file(yes - 1 or no - 0):1
Enter file name to be created:ss
Do you want to enter another file(yes - 1 or no - 0):1
Enter file name to be created:sk
Do you want to enter another file(yes - 1 or no - 0):0
Directory name is:siddhika
Files names are:
sid
shukla
ss
sk
PS C:\college programs>
```

```
1. Create Directory     2. Create File  3. Delete File
4. Search File          5. Display      6. Exit
Enter your choice -- 1

Enter name of directory -- siddhika
Directory created

1. Create Directory     2. Create File  3. Delete File
4. Search File          5. Display      6. Exit
Enter your choice -- 2

Enter name of the directory -- siddhika
Enter name of the file -- sid
File created

1. Create Directory     2. Create File  3. Delete File
4. Search File          5. Display      6. Exit
Enter your choice -- 5

Directory       Files
siddhika        sid

1. Create Directory     2. Create File  3. Delete File
4. Search File          5. Display      6. Exit
Enter your choice -- 6
PS C:\college programs>
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc hierarchical.c -o hierarchical } ; if ($?) { .\hierarchical }
Enter number of users: 1
Enter name: siddhika
Enter dir(1) or file(0): sid

Hierarchical
```

GURU TEGH BAHADUR INSTITUTE OF TECHNOLOGY

COMPILER DESIGNE LAB FILE

NAME: SIDDHIKA SHUKLA

ENROLLMENT NO.: 05113203121

BRANCH: IT-1, 5TH SEM

TITLE TABLE

S.NO.	TITLE	PAGE NO.	SIGNATURE

PRACTICAL – 1

Introduction to Compiler Design.

The compiler is software that converts a program written in a high-level language (Source Language) to a low-level language (Object/Target/Machine Language/0, 1's).

A translator or language processor is a program that translates an input program written in a programming language into an equivalent program in another language. The compiler is a type of translator, which takes a program written in a high-level programming language as input and translates it into an equivalent program in low-level languages such as machine language or assembly language.

The program written in a high-level language is known as a source program, and the program converted into a low-level language is known as an object (or target) program. Without compilation, no program written in a high-level language can be executed. For every programming language, we have a different compiler; however, the basic tasks performed by every compiler are the same. The process of translating the source code into machine code involves several stages, including lexical analysis, syntax analysis, semantic analysis, code generation, and optimization.

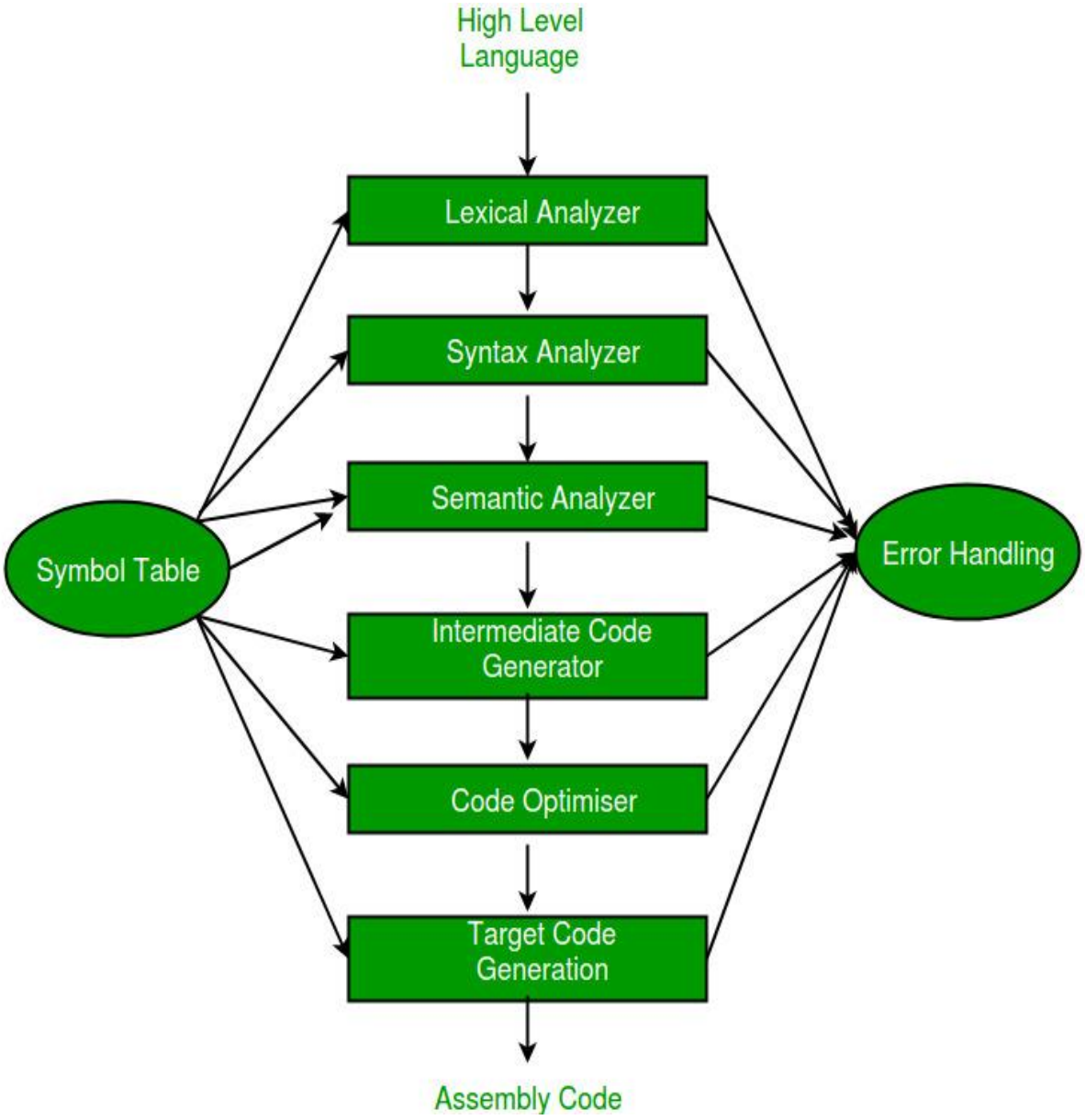
Compiler is an intelligent program as compare to an assembler. Compiler verifies all types of limits, ranges, errors, etc. Compiler program takes more time to run and it occupies huge amount of memory space. The speed of compiler is slower than other system software. It takes time because it enters through the program and then does translation of the full program. When compiler runs on same machine and produces machine code for the same machine on which it is running. Then it is called as self-compiler or resident compiler. Compiler may run on one machine and produces the machine codes for other computer then in that case it is called as cross compiler.

Stages of Compiler Design

- Lexical Analysis: The first stage of compiler design is lexical analysis, also known as scanning. In this stage, the compiler reads the source code character by character and breaks it down into a series of tokens, such as keywords, identifiers, and operators. These tokens are then passed on to the next stage of the compilation process.
- Syntax Analysis: The second stage of compiler design is syntax analysis, also known as parsing. In this stage, the compiler checks the syntax of the source code to ensure that it conforms to the rules of the programming language. The compiler builds a parse tree, which is a hierarchical representation of the program's structure, and uses it to check for syntax errors.
- Semantic Analysis: The third stage of compiler design is semantic analysis. In this stage, the compiler checks the meaning of the source code to ensure that it makes sense. The compiler performs type checking, which ensures that variables are used correctly and that operations are performed on compatible data types. The compiler also checks for other semantic errors, such as undeclared variables and incorrect function calls.
- Code Generation: The fourth stage of compiler design is code generation. In this stage, the compiler translates the parse tree into machine code that can be executed by the computer. The code generated by the compiler must be efficient and optimized for the target platform.
- Optimization: The final stage of compiler design is optimization. In this stage, the compiler analyses the generated code and makes optimizations to improve its performance. The compiler may perform optimizations such as constant folding, loop unrolling, and function inlining.

Overall, compiler design is a complex process that involves multiple stages and requires a deep understanding of both the programming language and the target platform. A well-designed compiler can

greatly improve the efficiency and performance of software programs, making them more useful and valuable for users.



PRACTICAL – 2

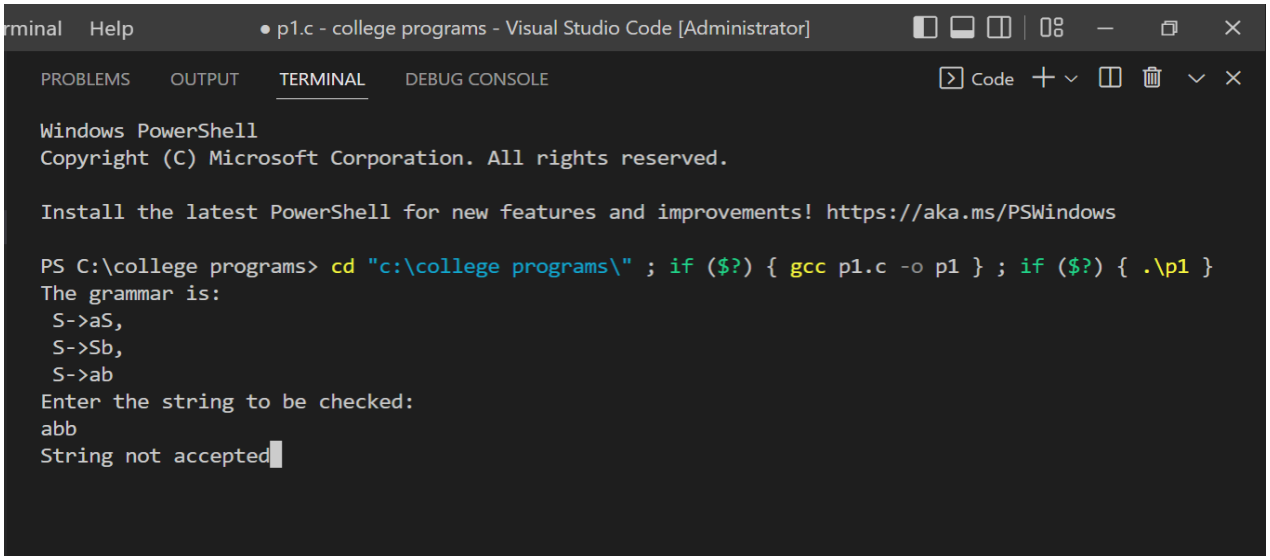
Write a program to check whether a string belong to the grammar or not.

Program:

```
#include<stdio.h>
#include<conio.h>
#include<string.h>
void main() {
        char string[50];
        int flag,count=0;
        printf("The grammar is:\n S->aS,\n S->Sb,\n S->ab\n");
        printf("Enter the string to be checked:\n");
        gets(string);
        if(string[0]=='a') {
                flag=0;
                for (count=1;string[count-1]!='\0';count++) {
                        if(string[count]=='b') {
                                flag=1;
                                continue;
                        }
                        else if((flag==1)&&(string[count]=='a')) {
                                printf("The string does not belong to the specified
grammar");
                                break;
                        }
                        else if(string[count]=='a'){
```

```
            continue;
        }
        else if((flag==1)&&(string[count]='\0')) {
            printf("String accepted…..!!!!");
            break;
        }
        else {
            printf("String not accepted");
        }
    }
}
    getch();
}
```

Output:



PRACTICAL – 3

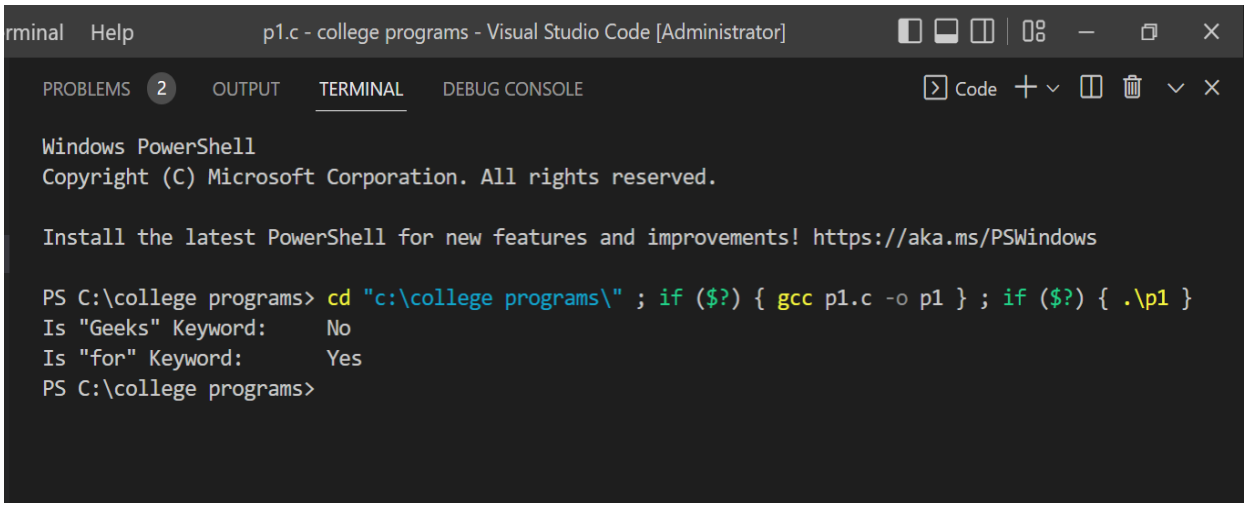
Write a program to check whether a string include keyword or not.

Program:

```
#include <stdbool.h>
#include <stdio.h>
#include <string.h>
bool isKeyword(char* str)
{
   if (!strcmp(str, "auto") || !strcmp(str, "default")
      || !strcmp(str, "signed") || !strcmp(str, "enum")
      || !strcmp(str, "extern") || !strcmp(str, "for")
      || !strcmp(str, "register") || !strcmp(str, "if")
      || !strcmp(str, "else") || !strcmp(str, "int")
      || !strcmp(str, "while") || !strcmp(str, "do")
      || !strcmp(str, "break") || !strcmp(str, "continue")
      || !strcmp(str, "double") || !strcmp(str, "float")
      || !strcmp(str, "return") || !strcmp(str, "char")
      || !strcmp(str, "case") || !strcmp(str, "const")
      || !strcmp(str, "sizeof") || !strcmp(str, "long")
      || !strcmp(str, "short") || !strcmp(str, "typedef")
      || !strcmp(str, "switch")
      || !strcmp(str, "unsigned") || !strcmp(str, "void")
      || !strcmp(str, "static") || !strcmp(str, "struct")
      || !strcmp(str, "goto") || !strcmp(str, "union")
      || !strcmp(str, "volatile"))
```

```
        return (true);
    return (false);
}
int main()
{
    printf("Is \"Geeks\" Keyword: \t");
    isKeyword("geeks") ? printf("Yes\n") : printf("No\n");
    printf("Is \"for\" Keyword: \t");
    isKeyword("for") ? printf("Yes\n") : printf("No\n");
    return 0;
}
```

Output:



PRACTICAL – 4

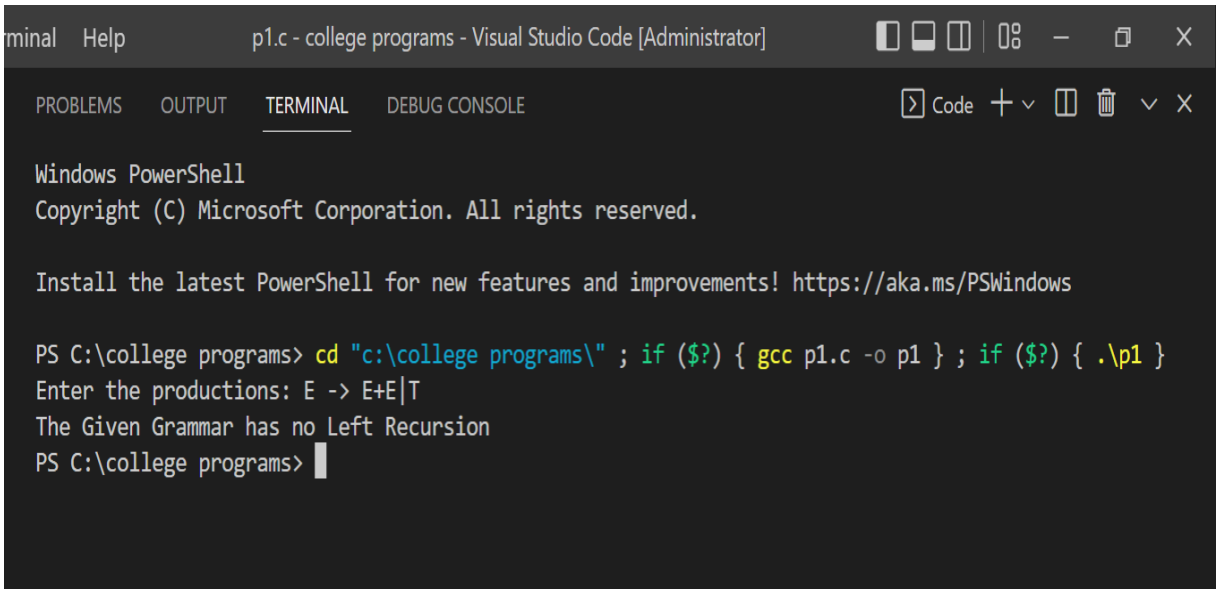
Write a program to remove left recursion from a grammar.

Program:

```
#include<stdio.h>
#include<string.h>
void main()  {
   char input[100],l[50],r[50],temp[10],tempprod[20],productions[25][50];
   int i=0,j=0,flag=0,consumed=0;
   printf("Enter the productions: ");
   scanf("%1s->%s",l,r);
   printf("%s",r);
   while(sscanf(r+consumed,"%[^|]s",temp) == 1 && consumed <= strlen(r))  {
      if(temp[0] == l[0])  {
         flag = 1;
         sprintf(productions[i++],"%s->%s%s'\0",l,temp+1,l);
      }
      else
         sprintf(productions[i++],"%s'->%s%s'\0",l,temp,l);
      consumed += strlen(temp)+1;
   }
   if(flag == 1)  {
      sprintf(productions[i++],"%s->ε\0",l);
      printf("The productions after eliminating Left Recursion are:\n");
      for(j=0;j<i;j++)
         printf("%s\n",productions[j]);
   }
```

```
    else
        printf("The Given Grammar has no Left Recursion");
}
```

Output:



PRACTICAL – 5

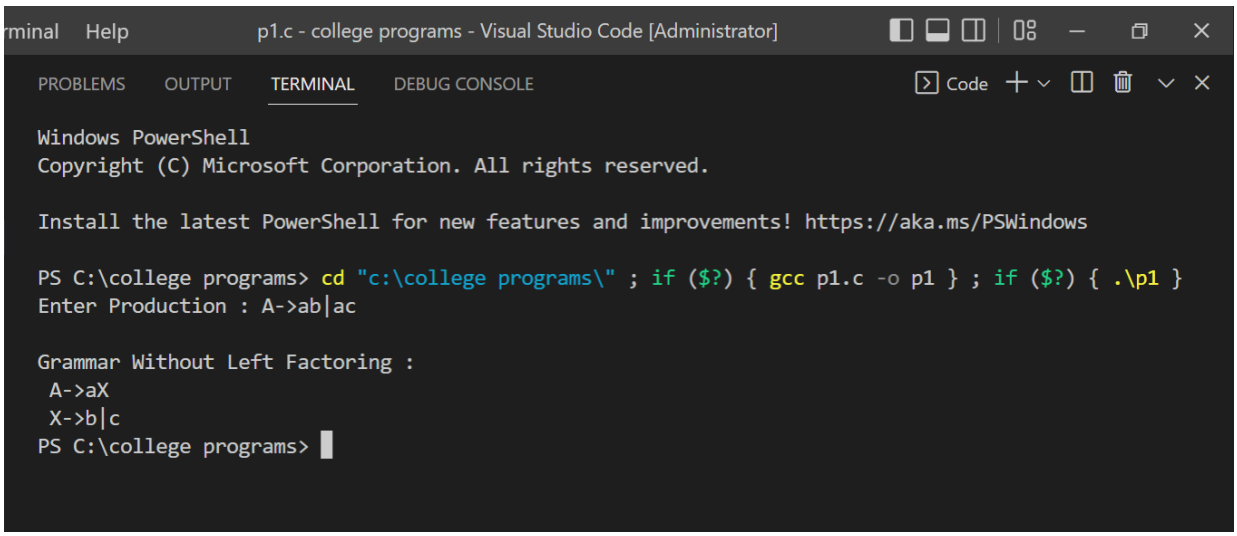
Write a program to perform left factoring on a grammar.

Program:

```
#include<stdio.h>
#include<string.h>
int main()
{
   char
gram[20],part1[20],part2[20],modifiedGram[20],newGram[20],tempGram[20];
   int i,j=0,k=0,l=0,pos;
   printf("Enter Production : A->");
   gets(gram);
   for(i=0;gram[i]!='|';i++,j++)
      part1[j]=gram[i];
   part1[j]='\0';
   for(j=++i,i=0;gram[j]!='\0';j++,i++)
      part2[i]=gram[j];
   part2[i]='\0';
   for(i=0;i<strlen(part1)||i<strlen(part2);i++){
      if(part1[i]==part2[i]){
         modifiedGram[k]=part1[i];
         k++;
         pos=i+1;
      }
   }
   for(i=pos,j=0;part1[i]!='\0';i++,j++){
```

```
        newGram[j]=part1[i];
    }
    newGram[j++]='|';
    for(i=pos;part2[i]!='\0';i++,j++){
        newGram[j]=part2[i];
    }
    modifiedGram[k]='X';
    modifiedGram[++k]='\0';
    newGram[j]='\0';
    printf("\nGrammar Without Left Factoring :  \n");
    printf(" A->%s",modifiedGram);
    printf("\n X->%s\n",newGram);
}
```

Output:



PRACTICAL – 6

Write a program to show all the operations of a stack.

Program:

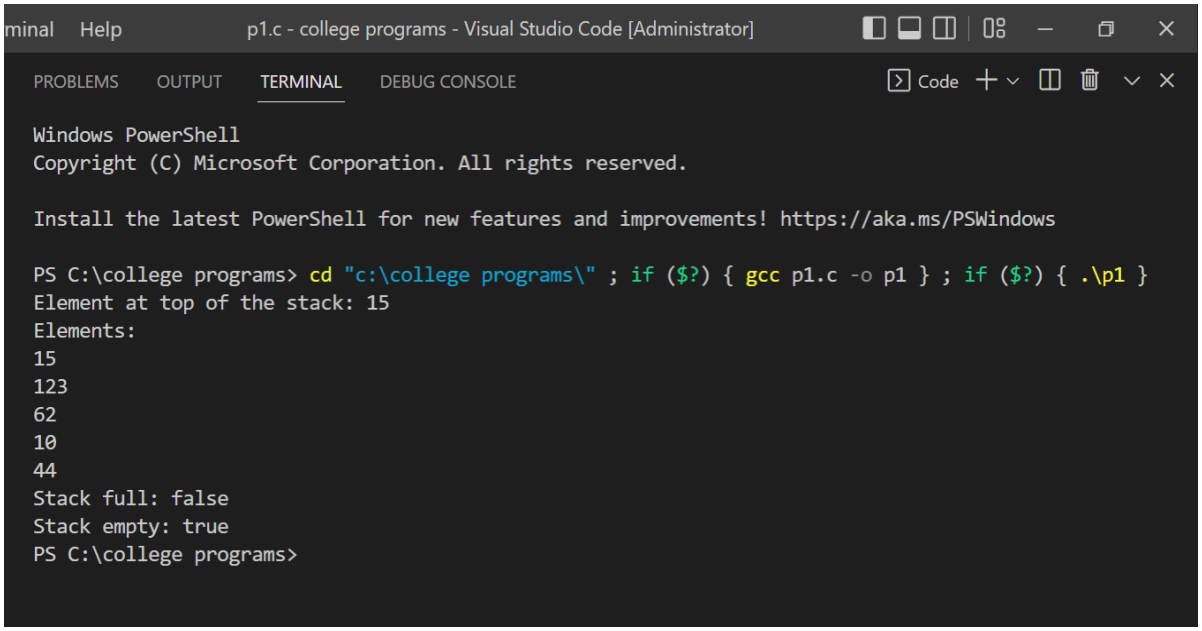
```
#include <stdio.h>
int MAXSIZE = 8;
int stack[8];
int top = -1;
int isempty(){
   if(top == -1)
      return 1;
   else
      return 0;
}
int isfull(){
   if(top == MAXSIZE)
      return 1;
   else
      return 0;
}
int peek(){
   return stack[top];
}
int pop(){
   int data;
   if(!isempty()) {
      data = stack[top];
```

```
      top = top - 1;
      return data;
   } else {
      printf("Could not retrieve data, Stack is empty.\n");
   }
}
int push(int data){
   if(!isfull()) {
      top = top + 1;
      stack[top] = data;
   } else {
      printf("Could not insert data, Stack is full.\n");
   }
}
int main(){
   push(44);
   push(10);
   push(62);
   push(123);
   push(15);
   printf("Element at top of the stack: %d\n" ,peek());
   printf("Elements: \n");

   // print stack data
   while(!isempty()) {
      int data = pop();
      printf("%d\n",data);
```

```
    }
    printf("Stack full: %s\n" , isfull()?"true":"false");
    printf("Stack empty: %s\n" , isempty()?"true":"false");
    return 0;
}
```

Output:



PRACTICAL – 7

Write a program to find out the leading of the non-terminals in a grammar.

Program:

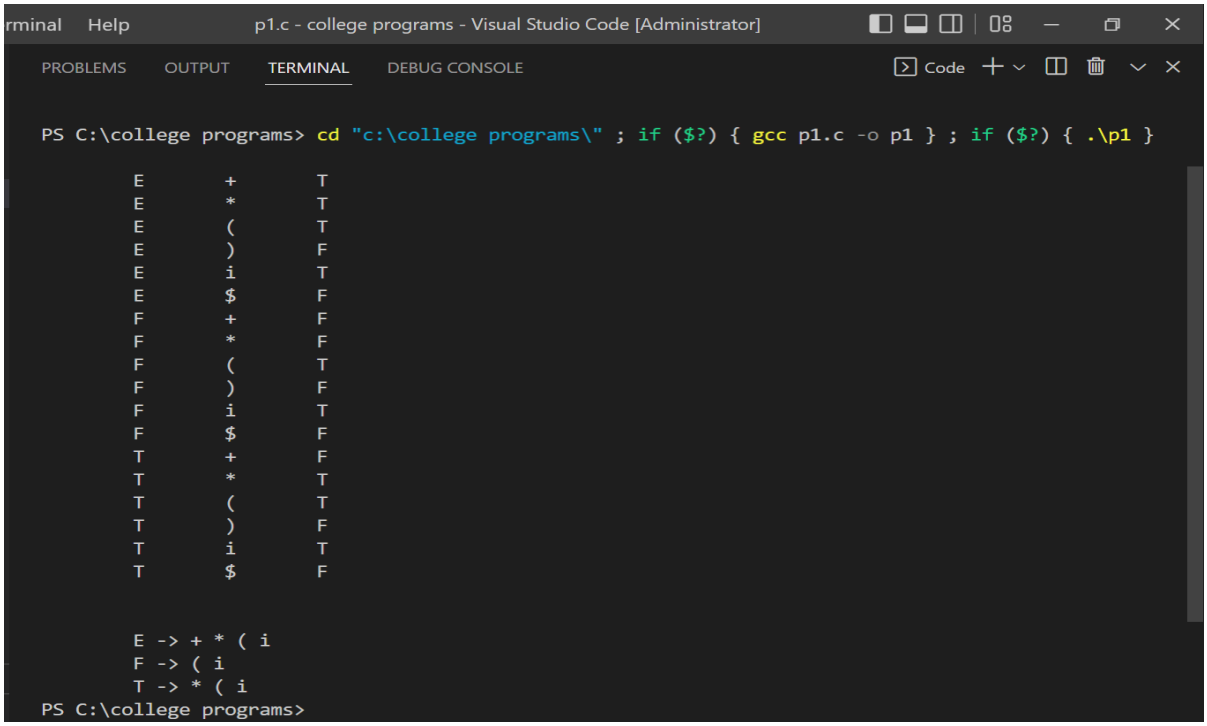
```
#include<conio.h>
#include<stdio.h>
char arr[18][3] ={{'E', '+', 'F'},{'E', '*', 'F'},{'E', '(', 'F'}, {'E', ')', 'F'},{'E', 'i', 'F'},{'E', '$', 'F'},
{'F', '+', 'F'},{'F', '*', 'F'},{'F', '(', 'F'},{'F', ')', 'F'},{'F', 'i', 'F'},{'F', '$', 'F'}, {'T', '+', 'F'},
{'T', '*', 'F'}, {'T', '(', 'F'},{'T', ')', 'F'},{'T', 'i', 'F'},{'T', '$', 'F'}};
char prod[6] = "EETTFF";
char res[6][3] ={ {'E', '+', 'T'}, {'T', '\0'}, {'T', '*', 'F'},  {'F', '\0'}, {'(', 'E', ')'}, {'i', '\0'}};
char stack [5][2];
int top = -1;
void install(char pro, char re) {
   int i;
   for (i = 0; i < 18; ++i) {
      if (arr[i][0] == pro && arr[i][1] == re) {

         arr[i][2] = 'T';
         break;
      }
   }
   ++top;
   stack[top][0] = pro;
```

```
    stack[top][1] = re;
}
void main() {
    int i = 0, j;
    char pro, re, pri = ' ';
    for (i = 0; i < 6; ++i) {
        for (j = 0; j < 3 && res[i][j] != '\0'; ++j) {
            if (res[i][j] == '+' || res[i][j] == '*' || res[i][j] == '(' || res[i][j] == ')' ||
res[i][j] == 'i' || res[i][j] == '$') {
                install(prod[i], res[i][j]);
                break;
            }
        }
    }
    while (top >= 0) {
        pro = stack[top][0];
        re = stack[top][1];
        --top;
        for (i = 0; i < 6; ++i) {
            if (res[i][0] == pro && res[i][0] != prod[i]) {
                install(prod[i], re);
            }
        }
    }
    for (i = 0; i < 18; ++i) {
        printf("\n\t");
        for (j = 0; j < 3; ++j)
            printf("%c\t", arr[i][j]);
```

```
    }
    getch();
    printf("\n\n");
    for (i = 0; i < 18; ++i) {
        if (pri != arr[i][0]) {
            pri = arr[i][0];
            printf("\n\t%c -> ", pri);
        }
        if (arr[i][2] == 'T')
            printf("%c ", arr[i][1]);
    }
    getch();
}
```

Output:



PRACTICAL – 8

Write a program to implement shift reduce parsing for a string.

Program:

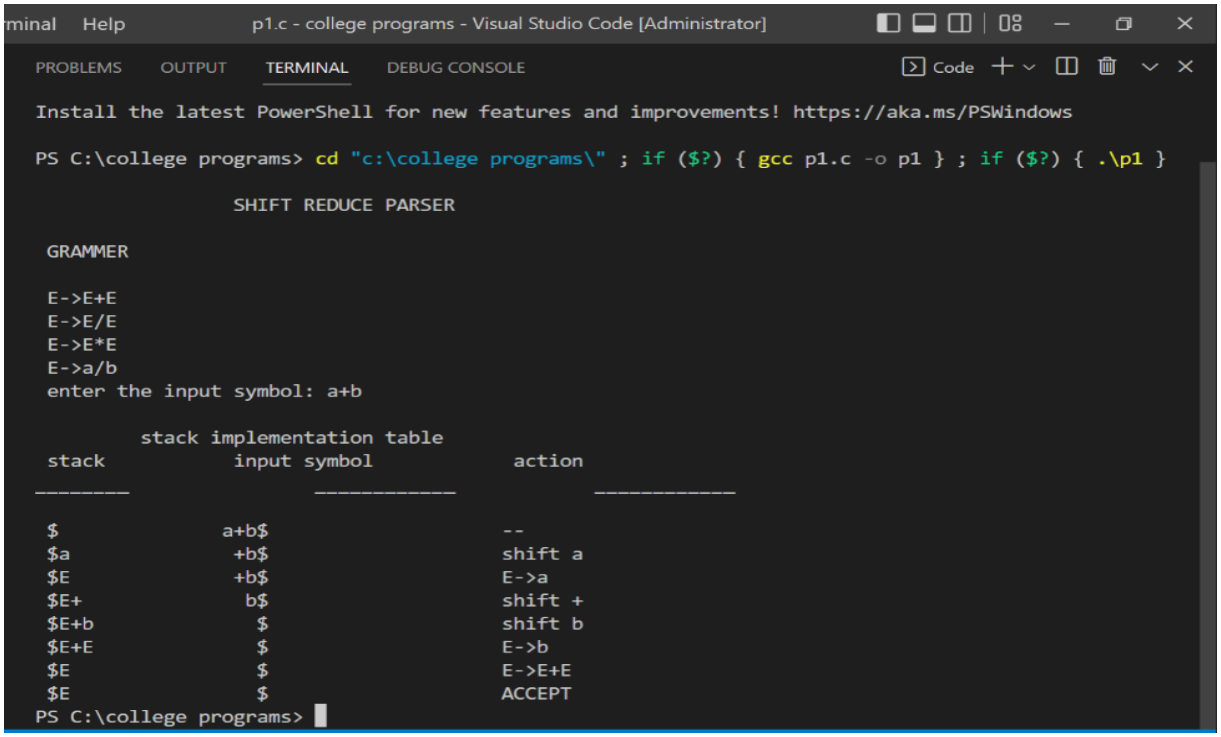
```
#include<stdio.h>
#include<stdlib.h>
#include<conio.h>
#include<string.h>
char ip_sym[15],stack[15];
int ip_ptr=0,st_ptr=0,len,i;
char temp[2],temp2[2];
char act[15];
void check();
void main()
{
printf("\n\t\t SHIFT REDUCE PARSER\n");
printf("\n GRAMMER\n");
printf("\n E->E+E\n E->E/E");
printf("\n E->E*E\n E->a/b");
printf("\n enter the input symbol: ");
gets(ip_sym);
printf("\n\t stack implementation table");
printf("\n stack \t\t input symbol\t\t action");
printf("\n________\t\t_____________\t\t_____________\n");
printf("\n $\t\t%s$\t\t\t--",ip_sym);
strcpy(act,"shift ");
```

```
temp[0]=ip_sym[ip_ptr];
temp[1]='\0';
strcat(act,temp);
len=strlen(ip_sym);
for(i=0;i<=len-1;i++)
{
stack[st_ptr]=ip_sym[ip_ptr];
stack[st_ptr+1]='\0';
ip_sym[ip_ptr]=' ';
ip_ptr++;
printf("\n $%s\t\t%s$\t\t\t%s",stack,ip_sym,act);
strcpy(act,"shift ");
temp[0]=ip_sym[ip_ptr];
temp[1]='\0';
strcat(act,temp);
check();
st_ptr++;
}
st_ptr++;
check();
}
void check()
{
int flag=0;
temp2[0]=stack[st_ptr];
temp2[1]='\0';
if((!strcmpi(temp2,"a"))||(!strcmpi(temp2,"b")))
```

```
{
stack[st_ptr]='E';
if(!strcmpi(temp2,"a"))
printf("\n $%s\t\t%s$\t\t\tE->a",stack,ip_sym);
else
printf("\n $%s\t\t%s$\t\t\tE->b",stack,ip_sym);
flag=1;
}
if((!strcmpi(temp2,"+"))||(strcmpi(temp2,"*"))||(!strcmpi(temp2,"/"))) { flag=1;
}
if((!strcmpi(stack,"E+E"))||(!strcmpi(stack,"E\E"))||(!strcmpi(stack,"E*E")))
{
strcpy(stack,"E");
st_ptr=0;
if(!strcmpi(stack,"E+E"))
printf("\n $%s\t\t%s$\t\t\tE->E+E",stack,ip_sym);
else
if(!strcmpi(stack,"E\E"))
printf("\n $%s\t\t%s$\t\t\tE->E\E",stack,ip_sym);
else if(!strcmpi(stack,"E*E"))
printf("\n $%s\t\t%s$\t\t\tE->E*E",stack,ip_sym);
else
printf("\n $%s\t\t%s$\t\t\tE->E+E",stack,ip_sym);
flag=1;
}
if(!strcmpi(stack,"E")&&ip_ptr==len)
{
```

```
printf("\n $%s\t\t%s$\t\t\tACCEPT",stack,ip_sym);
getch();
exit(0);
}
if(flag==0)
{
printf("\n%s\t\t\t%s\t\t reject",stack,ip_sym);
exit(0);
}
return;
}
```

Output:



PRACTICAL – 9

Write a program to find out the FIRST of the non-terminals in a grammar.

Program:

```
#include<stdio.h>
#include<conio.h>
char array[10][20],temp[10];
int c,n;
void fun(int,int[]);
int fun2(int i,int j,int p[],int );
void main()
{
  int p[2],i,j;
  printf("Enter the no. of productions :");
  scanf("%d",&n);
  printf("Enter the productions :\n");
  for(i=0;i<n;i++)
  scanf("%s",array[i]);
  for(i=0;i<n;i++)
  {
   c=-1,p[0]=-1,p[1]=-1;
   fun(i,p);
   printf("First(%c) : [ ",array[i][0]);
   for(j=0;j<=c;j++)
   printf("%c,",temp[j]);
   printf("\b ].\n");
```

```
    getch();
   }
}
int fun2(int i,int j,int p[],int key)
{
  int k;
  if(!key)
  {
    for(k=0;k<n;k++)
    if(array[i][j]==array[k][0])
    break;
    p[0]=i;p[1]=j+1;
    fun(k,p);
    return 0;
  }
  else
  {
    for(k=0;k<=c;k++)
    {
    if(array[i][j]==temp[k])
    break;
    }
    if(k>c)return 1;
    else return 0;
  }
}
 void fun(int i,int p[])
```

```
{
int j,k,key;
for(j=2;array[i][j] != NULL; j++)
{
if(array[i][j-1]=='/')
{
if(array[i][j]>= 'A' && array[i][j]<='Z')
{
key=0;
fun2(i,j,p,key);
}
else
{
key = 1;
if(fun2(i,j,p,key))
temp[++c] = array[i][j];
if(array[i][j]== '@'&& p[0]!=-1)
{
if(array[p[0]][p[1]]>='A' && array[p[0]][p[1]] <='Z')
{
key=0;
fun2(p[0],p[1],p,key);
}
else
if(array[p[0]][p[1]] != '/'&& array[p[0]][p[1]]!=NULL)
{
if(fun2(p[0],p[1],p,key))
```

```
temp[++c]=array[p[0]][p[1]];
}
}
}
}
}
}
```

Output:

```
Enter the no. of productions :6
Enter the productions :
S/aBDh
B/cC
C/bC/e
E/g/e
D/E/F
F/f/e
First(S) : [ a ].
First(B) : [ c ].
First(C) : [ b,e ].
First(E) : [ g,e ].
First(D) : [ g,e,f ].
First(F) : [ f,e ].
PS C:\college programs>
```

PRACTICAL – 10

Write a program to check whether a grammar is operator precedent.

Program:

```
#include<stdio.h>
#include<string.h>
char *input;
int i=0;
char lasthandle[6],stack[50],handles[][5]={")E(","E*E","E+E","i","E^E"};
int top=0,l;
char prec[9][9]={
            '>', '>','<','<','<','<','<','>','>',
            '>', '>','<','<','<','<','<','>','>',
            '>', '>','>','>','<','<','<','>','>',
            '>', '>','>','>','<','<','<','>','>',
            '>', '>','>','>','<','<','<','>','>',
            '>', '>','>','>','>','e','e','>','>',
            '<', '<','<','<','<','<','<','>','e',
            '>', '>','>','>','>','e','e','>','>',
            '<', '<','<','<','<','<','<','<','>',
           };
int getindex(char c)
{
switch(c)
   {
   case '+':return 0;
```

```
    case '-':return 1;
    case '*':return 2;
    case '/':return 3;
    case '^':return 4;
    case 'i':return 5;
    case '(':return 6;
    case ')':return 7;
    case '$':return 8;
    }
}
int shift()
{
stack[++top]=*(input+i++);
stack[top+1]='\0';
}
int reduce()
{
int i,len,found,t;
for(i=0;i<5;i++)
    {
    len=strlen(handles[i]);
    if(stack[top]==handles[i][0]&&top+1>=len)
        {
        found=1;
        for(t=0;t<len;t++)
            {
            if(stack[top-t]!=handles[i][t])
```

```
            {
            found=0;
            break;
            }
          }
        if(found==1)
            {
            stack[top-t+1]='E';
            top=top-t+1;
            strcpy(lasthandle,handles[i]);
            stack[top+1]='\0';
            return 1;
            }
        }
   }
return 0;
}
void dispstack()
{
int j;
for(j=0;j<=top;j++)
    printf("%c",stack[j]);
}
void dispinput()
{
int j;
for(j=i;j<l;j++)
```

```
    printf("%c",*(input+j));
}
void main()
{
int j;
input=(char*)malloc(50*sizeof(char));
printf("\nEnter the string\n");
scanf("%s",input);
input=strcat(input,"$");
l=strlen(input);
strcpy(stack,"$");
printf("\nSTACK\tINPUT\tACTION");
while(i<=l)
                                        {
                                        shift();
                                        printf("\n");
                                        dispstack();
                                        printf("\t");
                                        dispinput();
                                        printf("\tShift");
                                        if(prec[getindex(stack[top])][getindex(input[i])]=='>
')
                                             {
                                             while(reduce())
                                                  {
                                                  printf("\n");
                                                  dispstack();
                                                  printf("\t");
```

```
                                    dispinput();
                                    printf("\tReduced: E->%s",lasthandle);
                                    }
                                }
                            }
if(strcmp(stack,"$E$")==0)
   printf("\nAccepted;");
else
  printf("\nNot Accepted;");
}
```

Output:

```
Enter the string
i*(i+i)*i

STACK   INPUT   ACTION
$i      *(i+i)*i$       Shift
$E      *(i+i)*i$       Reduced: E->i
$E*     (i+i)*i$        Shift
$E*(    i+i)*i$ Shift
$E*(i   +i)*i$  Shift
$E*(E   +i)*i$  Reduced: E->i
$E*(E+  i)*i$   Shift
$E*(E+i )*i$    Shift
$E*(E+E )*i$    Reduced: E->i
$E*(E   )*i$    Reduced: E->E+E
$E*(E)  *i$     Shift
$E*E    *i$     Reduced: E->)E(
$E      *i$     Reduced: E->E*E
$E*     i$      Shift
$E*i    $       Shift
$E*E    $       Reduced: E->i
$E      $       Reduced: E->E*E
$E$             Shift
$E$             Shift
Accepted;
PS C:\college programs>
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
P  BT  WT  TAT
1  10  0   10
2  5  10   15
3  8  15   23
Average waiting time = 8.333333
Average turn around time = 16.000000
PS C:\college programs>
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
Enter number of process: 5
Enter Burst Time:
P1: 01
P2: 02
P3: 03
P4: 04
P5: 05
P       BT      WT      TAT
P1      1       0       1
P2      2       1       3
P3      3       3       6
P4      4       6       10
P5      5       10      15
Average Waiting Time= 4.000000
Average Turnaround Time= 7.000000
PS C:\college programs>
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
Enter Number of Processes: 5
Enter Burst Time and Priority Value for Process 1: 1 3
Enter Burst Time and Priority Value for Process 2: 2 2
Enter Burst Time and Priority Value for Process 3: 3 1
Enter Burst Time and Priority Value for Process 4: 4 5
Enter Burst Time and Priority Value for Process 5: 5 4
Order of process Execution is
P4 is executed from 0 to 4
P5 is executed from 4 to 9
P1 is executed from 9 to 10
P2 is executed from 10 to 12
P3 is executed from 12 to 15

Process Id     Burst Time   Wait Time    TurnAround Time
P4          4          0          4
P5          5          4          9
P1          1          9          10
P2          2          10          12
P3          3          12          15
PS C:\college programs>
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
 Total number of process in the system: 2

 Enter the Arrival and Burst time of the Process[1]
 Arrival time is:       1

Burst time is:  8

 Enter the Arrival and Burst time of the Process[2]
 Arrival time is:       2

Burst time is:  4
Enter the Time Quantum for the process:         3

 Process No              Burst Time              TAT             Waiting Time
Process No[2]           4                               8                       4
Process No[1]           8                               11                      3
 Average Turn Around Time:      9.500000
 Average Waiting Time:  3.500000
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
Enter no of pages:10
Enter the reference string:7 8 9 3 2 4 7 4 6 1
Enter no of frames:3

        7
        7       8
        7       8       9
        3       8       9
        3       2       9
        3       2       4
        7       2       4
        7       6       4
        1       6       4

The no of page faults is 9
PS C:\college programs>
```

```
 Incoming  t Frame 1  t Frame 2  t Frame 3
4                       4                       -                       -
1                       4                       1                       -
2                       4                       1                       2
4                       4                       1                       2
5                       5                       1                       2
Total Page Faults:      4
PS C:\college programs>
```

```
 PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc p1.c -o p1 } ; if ($?) { .\p1 }
 Enter number of frames: 3
 Enter number of pages: 10
 Enter page reference string: 7 8 9 3 2 1 6 5 4 9

 7       -1      -1
 7       8       -1
 7       8       9
 3       8       9
 2       8       9
 1       8       9
 6       8       9
 5       8       9
 4       8       9
 4       8       9

 Total Page Faults = 9
 PS C:\college programs>
```

```
        Memory Management Scheme - Worst Fit
Enter the number of blocks:3
Enter the number of files:3

Enter the size of the blocks:-
Block 1:5
Block 2:2
Block 3:7
Enter the size of the files :-
File 1:1
File 2:4
File 3:5

File_no:        File_size :     Block_no:       Block_size:     Fragement
1               1               3               7               6
2               4               1               5               1
3               5               0               8               0
```

```
        Memory Management Scheme - First Fit
Enter the number of blocks:3
Enter the number of files:2

Enter the size of the blocks:-
Block 1:5
Block 2:2
Block 3:7
Enter the size of the files :-
File 1:1
File 2:4

File_no:        File_size :     Block_no:       Block_size:     Fragement
1               1               1               5               4
2               4               3               7               3
PS C:\college programs>
```

```
Enter the number of blocks:3
Enter the number of files:2

Enter the size of the blocks:-
Block 1:5
Block 2:7
Block 3:2
Enter the size of the files :-
File 1:4
File 2:3

File No File Size       Block No        Block Size      Fragment
1               4               1               5               1
2               3               2               7               4
PS C:\college programs>
```

```
1 reader is inside
1 Reader is leaving
Writer is trying to enter
Writer has entered
Writer is leaving
1 reader is inside
1 Reader is leaving
Writer is trying to enter
Writer has entered
Writer is leaving
1 reader is inside
1 Reader is leaving
Writer is trying to enter
Writer has entered
Writer is leaving
1 reader is inside
1 Reader is leaving
Writer is trying to enter
Writer has entered
Writer is leaving

...Program finished with exit code 0
Press ENTER to exit console.
```

```
Enter the number of Producers:2
Enter the number of Consumers:2
Enter buffer capacity:2
Successfully created producer 1
Producer 1 produced 29
Successfully created producer 2
Producer 2 produced 11
Successfully created consumer 1
Buffer:29 11
Consumer 3 consumed 11
Current buffer len: 1
Buffer:29
Consumer 2 consumed 29
Current buffer len: 0
Successfully created consumer 2
Producer 1 produced 3
Buffer:3
Consumer 2 consumed 3
Current buffer len: 0
Producer 2 produced 31
Producer 1 produced 27
Producer 1 produced 7
Buffer:31 27
```

```
Enter the number of process and resources
5 3
enter allocation of resource of all process 5x3 matrix
1 2 3
4 5 6
0 6 7
0 8 9
9 5 4
enter the max resource process required 5x3 matrix
0 1 0
1 2 3
2 3 4
3 4 5
4 5 6
enter the  available resource 3 4 2

 need resources matrix are
-1      -1      -3
-3      -3      -3
2       -3      -3
3       -4      -4
-5      0       2

 available resource after completion
17      30      31
 safe sequence are
p0      p1      p2      p3      p4
```

```
Enter the directory name:siddhika
Enter the number of files:3
Enter file name to be created:sid
Do you want to enter another file(yes - 1 or no - 0):1
Enter file name to be created:shukla
Do you want to enter another file(yes - 1 or no - 0):1
Enter file name to be created:ss
Do you want to enter another file(yes - 1 or no - 0):1
Enter file name to be created:sk
Do you want to enter another file(yes - 1 or no - 0):0
Directory name is:siddhika
Files names are:
sid
shukla
ss
sk
PS C:\college programs>
```

```
1. Create Directory     2. Create File  3. Delete File
4. Search File          5. Display      6. Exit
Enter your choice -- 1

Enter name of directory -- siddhika
Directory created

1. Create Directory     2. Create File  3. Delete File
4. Search File          5. Display      6. Exit
Enter your choice -- 2

Enter name of the directory -- siddhika
Enter name of the file -- sid
File created

1. Create Directory     2. Create File  3. Delete File
4. Search File          5. Display      6. Exit
Enter your choice -- 5

Directory       Files
siddhika        sid

1. Create Directory     2. Create File  3. Delete File
4. Search File          5. Display      6. Exit
Enter your choice -- 6
PS C:\college programs>
```

```
PS C:\college programs> cd "c:\college programs\" ; if ($?) { gcc hierarchical.c -o hierarchical } ; if ($?) { .\hierarchical }
Enter number of users: 1
Enter name: siddhika
Enter dir(1) or file(0): sid

Hierarchical
```

GURU TEGH BAHADUR INSTITUTE OF TECHNOLOGY

COMPILER DESIGNE LAB FILE

NAME: SIDDHIKA SHUKLA

ENROLLMENT NO.: 05113203121

BRANCH: IT-1, 5TH SEM

TITLE TABLE

S.NO.	TITLE	PAGE NO.	SIGNATURE

PRACTICAL – 1

Introduction to Compiler Design.

The compiler is software that converts a program written in a high-level language (Source Language) to a low-level language (Object/Target/Machine Language/0, 1's).

A translator or language processor is a program that translates an input program written in a programming language into an equivalent program in another language. The compiler is a type of translator, which takes a program written in a high-level programming language as input and translates it into an equivalent program in low-level languages such as machine language or assembly language.

The program written in a high-level language is known as a source program, and the program converted into a low-level language is known as an object (or target) program. Without compilation, no program written in a high-level language can be executed. For every programming language, we have a different compiler; however, the basic tasks performed by every compiler are the same. The process of translating the source code into machine code involves several stages, including lexical analysis, syntax analysis, semantic analysis, code generation, and optimization.

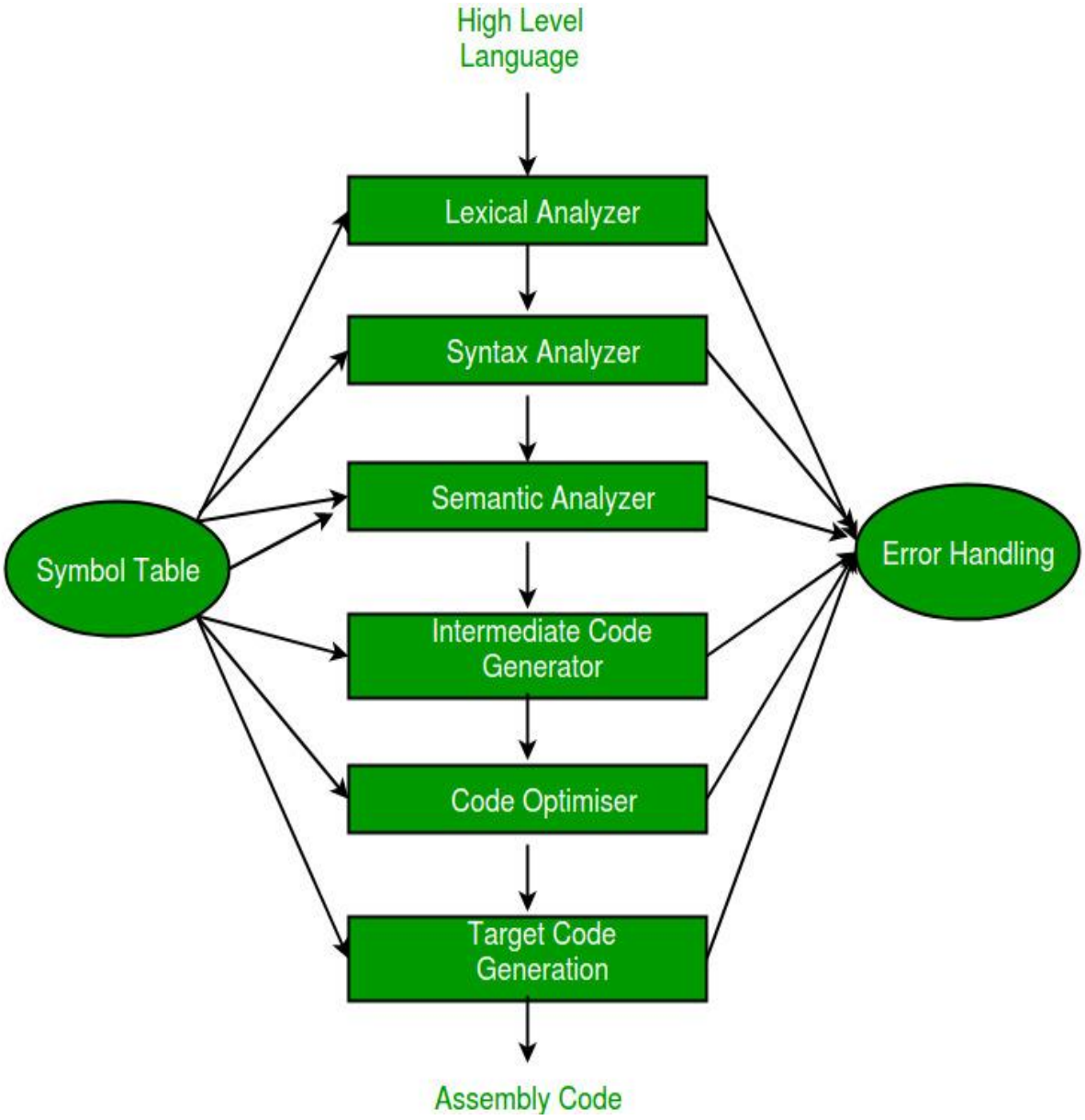
Compiler is an intelligent program as compare to an assembler. Compiler verifies all types of limits, ranges, errors, etc. Compiler program takes more time to run and it occupies huge amount of memory space. The speed of compiler is slower than other system software. It takes time because it enters through the program and then does translation of the full program. When compiler runs on same machine and produces machine code for the same machine on which it is running. Then it is called as self-compiler or resident compiler. Compiler may run on one machine and produces the machine codes for other computer then in that case it is called as cross compiler.

Stages of Compiler Design

- Lexical Analysis: The first stage of compiler design is lexical analysis, also known as scanning. In this stage, the compiler reads the source code character by character and breaks it down into a series of tokens, such as keywords, identifiers, and operators. These tokens are then passed on to the next stage of the compilation process.
- Syntax Analysis: The second stage of compiler design is syntax analysis, also known as parsing. In this stage, the compiler checks the syntax of the source code to ensure that it conforms to the rules of the programming language. The compiler builds a parse tree, which is a hierarchical representation of the program's structure, and uses it to check for syntax errors.
- Semantic Analysis: The third stage of compiler design is semantic analysis. In this stage, the compiler checks the meaning of the source code to ensure that it makes sense. The compiler performs type checking, which ensures that variables are used correctly and that operations are performed on compatible data types. The compiler also checks for other semantic errors, such as undeclared variables and incorrect function calls.
- Code Generation: The fourth stage of compiler design is code generation. In this stage, the compiler translates the parse tree into machine code that can be executed by the computer. The code generated by the compiler must be efficient and optimized for the target platform.
- Optimization: The final stage of compiler design is optimization. In this stage, the compiler analyses the generated code and makes optimizations to improve its performance. The compiler may perform optimizations such as constant folding, loop unrolling, and function inlining.

Overall, compiler design is a complex process that involves multiple stages and requires a deep understanding of both the programming language and the target platform. A well-designed compiler can

greatly improve the efficiency and performance of software programs, making them more useful and valuable for users.



PRACTICAL – 2

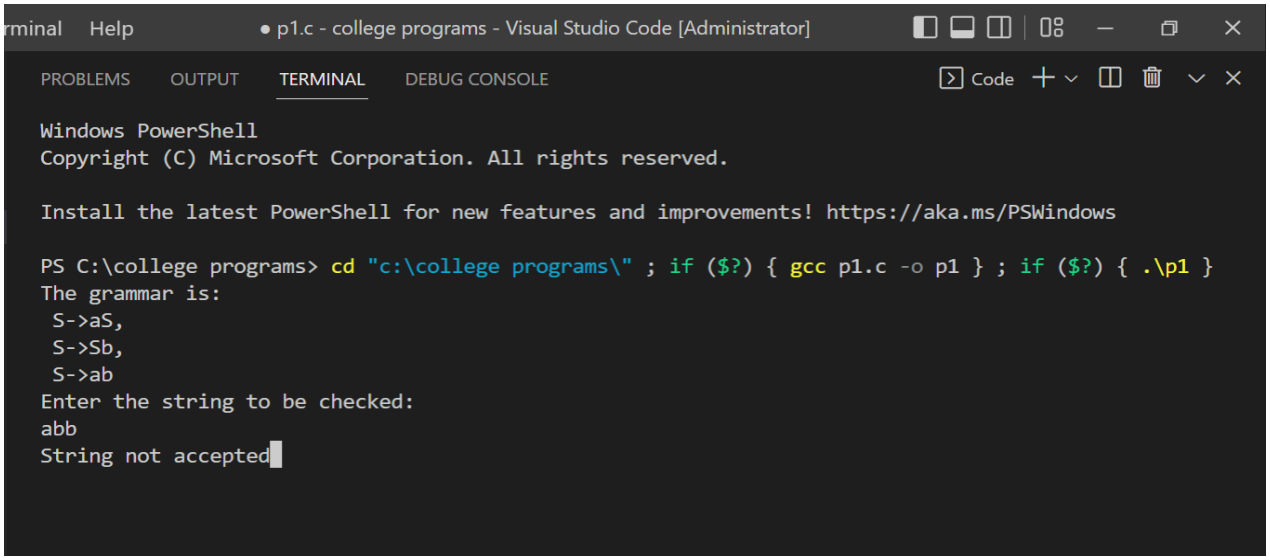
Write a program to check whether a string belong to the grammar or not.

Program:

```
#include<stdio.h>
#include<conio.h>
#include<string.h>
void main() {
        char string[50];
        int flag,count=0;
        printf("The grammar is:\n S->aS,\n S->Sb,\n S->ab\n");
        printf("Enter the string to be checked:\n");
        gets(string);
        if(string[0]=='a') {
                flag=0;
                for (count=1;string[count-1]!='\0';count++) {
                        if(string[count]=='b') {
                                flag=1;
                                continue;
                        }
                        else if((flag==1)&&(string[count]=='a')) {
                                printf("The string does not belong to the specified
grammar");
                                break;
                        }
                        else if(string[count]=='a'){
```

```
            continue;
        }
        else if((flag==1)&&(string[count]='\0')) {
            printf("String accepted…..!!!!");
            break;
        }
        else {
            printf("String not accepted");
        }
    }
}
    getch();
}
```

Output:



PRACTICAL – 3

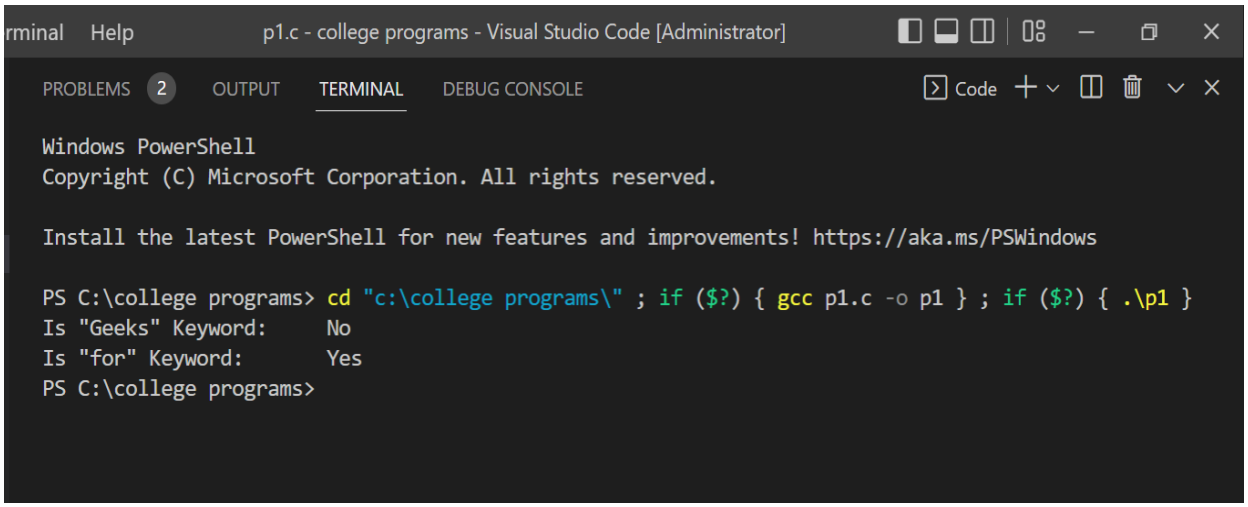
Write a program to check whether a string include keyword or not.

Program:

```
#include <stdbool.h>
#include <stdio.h>
#include <string.h>
bool isKeyword(char* str)
{
   if (!strcmp(str, "auto") || !strcmp(str, "default")
      || !strcmp(str, "signed") || !strcmp(str, "enum")
      || !strcmp(str, "extern") || !strcmp(str, "for")
      || !strcmp(str, "register") || !strcmp(str, "if")
      || !strcmp(str, "else") || !strcmp(str, "int")
      || !strcmp(str, "while") || !strcmp(str, "do")
      || !strcmp(str, "break") || !strcmp(str, "continue")
      || !strcmp(str, "double") || !strcmp(str, "float")
      || !strcmp(str, "return") || !strcmp(str, "char")
      || !strcmp(str, "case") || !strcmp(str, "const")
      || !strcmp(str, "sizeof") || !strcmp(str, "long")
      || !strcmp(str, "short") || !strcmp(str, "typedef")
      || !strcmp(str, "switch")
      || !strcmp(str, "unsigned") || !strcmp(str, "void")
      || !strcmp(str, "static") || !strcmp(str, "struct")
      || !strcmp(str, "goto") || !strcmp(str, "union")
      || !strcmp(str, "volatile"))
```

```
        return (true);
    return (false);
}
int main()
{
    printf("Is \"Geeks\" Keyword: \t");
    isKeyword("geeks") ? printf("Yes\n") : printf("No\n");
    printf("Is \"for\" Keyword: \t");
    isKeyword("for") ? printf("Yes\n") : printf("No\n");
    return 0;
}
```

Output:



PRACTICAL – 4

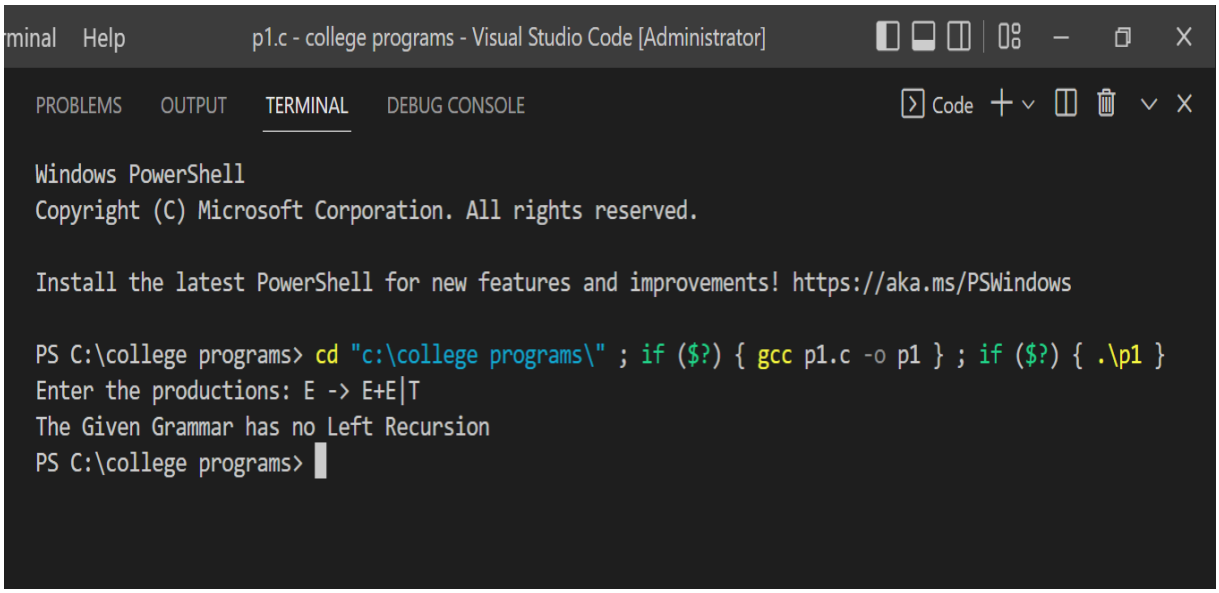
Write a program to remove left recursion from a grammar.

Program:

```
#include<stdio.h>
#include<string.h>
void main()  {
   char input[100],l[50],r[50],temp[10],tempprod[20],productions[25][50];
   int i=0,j=0,flag=0,consumed=0;
   printf("Enter the productions: ");
   scanf("%1s->%s",l,r);
   printf("%s",r);
   while(sscanf(r+consumed,"%[^|]s",temp) == 1 && consumed <= strlen(r))  {
      if(temp[0] == l[0])  {
         flag = 1;
         sprintf(productions[i++],"%s->%s%s'\0",l,temp+1,l);
      }
      else
         sprintf(productions[i++],"%s'->%s%s'\0",l,temp,l);
      consumed += strlen(temp)+1;
   }
   if(flag == 1)  {
      sprintf(productions[i++],"%s->ε\0",l);
      printf("The productions after eliminating Left Recursion are:\n");
      for(j=0;j<i;j++)
         printf("%s\n",productions[j]);
   }
```

```
    else
        printf("The Given Grammar has no Left Recursion");
}
```

Output:



PRACTICAL – 5

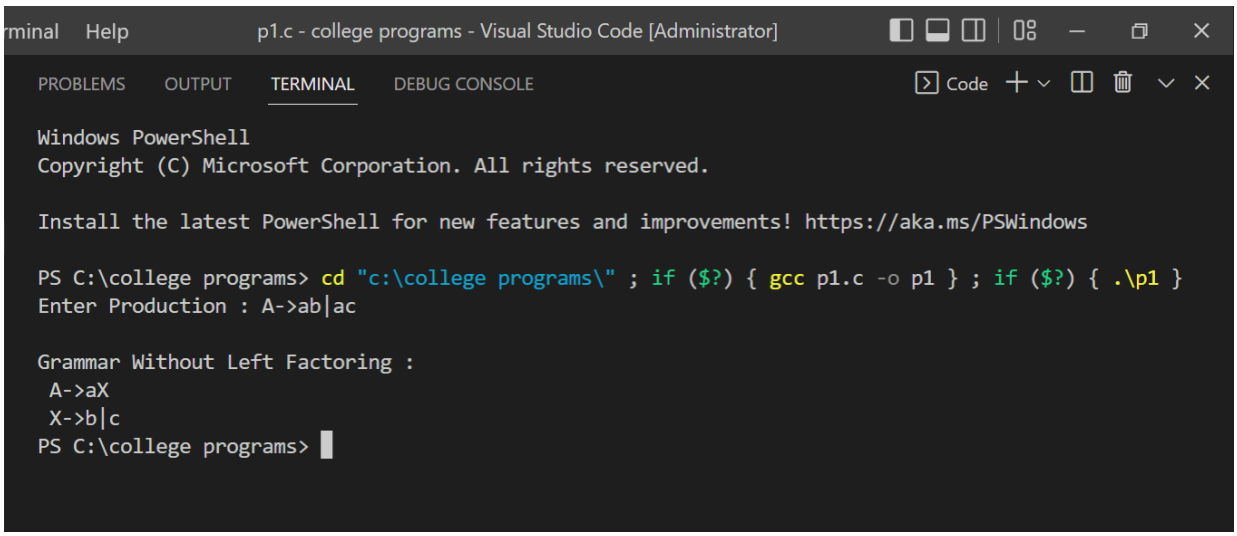
Write a program to perform left factoring on a grammar.

Program:

```
#include<stdio.h>
#include<string.h>
int main()
{
   char
gram[20],part1[20],part2[20],modifiedGram[20],newGram[20],tempGram[20];
   int i,j=0,k=0,l=0,pos;
   printf("Enter Production : A->");
   gets(gram);
   for(i=0;gram[i]!='|';i++,j++)
      part1[j]=gram[i];
   part1[j]='\0';
   for(j=++i,i=0;gram[j]!='\0';j++,i++)
      part2[i]=gram[j];
   part2[i]='\0';
   for(i=0;i<strlen(part1)||i<strlen(part2);i++){
      if(part1[i]==part2[i]){
         modifiedGram[k]=part1[i];
         k++;
         pos=i+1;
      }
   }
   for(i=pos,j=0;part1[i]!='\0';i++,j++){
```

```
        newGram[j]=part1[i];
    }
    newGram[j++]='|';
    for(i=pos;part2[i]!='\0';i++,j++){
        newGram[j]=part2[i];
    }
    modifiedGram[k]='X';
    modifiedGram[++k]='\0';
    newGram[j]='\0';
    printf("\nGrammar Without Left Factoring :  \n");
    printf(" A->%s",modifiedGram);
    printf("\n X->%s\n",newGram);
}
```

Output:



PRACTICAL – 6

Write a program to show all the operations of a stack.

Program:

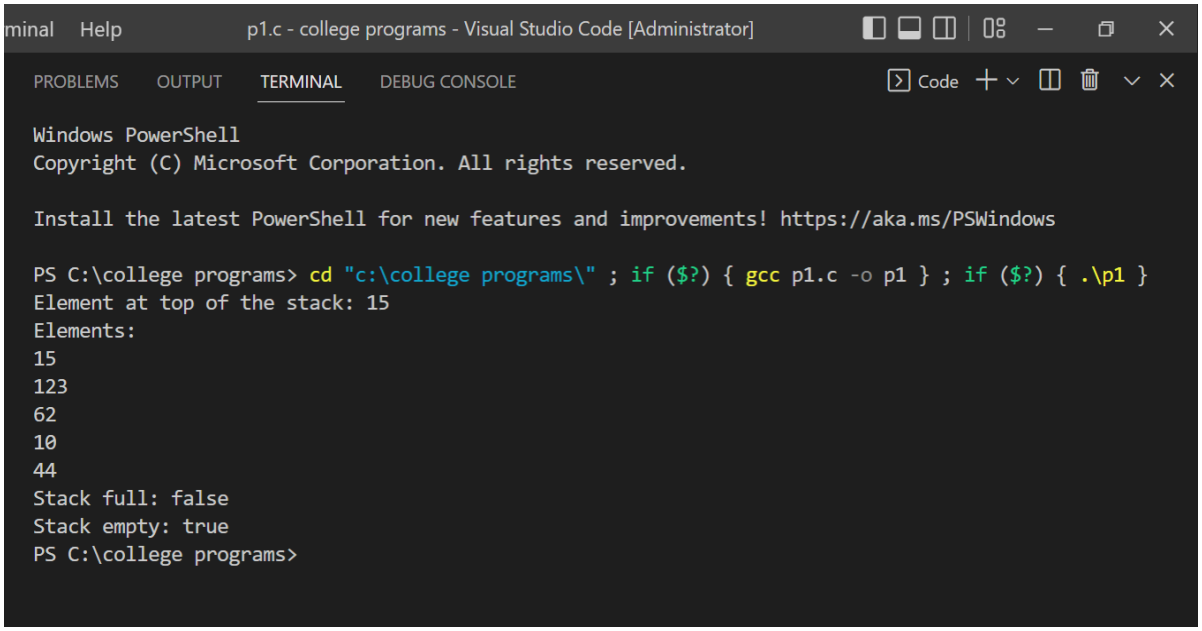
```
#include <stdio.h>
int MAXSIZE = 8;
int stack[8];
int top = -1;
int isempty(){
   if(top == -1)
      return 1;
   else
      return 0;
}
int isfull(){
   if(top == MAXSIZE)
      return 1;
   else
      return 0;
}
int peek(){
   return stack[top];
}
int pop(){
   int data;
   if(!isempty()) {
      data = stack[top];
```

```
      top = top - 1;
      return data;
   } else {
      printf("Could not retrieve data, Stack is empty.\n");
   }
}
int push(int data){
   if(!isfull()) {
      top = top + 1;
      stack[top] = data;
   } else {
      printf("Could not insert data, Stack is full.\n");
   }
}
int main(){
   push(44);
   push(10);
   push(62);
   push(123);
   push(15);
   printf("Element at top of the stack: %d\n" ,peek());
   printf("Elements: \n");

   // print stack data
   while(!isempty()) {
      int data = pop();
      printf("%d\n",data);
```

```
    }
    printf("Stack full: %s\n" , isfull()?"true":"false");
    printf("Stack empty: %s\n" , isempty()?"true":"false");
    return 0;
}
```

Output:



PRACTICAL – 7

Write a program to find out the leading of the non-terminals in a grammar.

Program:

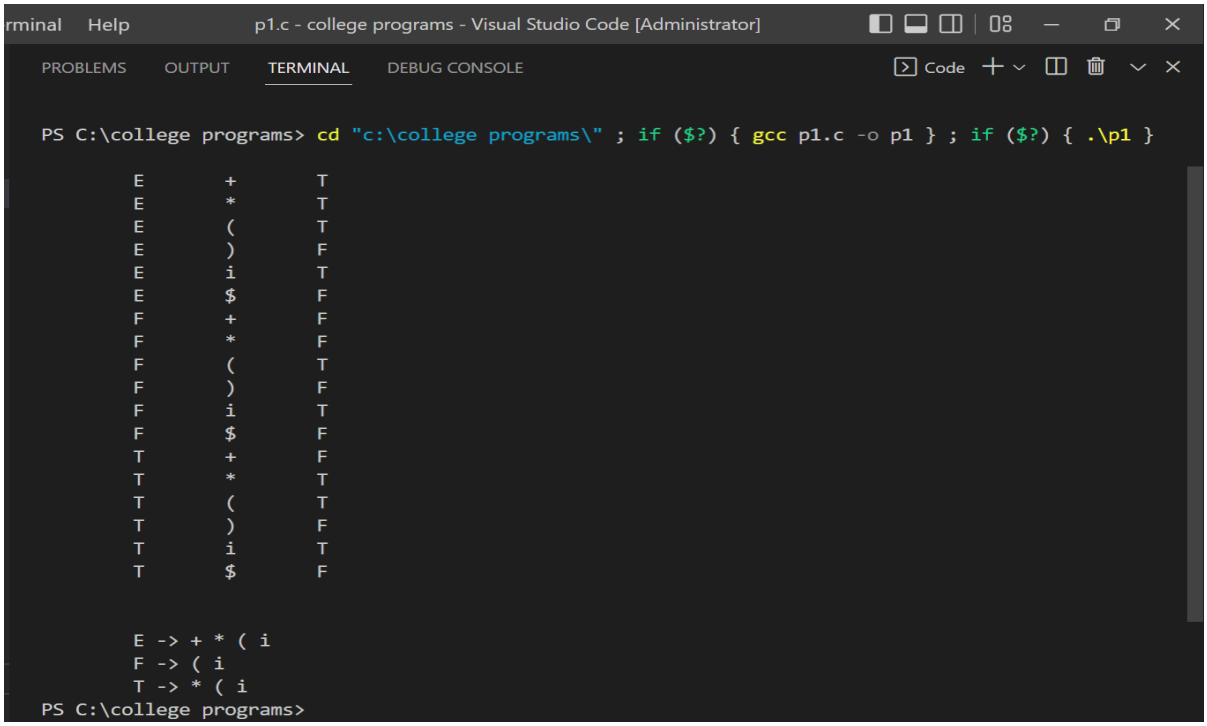
```
#include<conio.h>
#include<stdio.h>
char arr[18][3] ={{'E', '+', 'F'},{'E', '*', 'F'},{'E', '(', 'F'}, {'E', ')', 'F'},{'E', 'i', 'F'},{'E', '$', 'F'},
{'F', '+', 'F'},{'F', '*', 'F'},{'F', '(', 'F'},{'F', ')', 'F'},{'F', 'i', 'F'},{'F', '$', 'F'}, {'T', '+', 'F'},
{'T', '*', 'F'}, {'T', '(', 'F'},{'T', ')', 'F'},{'T', 'i', 'F'},{'T', '$', 'F'}};
char prod[6] = "EETTFF";
char res[6][3] ={ {'E', '+', 'T'}, {'T', '\0'}, {'T', '*', 'F'},  {'F', '\0'}, {'(', 'E', ')'}, {'i', '\0'}};
char stack [5][2];
int top = -1;
void install(char pro, char re) {
   int i;
   for (i = 0; i < 18; ++i) {
      if (arr[i][0] == pro && arr[i][1] == re) {

         arr[i][2] = 'T';
         break;
      }
   }
   ++top;
   stack[top][0] = pro;
```

```
    stack[top][1] = re;
}
void main() {
    int i = 0, j;
    char pro, re, pri = ' ';
    for (i = 0; i < 6; ++i) {
        for (j = 0; j < 3 && res[i][j] != '\0'; ++j) {
            if (res[i][j] == '+' || res[i][j] == '*' || res[i][j] == '(' || res[i][j] == ')' ||
res[i][j] == 'i' || res[i][j] == '$') {
                install(prod[i], res[i][j]);
                break;
            }
        }
    }
    while (top >= 0) {
        pro = stack[top][0];
        re = stack[top][1];
        --top;
        for (i = 0; i < 6; ++i) {
            if (res[i][0] == pro && res[i][0] != prod[i]) {
                install(prod[i], re);
            }
        }
    }
    for (i = 0; i < 18; ++i) {
        printf("\n\t");
        for (j = 0; j < 3; ++j)
            printf("%c\t", arr[i][j]);
```

```
    }
    getch();
    printf("\n\n");
    for (i = 0; i < 18; ++i) {
        if (pri != arr[i][0]) {
            pri = arr[i][0];
            printf("\n\t%c -> ", pri);
        }
        if (arr[i][2] == 'T')
            printf("%c ", arr[i][1]);
    }
    getch();
}
```

Output:



PRACTICAL – 8

Write a program to implement shift reduce parsing for a string.

Program:

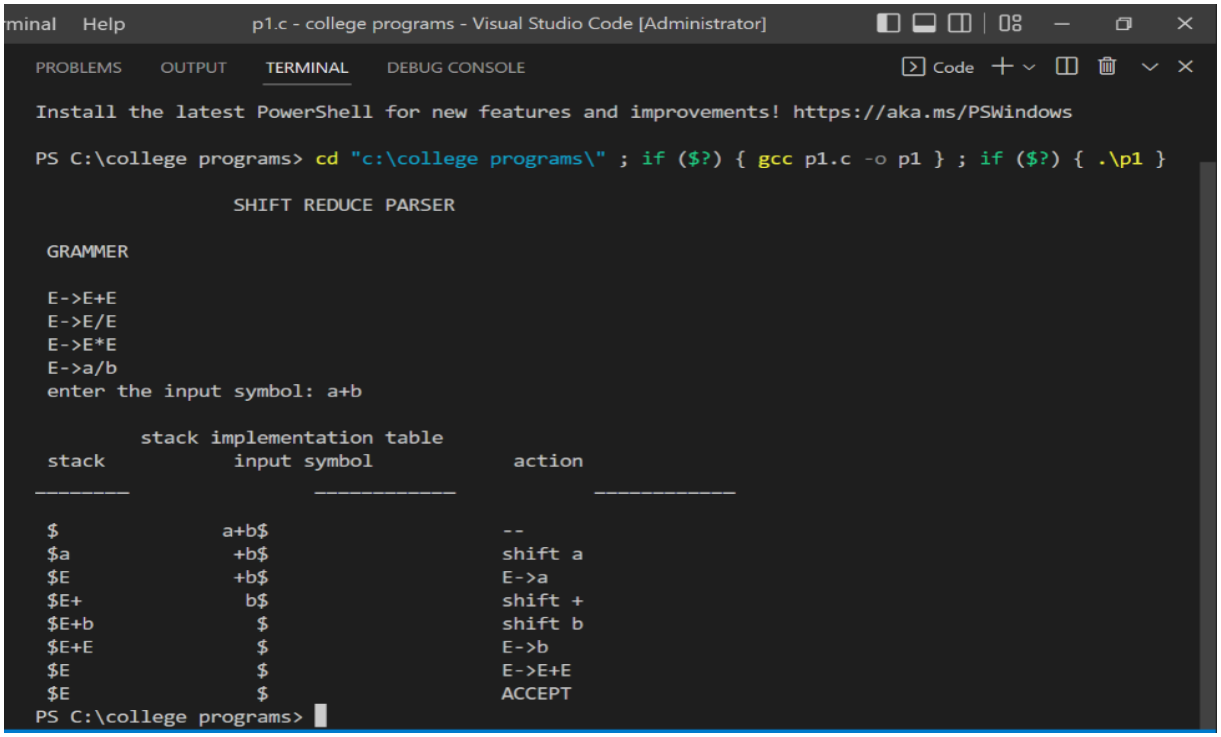
```
#include<stdio.h>
#include<stdlib.h>
#include<conio.h>
#include<string.h>
char ip_sym[15],stack[15];
int ip_ptr=0,st_ptr=0,len,i;
char temp[2],temp2[2];
char act[15];
void check();
void main()
{
printf("\n\t\t SHIFT REDUCE PARSER\n");
printf("\n GRAMMER\n");
printf("\n E->E+E\n E->E/E");
printf("\n E->E*E\n E->a/b");
printf("\n enter the input symbol: ");
gets(ip_sym);
printf("\n\t stack implementation table");
printf("\n stack \t\t input symbol\t\t action");
printf("\n________\t\t_____________\t\t_____________\n");
printf("\n $\t\t%s$\t\t\t--",ip_sym);
strcpy(act,"shift ");
```

```
temp[0]=ip_sym[ip_ptr];
temp[1]='\0';
strcat(act,temp);
len=strlen(ip_sym);
for(i=0;i<=len-1;i++)
{
stack[st_ptr]=ip_sym[ip_ptr];
stack[st_ptr+1]='\0';
ip_sym[ip_ptr]=' ';
ip_ptr++;
printf("\n $%s\t\t%s$\t\t\t%s",stack,ip_sym,act);
strcpy(act,"shift ");
temp[0]=ip_sym[ip_ptr];
temp[1]='\0';
strcat(act,temp);
check();
st_ptr++;
}
st_ptr++;
check();
}
void check()
{
int flag=0;
temp2[0]=stack[st_ptr];
temp2[1]='\0';
if((!strcmpi(temp2,"a"))||(!strcmpi(temp2,"b")))
```

```
{
stack[st_ptr]='E';
if(!strcmpi(temp2,"a"))
printf("\n $%s\t\t%s$\t\t\tE->a",stack,ip_sym);
else
printf("\n $%s\t\t%s$\t\t\tE->b",stack,ip_sym);
flag=1;
}
if((!strcmpi(temp2,"+"))||(strcmpi(temp2,"*"))||(!strcmpi(temp2,"/"))) { flag=1;
}
if((!strcmpi(stack,"E+E"))||(!strcmpi(stack,"E\E"))||(!strcmpi(stack,"E*E")))
{
strcpy(stack,"E");
st_ptr=0;
if(!strcmpi(stack,"E+E"))
printf("\n $%s\t\t%s$\t\t\tE->E+E",stack,ip_sym);
else
if(!strcmpi(stack,"E\E"))
printf("\n $%s\t\t%s$\t\t\tE->E\E",stack,ip_sym);
else if(!strcmpi(stack,"E*E"))
printf("\n $%s\t\t%s$\t\t\tE->E*E",stack,ip_sym);
else
printf("\n $%s\t\t%s$\t\t\tE->E+E",stack,ip_sym);
flag=1;
}
if(!strcmpi(stack,"E")&&ip_ptr==len)
{
```

```
printf("\n $%s\t\t%s$\t\t\tACCEPT",stack,ip_sym);
getch();
exit(0);
}
if(flag==0)
{
printf("\n%s\t\t\t%s\t\t reject",stack,ip_sym);
exit(0);
}
return;
}
```

Output:



PRACTICAL – 9

Write a program to find out the FIRST of the non-terminals in a grammar.

Program:

```
#include<stdio.h>
#include<conio.h>
char array[10][20],temp[10];
int c,n;
void fun(int,int[]);
int fun2(int i,int j,int p[],int );
void main()
{
  int p[2],i,j;
  printf("Enter the no. of productions :");
  scanf("%d",&n);
  printf("Enter the productions :\n");
  for(i=0;i<n;i++)
  scanf("%s",array[i]);
  for(i=0;i<n;i++)
  {
   c=-1,p[0]=-1,p[1]=-1;
   fun(i,p);
   printf("First(%c) : [ ",array[i][0]);
   for(j=0;j<=c;j++)
   printf("%c,",temp[j]);
   printf("\b ].\n");
```

```
    getch();
   }
}
int fun2(int i,int j,int p[],int key)
{
  int k;
  if(!key)
  {
    for(k=0;k<n;k++)
    if(array[i][j]==array[k][0])
    break;
    p[0]=i;p[1]=j+1;
    fun(k,p);
    return 0;
  }
  else
  {
    for(k=0;k<=c;k++)
    {
    if(array[i][j]==temp[k])
    break;
    }
    if(k>c)return 1;
    else return 0;
  }
}
 void fun(int i,int p[])
```

```
{
int j,k,key;
for(j=2;array[i][j] != NULL; j++)
{
if(array[i][j-1]=='/')
{
if(array[i][j]>= 'A' && array[i][j]<='Z')
{
key=0;
fun2(i,j,p,key);
}
else
{
key = 1;
if(fun2(i,j,p,key))
temp[++c] = array[i][j];
if(array[i][j]== '@'&& p[0]!=-1)
{
if(array[p[0]][p[1]]>='A' && array[p[0]][p[1]] <='Z')
{
key=0;
fun2(p[0],p[1],p,key);
}
else
if(array[p[0]][p[1]] != '/'&& array[p[0]][p[1]]!=NULL)
{
if(fun2(p[0],p[1],p,key))
```

```
temp[++c]=array[p[0]][p[1]];
}
}
}
}
}
}
```

Output:

```
Enter the no. of productions :6
Enter the productions :
S/aBDh
B/cC
C/bC/e
E/g/e
D/E/F
F/f/e
First(S) : [ a ].
First(B) : [ c ].
First(C) : [ b,e ].
First(E) : [ g,e ].
First(D) : [ g,e,f ].
First(F) : [ f,e ].
PS C:\college programs>
```

PRACTICAL – 10

Write a program to check whether a grammar is operator precedent.

Program:

```
#include<stdio.h>
#include<string.h>
char *input;
int i=0;
char lasthandle[6],stack[50],handles[][5]={")E(","E*E","E+E","i","E^E"};
int top=0,l;
char prec[9][9]={
            '>', '>','<','<','<','<','<','>','>',
            '>', '>','<','<','<','<','<','>','>',
            '>', '>','>','>','<','<','<','>','>',
            '>', '>','>','>','<','<','<','>','>',
            '>', '>','>','>','<','<','<','>','>',
            '>', '>','>','>','>','e','e','>','>',
            '<', '<','<','<','<','<','<','>','e',
            '>', '>','>','>','>','e','e','>','>',
            '<', '<','<','<','<','<','<','<','>',
           };
int getindex(char c)
{
switch(c)
   {
   case '+':return 0;
```

```
    case '-':return 1;
    case '*':return 2;
    case '/':return 3;
    case '^':return 4;
    case 'i':return 5;
    case '(':return 6;
    case ')':return 7;
    case '$':return 8;
    }
}
int shift()
{
stack[++top]=*(input+i++);
stack[top+1]='\0';
}
int reduce()
{
int i,len,found,t;
for(i=0;i<5;i++)
    {
    len=strlen(handles[i]);
    if(stack[top]==handles[i][0]&&top+1>=len)
        {
        found=1;
        for(t=0;t<len;t++)
            {
            if(stack[top-t]!=handles[i][t])
```

```
            {
            found=0;
            break;
            }
          }
        if(found==1)
            {
            stack[top-t+1]='E';
            top=top-t+1;
            strcpy(lasthandle,handles[i]);
            stack[top+1]='\0';
            return 1;
            }
        }
   }
return 0;
}
void dispstack()
{
int j;
for(j=0;j<=top;j++)
    printf("%c",stack[j]);
}
void dispinput()
{
int j;
for(j=i;j<l;j++)
```

```
    printf("%c",*(input+j));
}
void main()
{
int j;
input=(char*)malloc(50*sizeof(char));
printf("\nEnter the string\n");
scanf("%s",input);
input=strcat(input,"$");
l=strlen(input);
strcpy(stack,"$");
printf("\nSTACK\tINPUT\tACTION");
while(i<=l)
                                        {
                                        shift();
                                        printf("\n");
                                        dispstack();
                                        printf("\t");
                                        dispinput();
                                        printf("\tShift");
                                        if(prec[getindex(stack[top])][getindex(input[i])]=='>
')
                                             {
                                             while(reduce())
                                                  {
                                                  printf("\n");
                                                  dispstack();
                                                  printf("\t");
```

```
                                    dispinput();
                                    printf("\tReduced: E->%s",lasthandle);
                                    }
                                }
                            }
if(strcmp(stack,"$E$")==0)
   printf("\nAccepted;");
else
  printf("\nNot Accepted;");
}
```

Output:

```
Enter the string
i*(i+i)*i

STACK   INPUT   ACTION
$i      *(i+i)*i$       Shift
$E      *(i+i)*i$       Reduced: E->i
$E*     (i+i)*i$        Shift
$E*(    i+i)*i$ Shift
$E*(i   +i)*i$  Shift
$E*(E   +i)*i$  Reduced: E->i
$E*(E+  i)*i$   Shift
$E*(E+i )*i$    Shift
$E*(E+E )*i$    Reduced: E->i
$E*(E   )*i$    Reduced: E->E+E
$E*(E)  *i$     Shift
$E*E    *i$     Reduced: E->)E(
$E      *i$     Reduced: E->E*E
$E*     i$      Shift
$E*i    $       Shift
$E*E    $       Reduced: E->i
$E      $       Reduced: E->E*E
$E$             Shift
$E$             Shift
Accepted;
PS C:\college programs>
```

YOGA with ADRIENE
FIND WHAT Feels Good

EASE

OCTOBER
2023

S	M	T	W	T	F	S
1 BEDTIME YOGA SEQUENCE 37 min	2 SUKHASANA, THE EASY POSE 8 min MORNING YOGA FOR BEGINNERS - GENTLE MORNING YOGA 21 min	3 NEW YOGA FOR SICK RECOVERY 21 min	4 YOGA CAMP - DAY 11 I RELEASE 45 min	5 FUNDAMENTALS OF EASE 35 min	6 YOGA FOR STRENGTH AND FOCUS 43 min	7 YOGA FOR RELAXATION 33 min FWFG: Ease of Fight or Flight 27 min
8 CROW POSE 10 min CROW PRACTICE 24 min FWFG: Ease in the Seat of Fire - 25 min	9 QUICK STRESS FIX 5 min MEDITATION FOR INNER PEACE 11 min	10 STRESS MELT 25 min	11 YOGA TO CALM YOUR NERVES 24 min	12 30 DAYS OF YOGA - DAY 13 - ENDURANCE & EASE 26 min	13 STREET YOGA - YOGA YOU CAN DO ANYWHERE 14 min	14 PEACEFUL WARRIOR 27 min
15 INTRO TO YIN YOGA 26 min FWFG: Functional Movement with Sumair - Day 1 - 24 min	16 30 DAYS OF YOGA - DAY 1 - EASE INTO IT 35 min FWFG: Functional Movement with Sumair - Day 2 - 37 min	17 YOGA FOR PANIC & ANXIETY 15 min FWFG: Functional Movement with Sumair - Day 3 - 20 min	18 MORNING YOGA FLOW 20 min FWFG: Functional Movement with Sumair - Day 4 - 11 min	19 YOGA TO SLOW YOUR ROLL 16 min FWFG: Functional Movement with Sumair - Day 5 - 13 min	20 YOGA FOR STRESS RELIEF 37 min FWFG: Functional Movement with Sumair Day 6 - 14 min	21 REVOLUTION - DAY 1 - PRACTICE EASE 24 min FWFG: Functional Movement with Sumair - Day 7 - 13 min
22 YOGA FOR WHEN YOU ARE SICK 20 min	23 FOUNDATIONS OF YOGA - WILD THING 3 min YOGA FOR COMFORT AND NOURISHMENT 25 min	24 MEDITATION FOR BALANCING THE NERVOUS SYSTEM 11 min	25 YOGA FOR ZOMBIES 15 min	26 YOGA FOR HEALTHY BLOOD FLOW 19 min	27 YOGA FOR INNER SPACE TRAVEL 14 min	28 YOGA FOR WHEN YOU FEEL DEAD INSIDE 27 min
29 YOGA FOR WHEN YOU ARE FEELING SCARED 28 min	30 YOGA FOR BONE HEALTH 21 min	31 NEW BRIDE OF PLANKENSPINE PRACTICE 18 min	**Free practices all month long on YWA YouTube!** **Check out FindWhatFeelsGood.com for Adriene's monthly member's vlog + other new uploads!** **Join us 10/15-10/21 for a brand new 7 Day Functional Movement with Sumair on FWFG.**			

EASE

OCTOBER
2023

Oh sweet soft supportive October. Welcome. A new month.
And with it, another free yoga practice calendar to help you slink into daily practice and feel your sacred center.

Ease is what this month is about.

Strength with ease. Curiosity and ease. Creativity and ease. Rest with ease.

If there was ever a month to give the full 31 practices a try, this may be it. With a calming yet strengthening and fun curation, this set of sessions is sweet, spooky and designed to inspire the spontaneity of ease.

Allow ease in, let it surprise you.

Soften, let go.

I will see you on the mat!

October disclosure 🐶: It is a tradition that we do a Halloween video for all ages on the Yoga With Adriene channel - so you will see a week of Halloween themed practices including a brand new one on Halloween October 31. These are fun practices to inspire a playfulness and ease. Practice alone if you dare, or invite a friend to join you. (No tricks, just treats.)

FWFG members, join me for Sumair's Functional Movement Series this month! I challenge you to take the whole week with me! No stops. You won't regret it. Working with a professional trainer is an amazing way to deepen your practice and knowledge of your body to increase ability, ease, and avoid injury.

*Daily practices are free on YouTube
*Find What Feels Good (FWFG) practices may be found at FWFG.com, thank you for being a member!

Much Love,
Adriene

YOGA with ADRIENE | FIND WHAT Feels Good

Playlists

- Bookmark the playlist for easy access.
  - free YouTube playlist
  - FWFG playlist for members
- Learn more about the FWFG videos on the calendar by visiting FWFG.com.

How it Works

- Follow along every day or drop in throughout the month.
- Invite someone to join you!
- Share your experience with the community. Follow the hashtag and tag your social posts with it.
- Connect with @adrienelouise and @fwfglife on Instagram.

#ywaEASE


FREE PROGRAMMING RESOURCES FROM THE LEARN PROGRAMMING ACADEMY
LP
LearnProgrammingAcademy.com

ABOUT
THE LEARN PROGRAMMING ACADEMY (LPA)

The Learn Programming Academy produces world-class video training to teach people how to become programmers in the shortest possible time, utilizing industry best practices to ensure the training is 100% relevant to today's employers.

We're on a mission to teach one million people how to become programmers and are already over fifty percent of the way!

BEGINNING C++ COURSE SLIDES (FREE)

FREE YOUTUBE LEARN TO CODE COURSE

OUR 53 PROGRAMMING COURSES

PROGRAMMING CAREER GUIDE E-BOOK

PROGRAMMING CAREER VIDEOS

Learn Programming Academy Headquarters
Level 1, 8 Beulah Road, Norwood SA 5067
Australia

LearnProgrammingAcademy.com

Table of Contents

Chapter 1 - Introduction
Chapter 2 - Beginning C++ Course Slides
Chapter 3 - Programming Career Guide
Chapter 4 - List of Learn Programming Academy Courses
Chapter 5 - Learn to Code Course
Chapter 6 - Programming Tip of the Day videos

CHAPTER 1 – INTRODUCTION

Introduction - Thanks for downloading this E-Book.

Subscribe to my Email list ** groan **.

To get a lot of the free stuff, I'm asking you to sign up for my email list. Why am I asking you to sign up to my email list?

1. Getting course updates to you!

Firstly, I want to keep you updated when new courses come out. The reality is the announcements on Udemy seem only ever to be received by around 2% or less of my students. The remaining 98% don't see these announcements.

Why? I don't know. I know that about 98% of my students never see some or all of the Udemy announcements I send. Getting you to sign up for my email list makes it easy for me to keep you informed.

Most of my communication moving forward will be regular updates on new and updated courses I have published, free stuff like the new career paths guide, my existing programming career guide, my new Learn to Code course, my 100+ programming tips of the day videos, and more.

Plus, as a student of Beginning C++, you also get the current version of the slides for the course and the updates when they are released.

2. Making my courses as cheap as possible for you.

In early October 2019, Udemy changed the way that instructors can provide discounts for courses.

It's no longer possible for an instructor to create a never expiring coupon for their courses at the lowest price.

I, along with other instructors on Udemy, can only pass on the biggest discounts to our courses with coupons that expire automatically in five days from the date of creation.

I'll also send out a Udemy promotion, but as established above, around 98% of students on Udemy never see those announcements.

Because of the limited number of coupons that I can create each month, I'll be sending out emails to students on my list with those discounts once or twice a month. This way, I can ensure that I pass on the biggest discounts.

These links I will send will enable you to buy any of my courses at the lowest price.

Make sure you sign up and say on my email list if you want to get access to these discounts.

3. So I can spam you?

No, I won't.

I promise not to send too many emails, and I won't spam. The only information you will get relates to my Learn Programming academy's courses or free programming stuff that is useful and will be of benefit to you on your programming journey.

While I will be upfront and say I hope you will consider purchasing some of my other programming courses if they prove useful and fit a need you have to learn a specific programming language or framework, I am not about `selling.'

You won't ever see me sending you "stuff" to buy (other than my courses).

I'm about empowering people to become programmers by giving them the training and resources they need to succeed.

CHAPTER 2 – BEGINNING C++ SLIDES

Here is where you get access to the slides for the Beginning C++ course.

Note: I am doing it this way so that I can send out an email every time the slides are updated.

Note that by clicking the link below, you also get the programming career book.

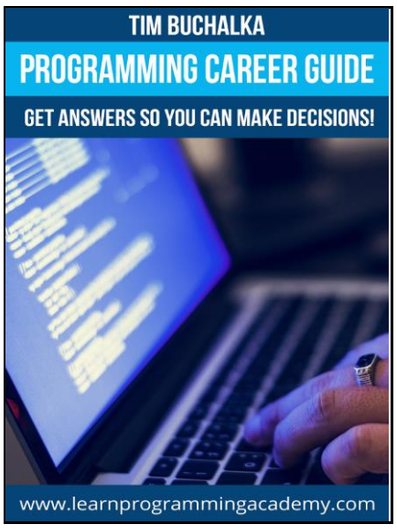
Click HERE to get the Beginning C++ Slides and the programming career E-Book.

CHAPTER 3 – PROGRAMMING CAREER GUIDE

This Programming Career guide answers a lot of the questions that students have relating to careers in programming. Having trained over half a million students to program, I've identified the major questions and wrote an E-Book to answer them.

To grab this Guide right now, 100% for free, click the link below.

CLICK HERE TO GET BOTH PROGRAMMING CAREER GUIDES (PLUS AS A STUDENT OF THE BEGINNING C++ COURSE YOU ALSO GET THE SLIDES FOR THE COURSE).



OTHER STUFF

Here are some other very useful resources for you - these don't require you to subscribe to an email list, click the link below to find out more about each course, or to watch the Learn to Code Video Series, or to watch 106 Programming Tip of the day videos I have created.

No strings attached!

CHAPTER 4 – COMPLETE LIST OF OUR COURSES

Currently, the Academy has fifty (52) software development courses. Languages such as Java, Python, C++, C#, C, Ruby, Kotlin, and more are covered and frameworks such as Android app development, Spring Framework, Java Enterprise development, Games development.

All these courses are on Udemy.

Below is a screenshot of each course, and you can click the image or link below for more information about each course.

Note: The links will give you a great discount price off the "everyday" price of each course on Udemy.

But keep in mind that due to Udemy changing their system for coupons, I can no longer create coupons that do not expire.

If you want the biggest possible discounted price for each course, then join my email list – once or twice a month, I'll send through coupons that offer all my courses at the lowest cost. Keep in mind these coupons will expire in five days from the email I send.

As an example, as of the time of writing this e-Book, if you click a link to one of my courses below, then the price should be USD 13.99 (the minimum price Udemy allows me to set for a coupon that expires in 31 days).

If you sign up to my email list and wait for the next email I sent out (generally once or twice a month), then the price is USD 9.99 – as you can see a considerable discount. In this case, the link will expire in only five days, hence the need for you to be signed up to receive the emails.

Keep in mind that Udemy automatically changes pricing into your local currency, but the percentage of discounts should be the same.

Either way, you get a considerable discount from the every day Udemy price for one of my courses.

You have two options. Get the course today for a still decent discount or join the email list for a much larger discount and then wait until I send out the discount links each month.

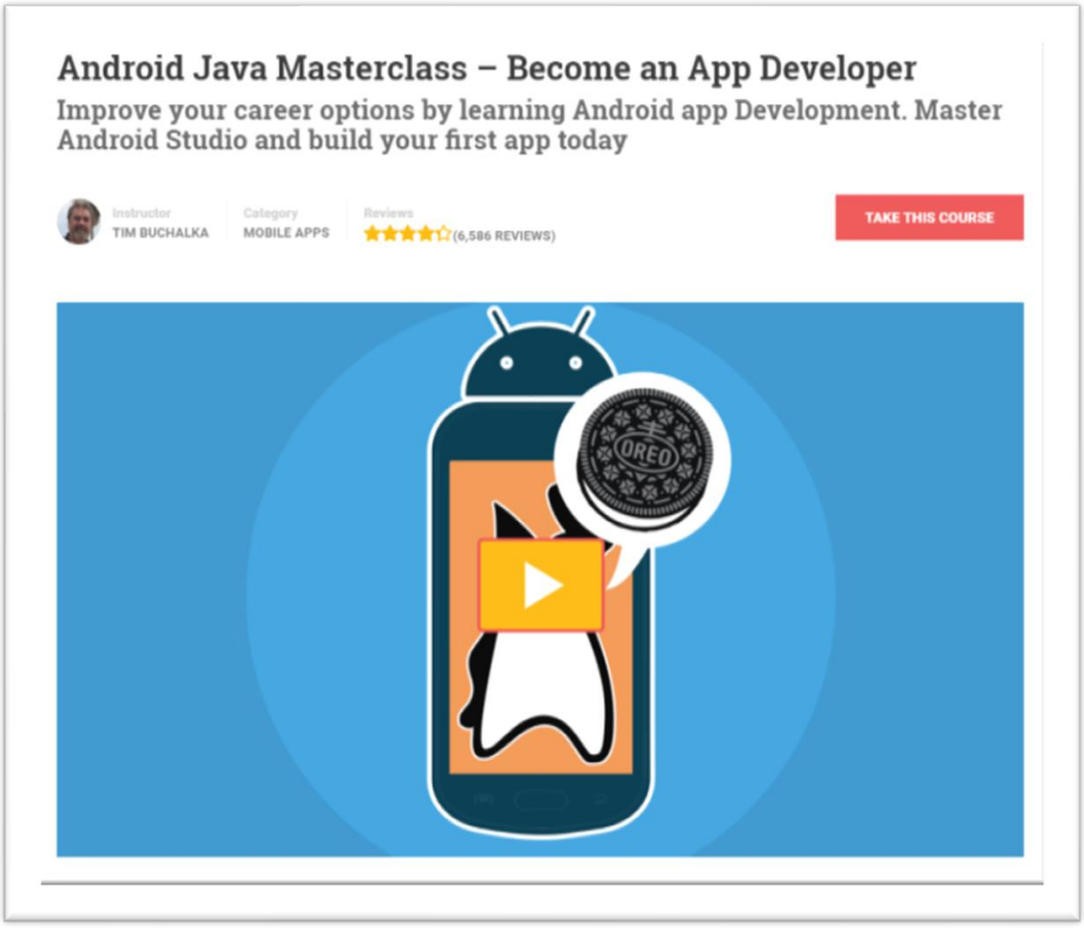
I hope that makes sense – send me a message if anything is unclear.

Get the [Java Masterclass here.]

Get the [Python Masterclass here.]

Get the [C++ course here.]

Get the [1Z0-819 OCP Course – Part 1 here.]

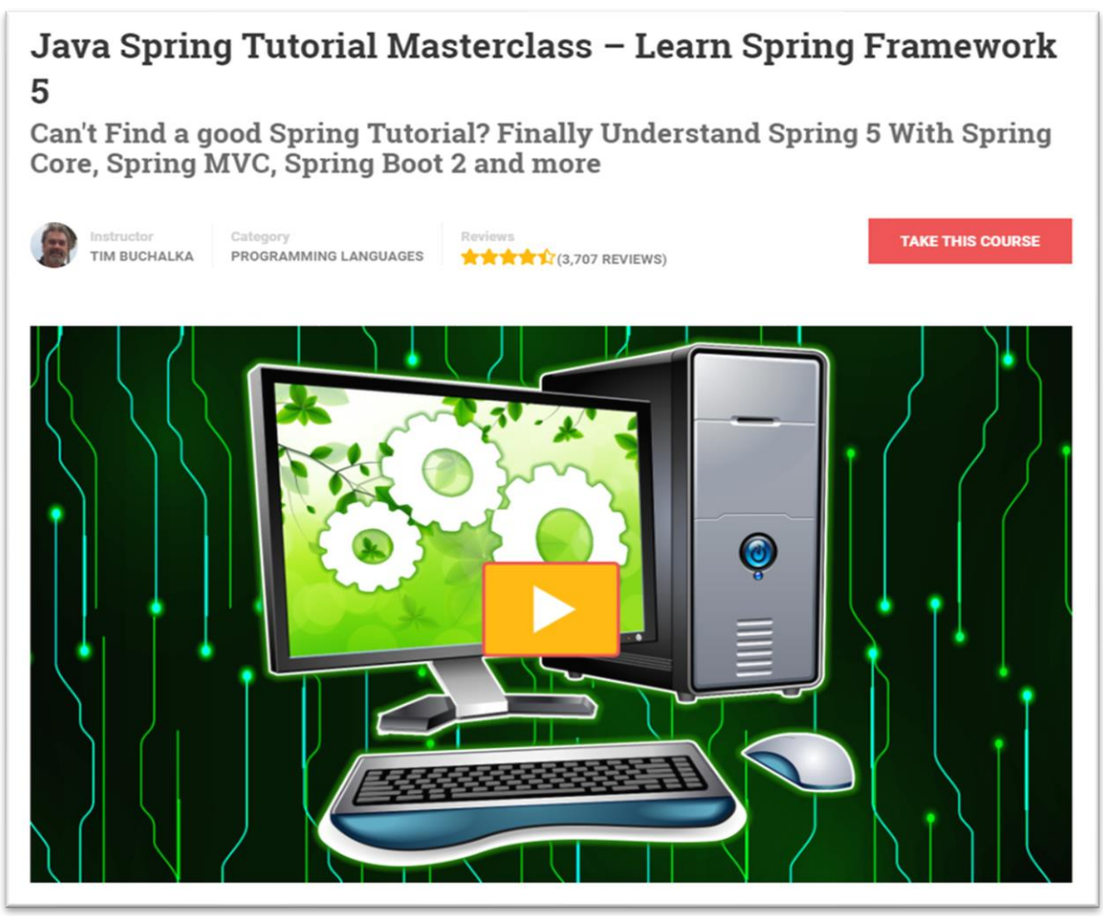


Get the [Android Java Masterclass here].

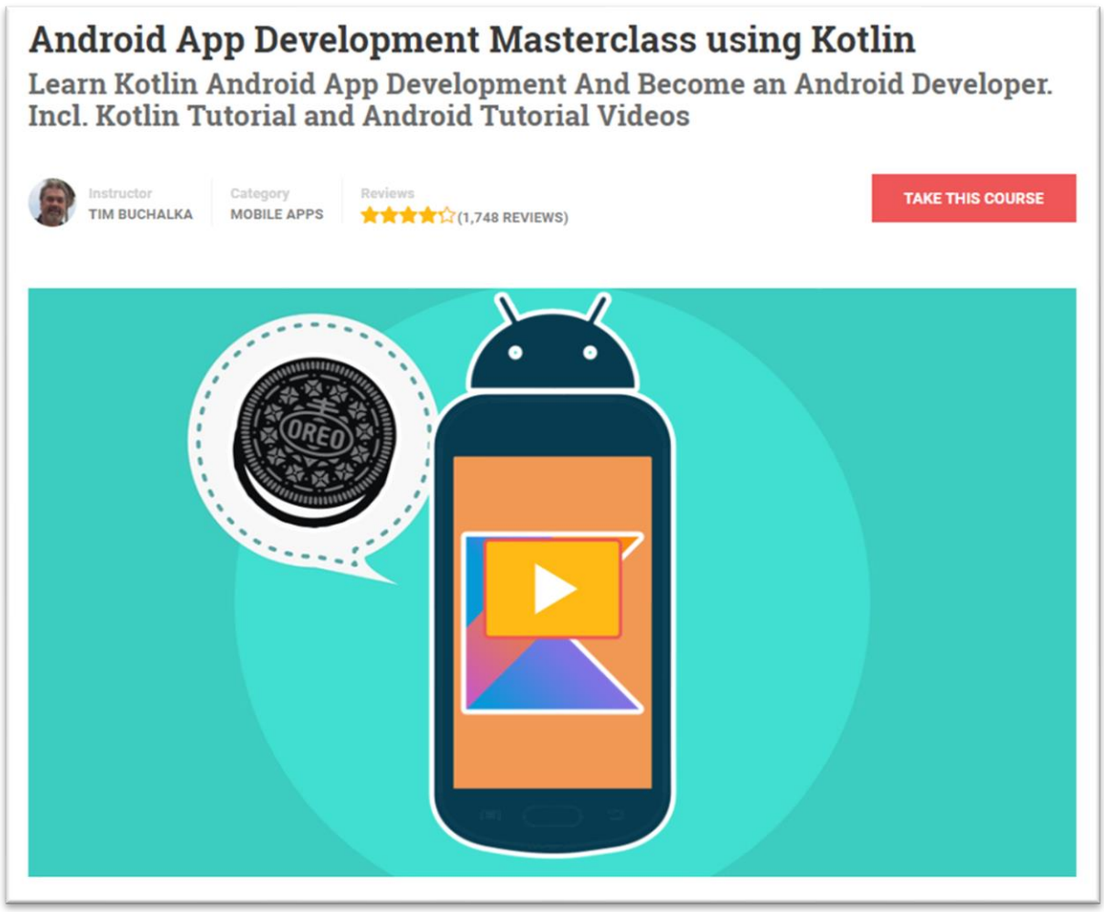
Get the [C Programming course here.]

Get the [Advanced C Programming Course here]

Get the [Data Structures and Algorithms course here]



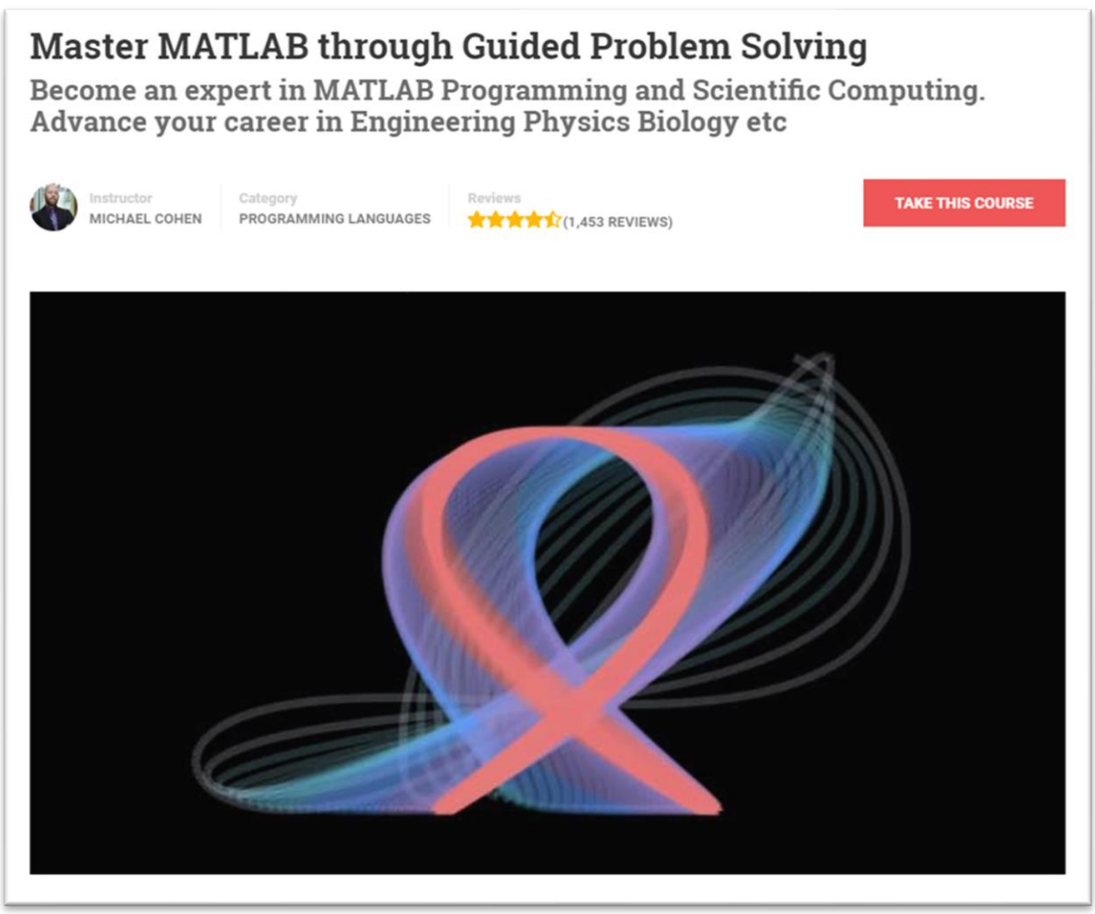
Get the [Java Spring Masterclass here]



Get the [Android Kotlin Masterclass here]

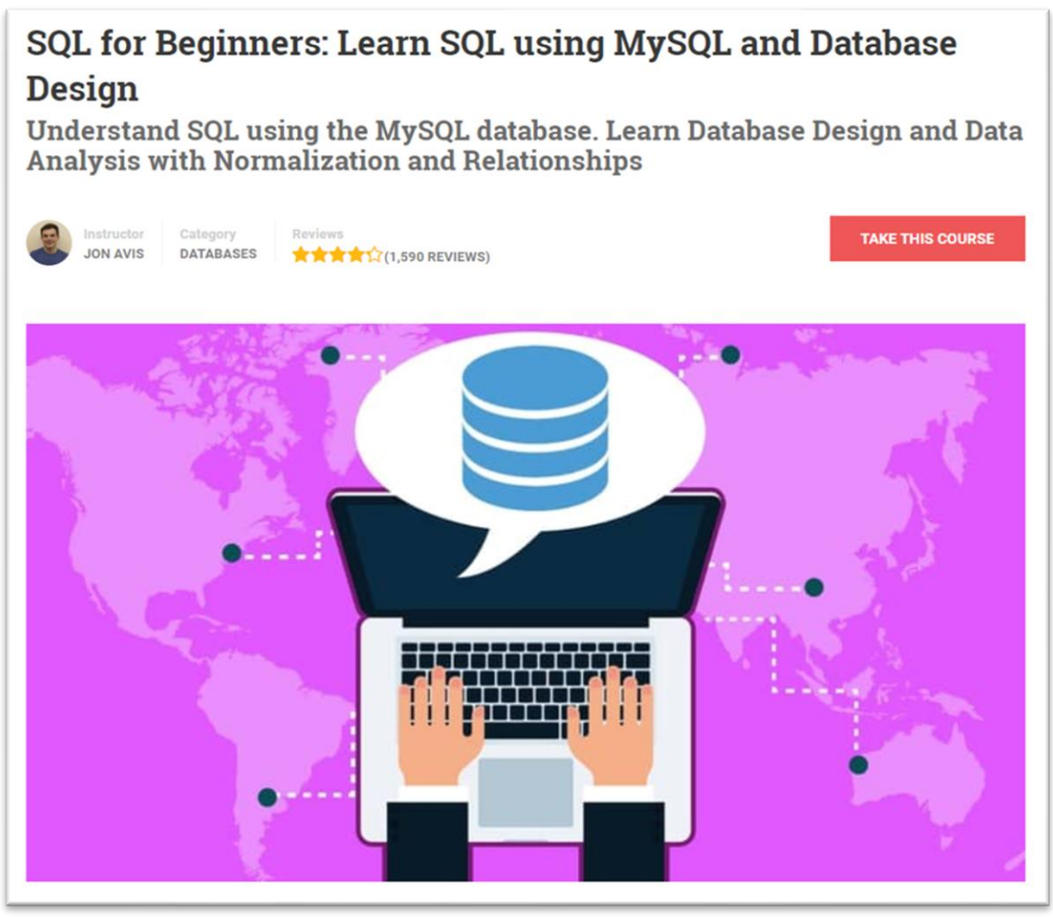
Get the [Complete Xamarin course here.]

Get the [Oracle Java Certification course here.]



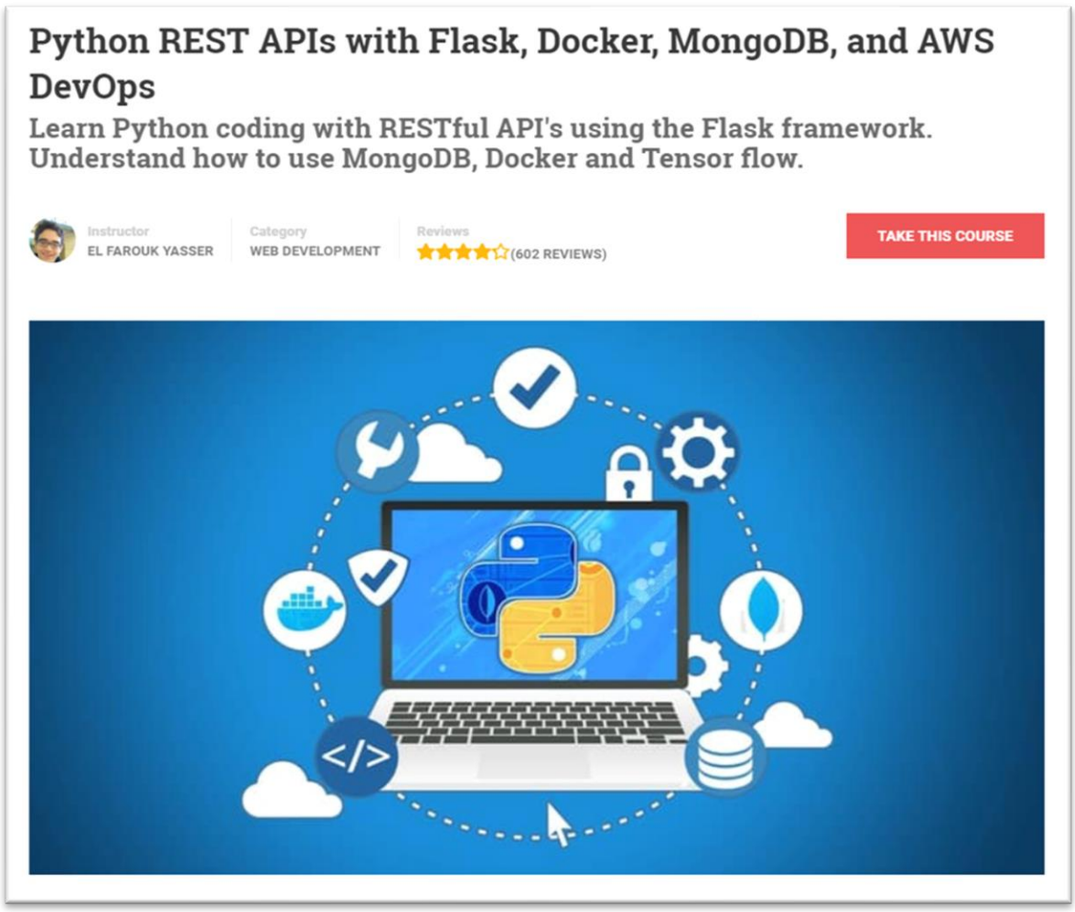
Get the [MATLAB course here]

Get the [Kotlin for Java Developers course here.]



Get the [SQL course here].

Get the [WPF Masterclass here.]

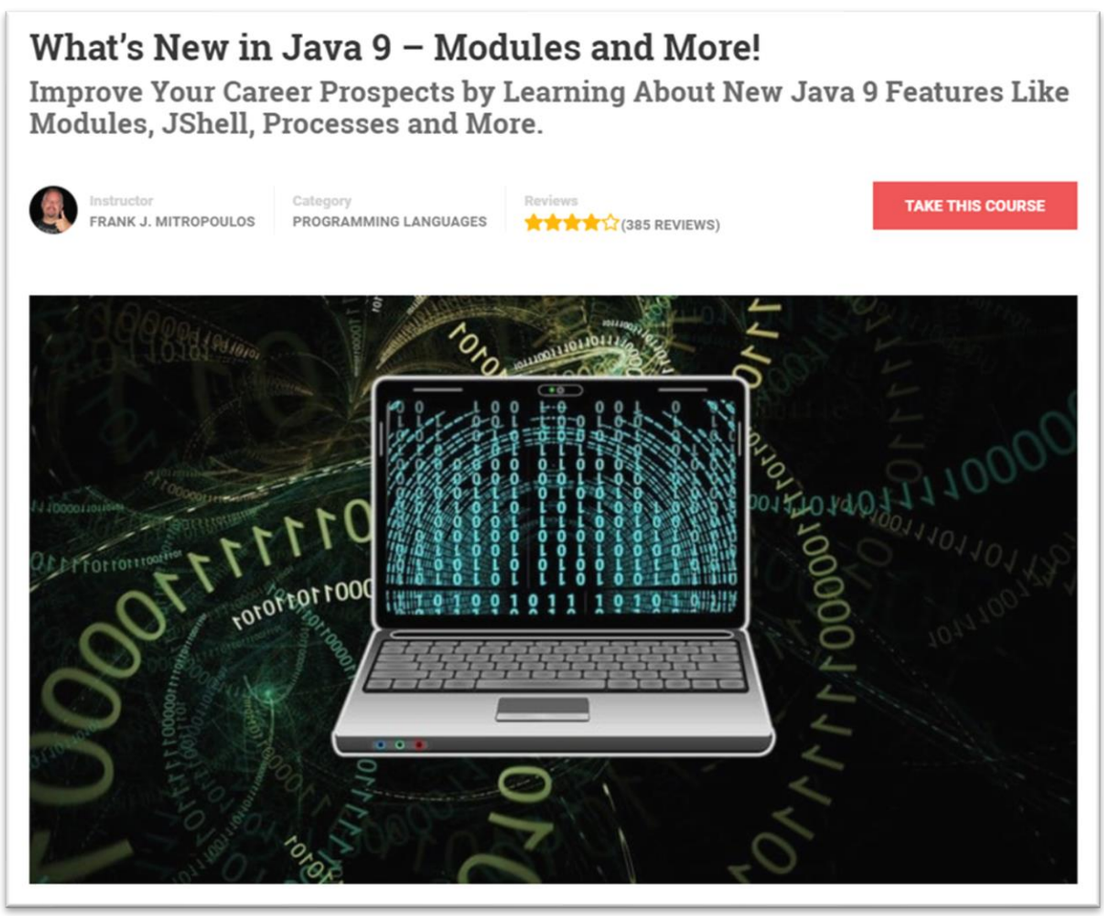


Get the [Python APIs course here.]

Get the [Java crash course here.]

Get the [PHP course here.]

Get the [Machine Learning - Python course here.]

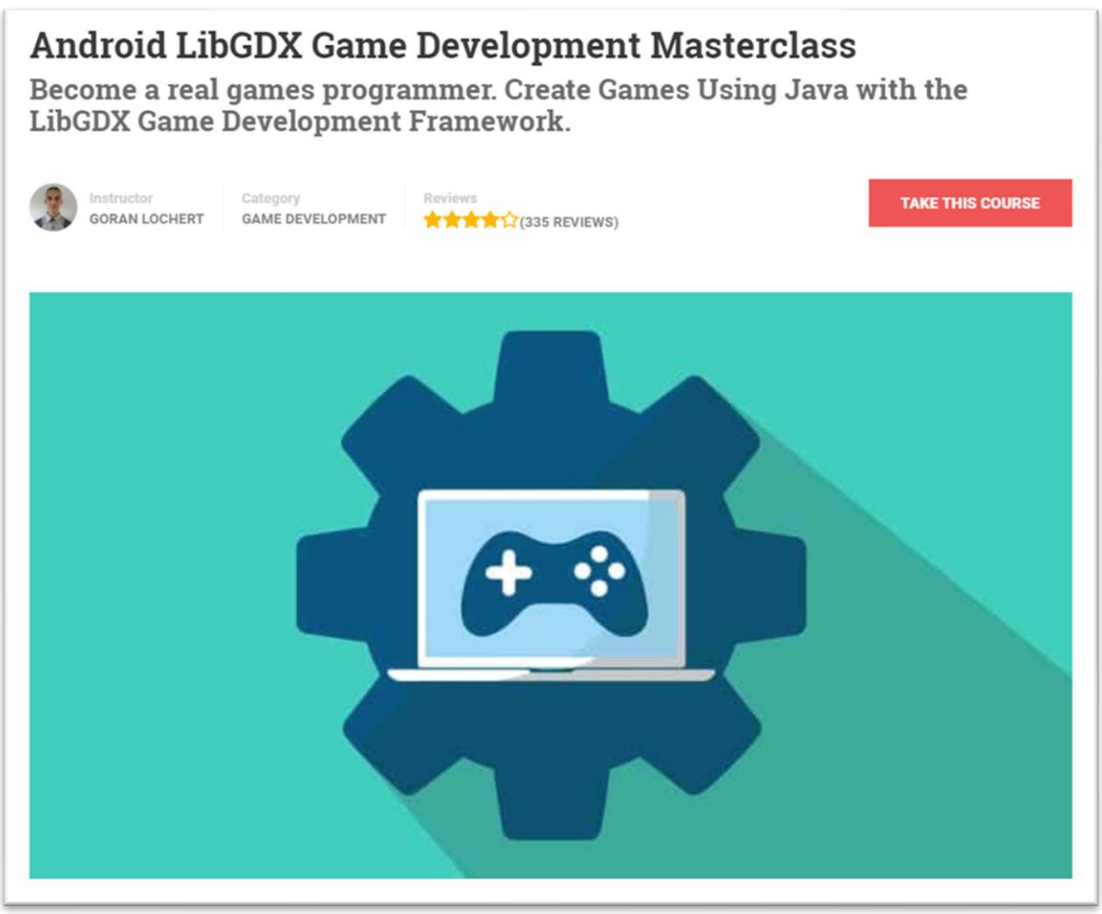


Get the [Java 9 course here.]

Get the [JEE8 course here.]

Get the [Ethical Hacking course here.]

Get the [Java Design Patterns course here.]



Get the [Android LibGDX course here.]

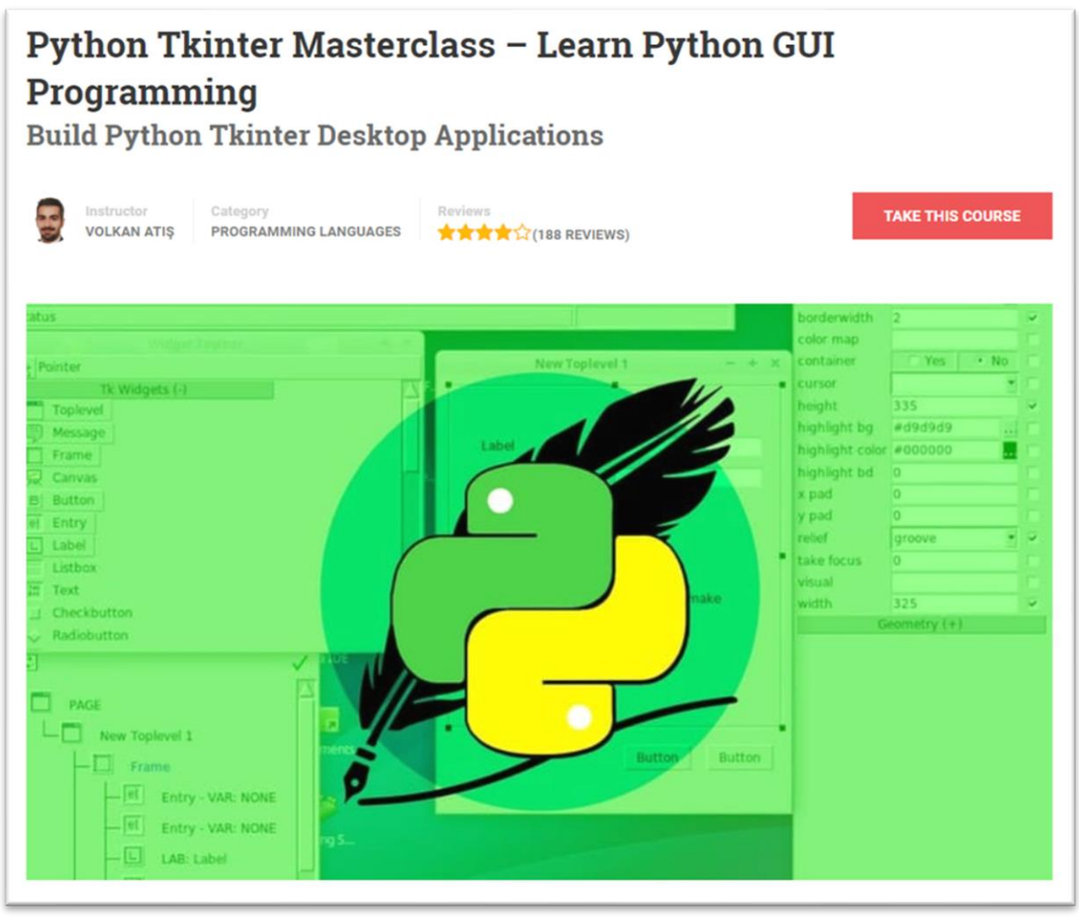
Get the [Advanced Algorithms - Java course here.]

Get the [Git & GitHub Masterclass here.]

Get the [Advanced Xamarin Masterclass here.]

Get the [3D Programming course here.]

Get the [C# crash course here.]



Get the [Python Tkinter Masterclass here.]

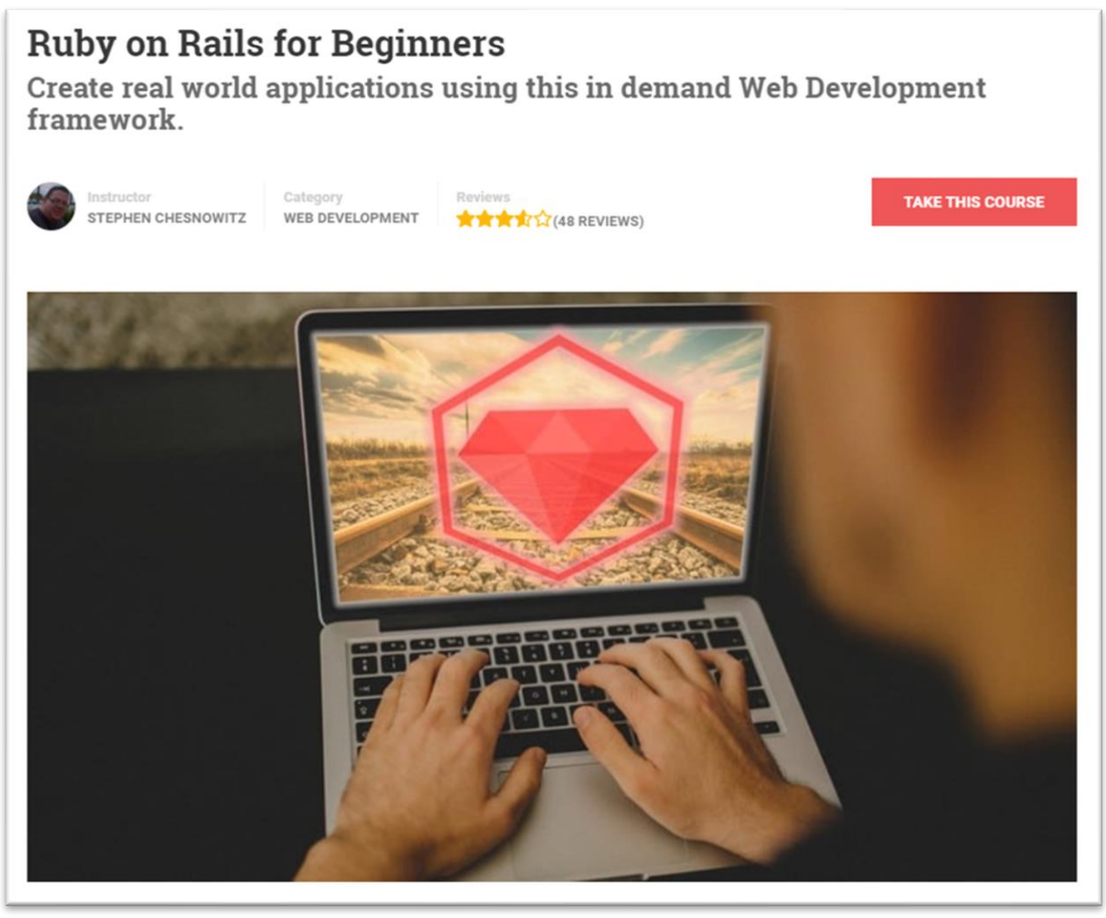
Get the [Rust course here.]

Get the [ArcPy for Python course here.]

Get the [Kotlin LibGDX Masterclass here.]

Get the [Unity Masterclass here.]

Get the [Python GUI - PyQt5 course here.]



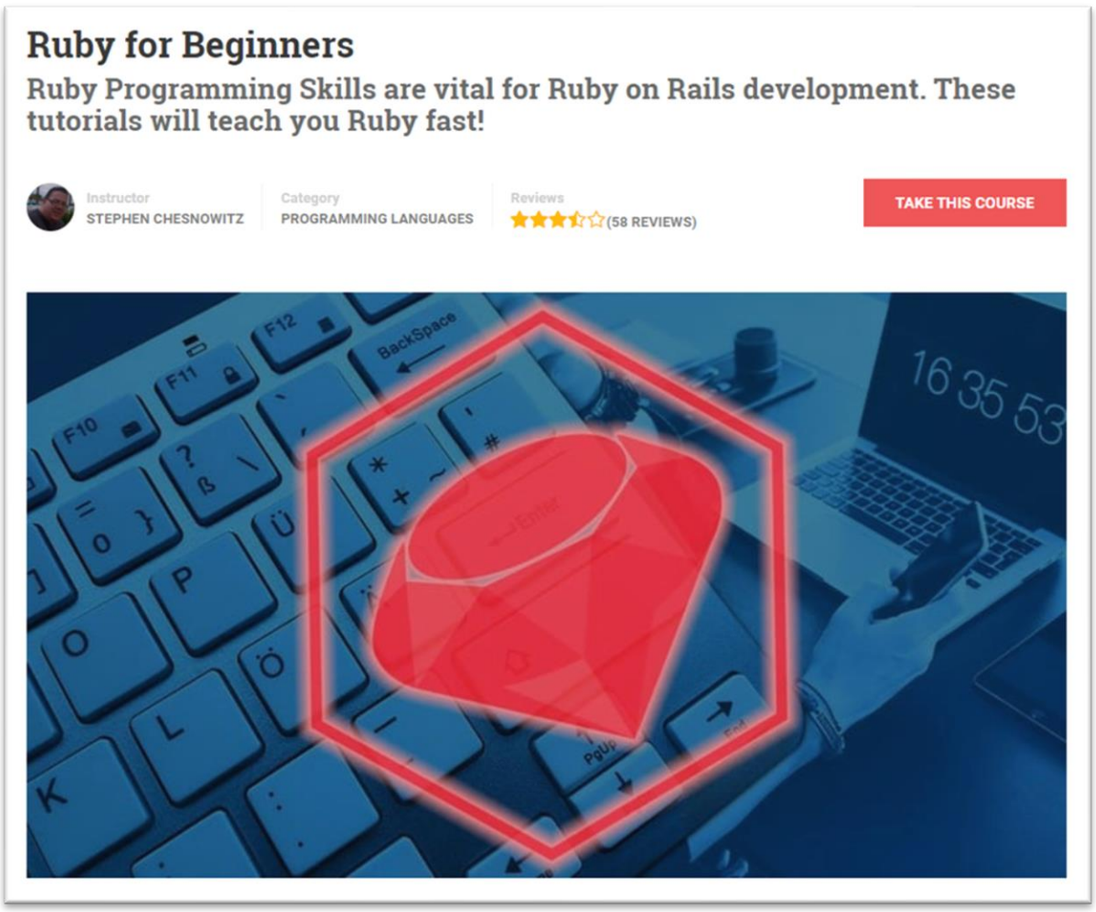
Get the [Ruby on Rails course here.]

Get the [Search Algorithms in AI course here.]

Get the [Javascript course here.]

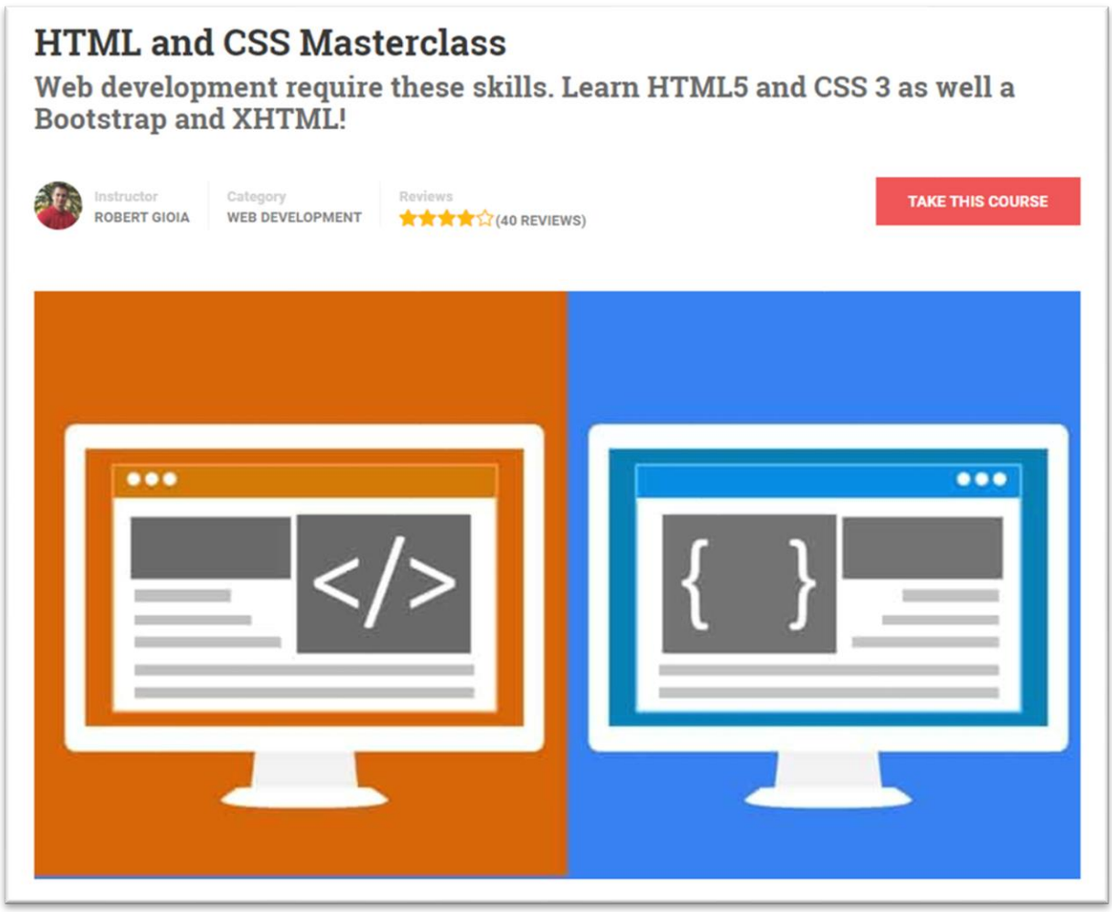
Get the [Azure Machine Learning course here.]

Get the [IntelliJ and Android Studio course here.]



Get the [Ruby for Beginners course here.]

Get the [Learning Bootstrap course here.]

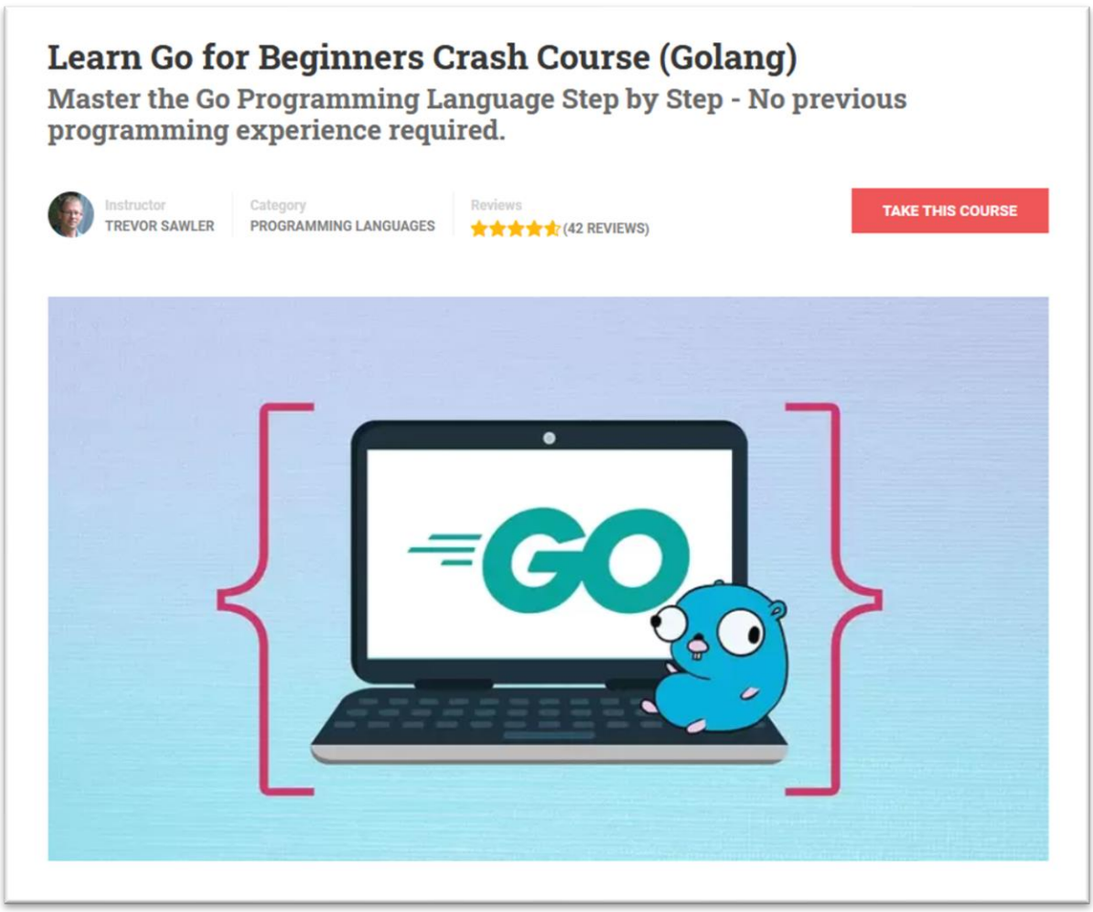


Get the [HTML and CSS Masterclass here.]

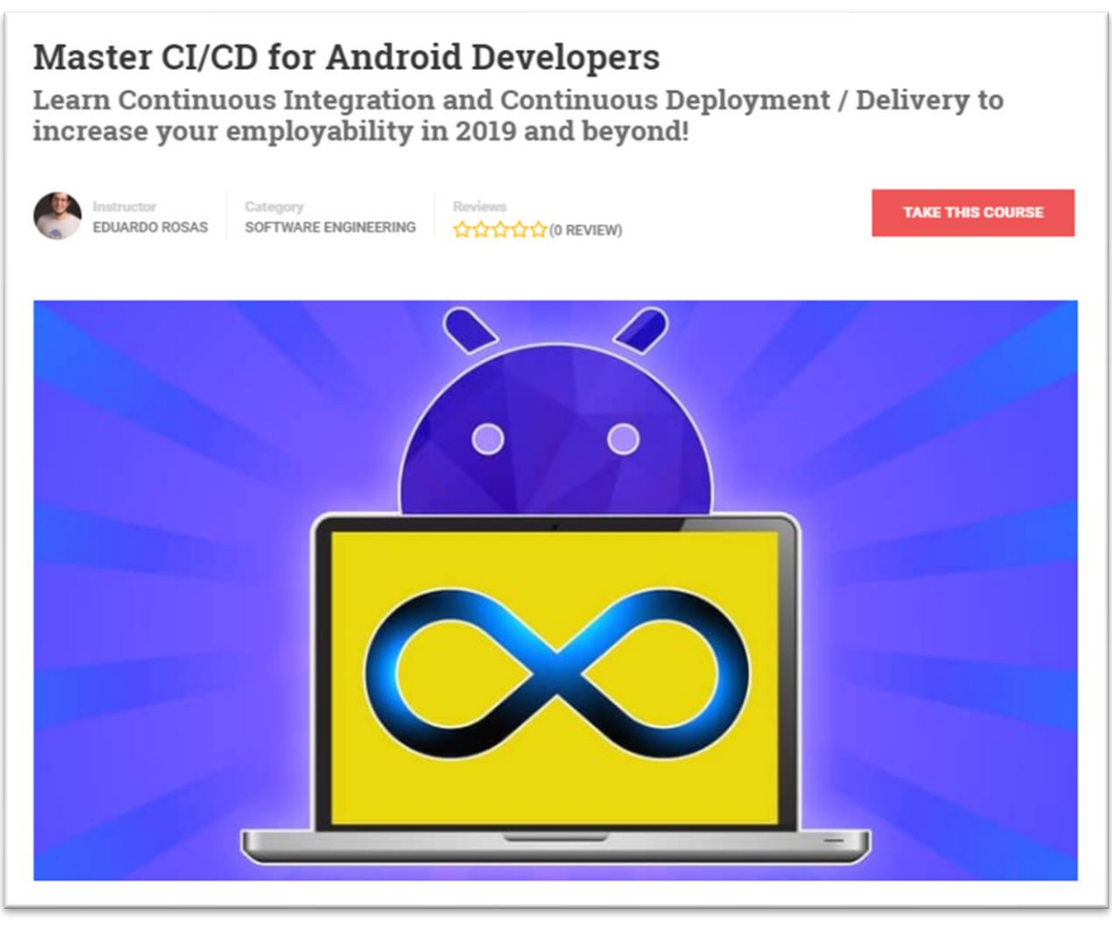
Get the [Android Firebase Masterclass here.]

Get the [iOS Firebase Masterclass here.]

Get the [CI/CD for Xamarin here]

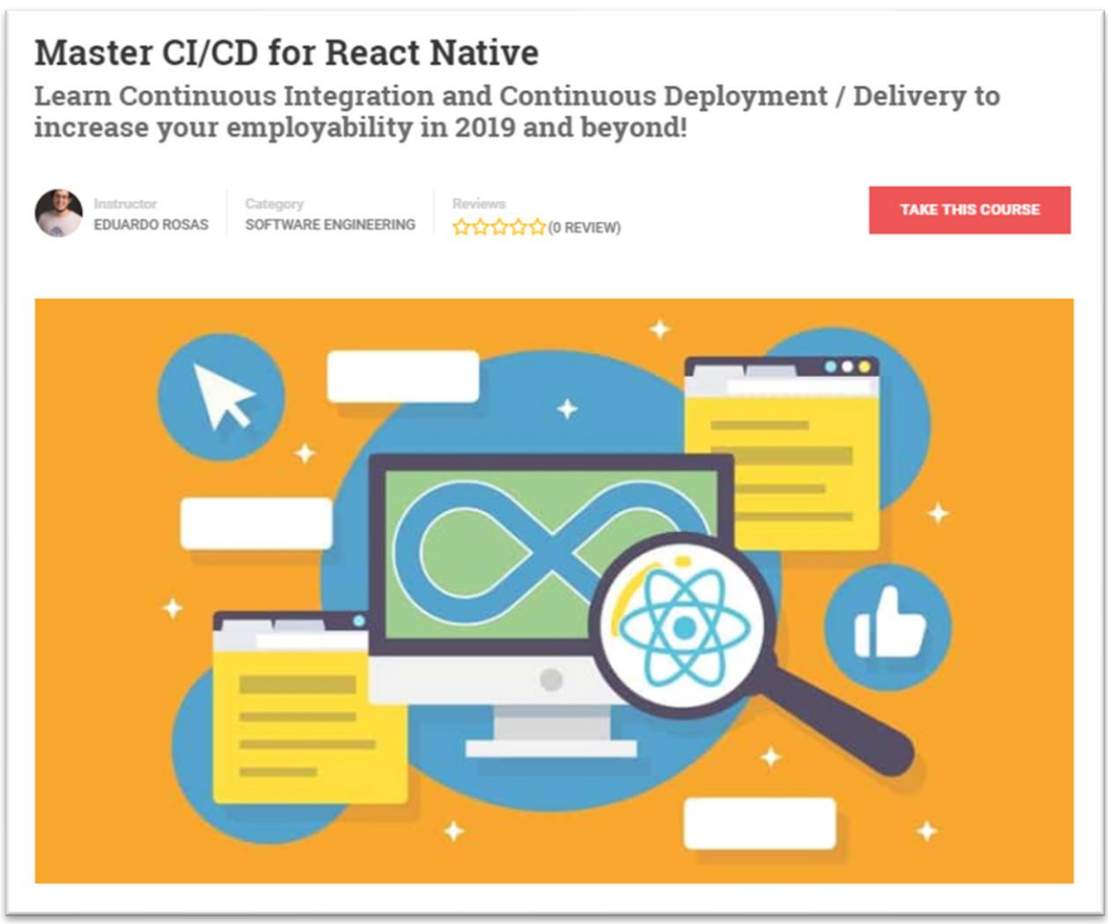


Get the [Go Crash Course here]



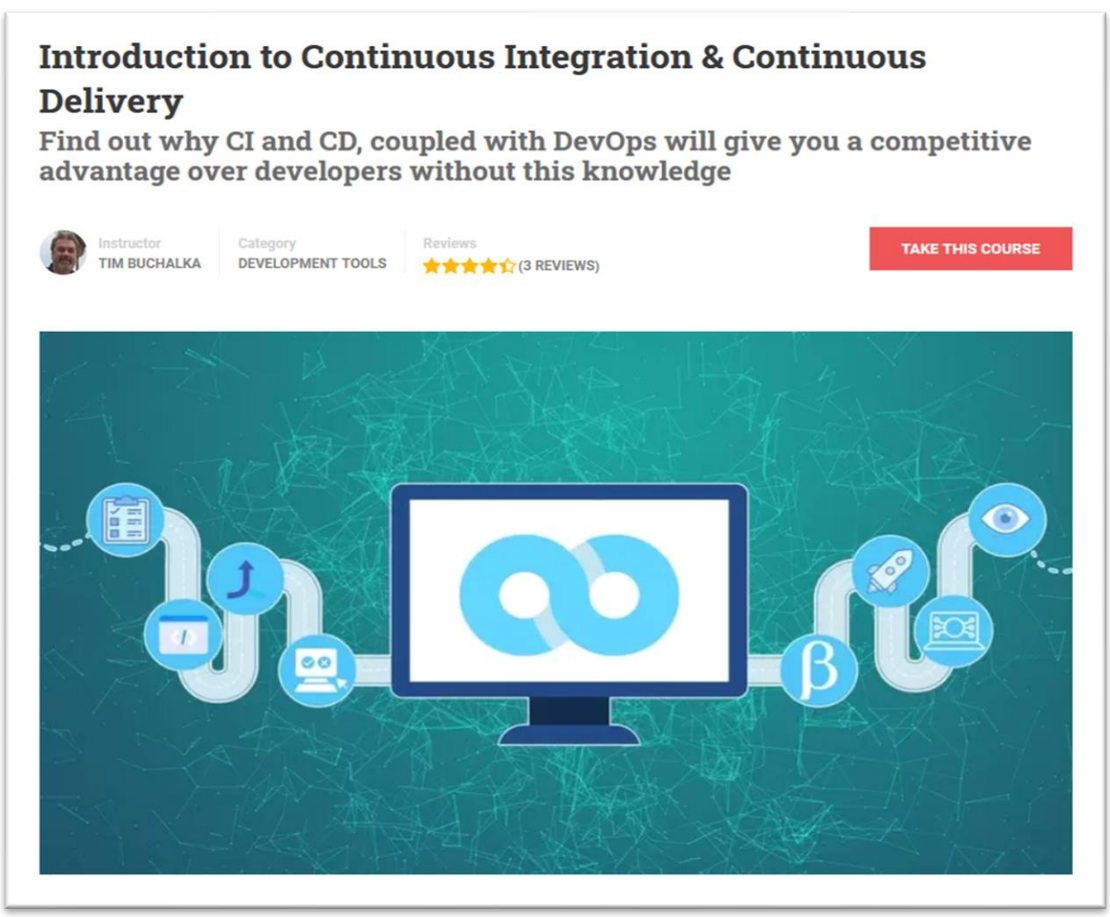
Get the [CI/CD for Android here]

Get the [CI/CD for iOS Developers here]



Get the [CI/CD for React Native here]

Get the [1Z0-819 OCP Course – Part 2 here.]



Get the [Introduction to CI/CD here.]

CHAPTER 5 – LEARN TO CODE COURSE

I've been busy working on a Learn to Code course. The course is the only course of mine that is not available on Udemy but is available to **you for free.**

You might be wondering why am I releasing another Learn to Code Course, why is it not on Udemy, and what's different about the course compared to a course like my Java Masterclass?

Good questions, all of them.

Firstly, I am a believer in students learn to program having an understanding of how a computer works under the hood.

For example, did you know that a programming language you use like Java to create programs makes no sense to a computer?

The computer has no understanding of Java as such. It can only understand a single language. That language is called machine code. Machine code uses binary – 0's and 1's and makes sense to computers.

Any modern programming language you use has to be "converted" into machine code before a computer can run it.

I think that you learning how a computer runs programs you write, and what binary is, how to use it, and so on really will give you an edge in your programming career.

That’s why I created this Learn to Code course - it's designed to teach you things like this that very few other courses go into, but that I feel will help you.

That’s not all I cover, and by the end of the course, you will have worked with C++, Java, Kotlin, and Python and will truly understand how this stuff works, but also other programming concepts.

Think of this as a supplement course to any of your other training courses, including all of the Learn Programming Academy courses.

A publisher contacted me about the course wanting to publish it as a paid course.

But I refused. Instead, I’m making it 100% free for you to access right now.

It’s on YouTube, click on the link below to watch the first video. Be sure to subscribe to be notified each time I release the next video in the series.

You will find this course to be fun and informative, so be sure to check it out.

I’m releasing a video each week for this course.

Click here to watch the first Learn to Code video on YouTube now (there are already several videos available for immediate viewing).

CHAPTER 6 – PROGRAMMING TIP OF THE DAY VIDEOS

At last count, there are 106 videos available for you to freely access. They cover a range of important topics such as

- How long does it take to become a programmer?
- Do you need a degree to get a programming job?
- What is the number one skill you need to possess to be an effective programmer?
- Are you too old to become a programmer?
- Do you need to be good at math to become a programmer?
- But other questions like which is better to learn Kotlin or Java, What is JEE, and other related videos.

I am sure these videos will be very useful for you.

Each video is available for you to watch - the video image in the PDF contains the question that I answer in each video - click the image to play each video or the link below each video.

Click an image to watch that video right now:

Watch Programming Tips video here

Watch Timeframes video here

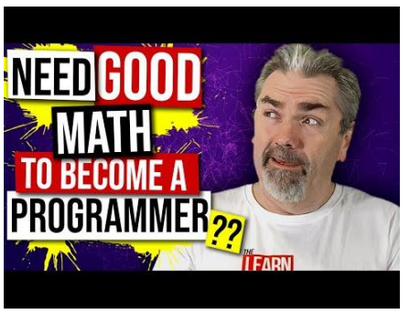
Click an image to watch that video right now:

Watch Careers video here

Watch Degree video here

Watch Skills video here

Watch Am I Too Old video here



Watch Math video here

Watch Interview Tips video here

Watch Languages video here

Watch Transitioning video here

Watch Search Engines video here

Watch First Job video here

Click an image or the link below it to watch that video right now:

Watch Technology video here

Watch Career video here

Watch Overwhelmed video here

Watch Practice Skills video here

Watch Java or Kotlin video here

Watch Training video here

Watch Shortcuts video here

Watch Courses video here

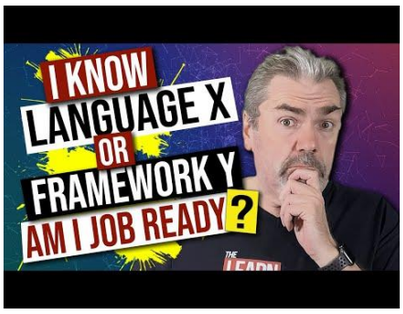
Watch AI video here

Watch Code Fear video here

Click an image to watch that video right now:

Watch Better Programmer video here

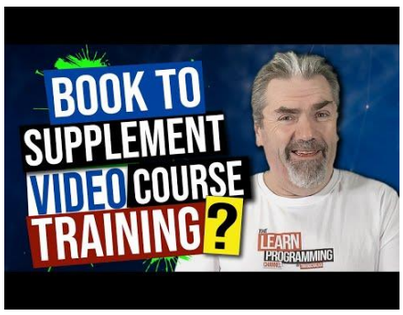
Watch Course Completed video here



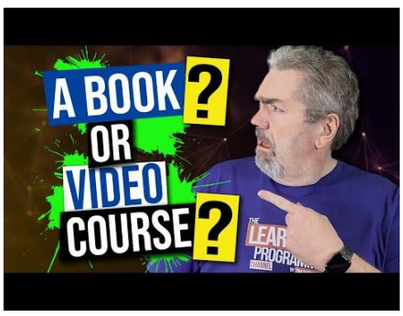
Watch Job Ready video here

Watch Move video here

Watch Engineer vs Dev video here

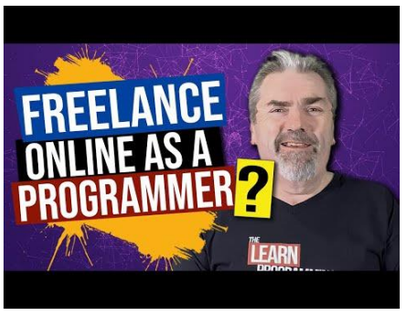


Watch Book Supplement video here



Watch Book or Video video here

Watch CSharp Vs. Java video here



Watch Freelance video here

Watch Apply for Job video here

Click an image to watch that video right now:

Watch Framework video here

Watch Coding Tests video here

Watch Linux Skills video here

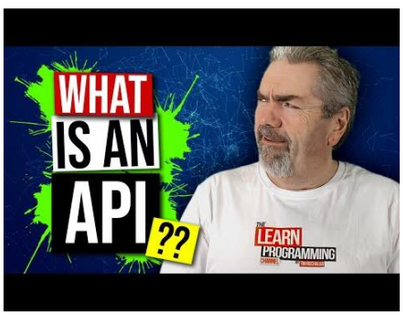
Watch Certifications video here

Watch Design Patterns video here

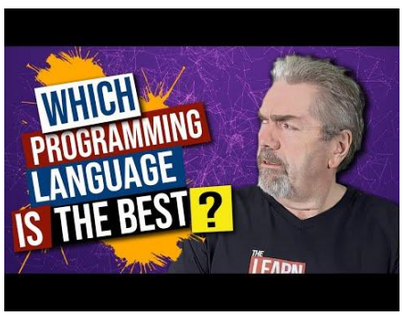
Watch Solving Problems video here

Watch Right Career video here

Watch Online Course video here



Watch API video here



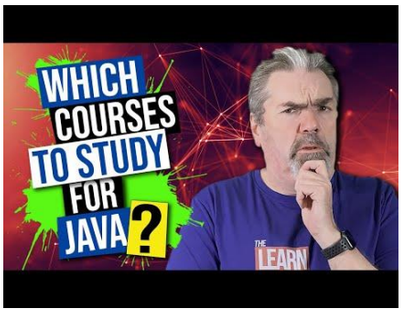
Watch Best Language video here

Click an image to watch that video right now:

Watch All Languages video here

Watch Distractions video here

Watch IDE video here



Watch Courses video here

Watch Jobs In Demand video here

Watch Requirements video here

Watch Resume video here

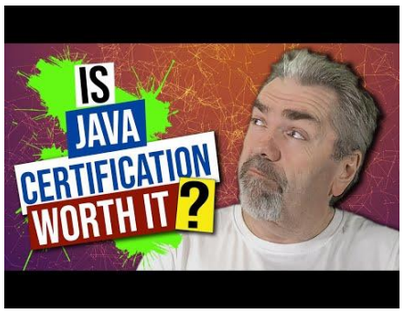
Watch Two Areas video here

Watch Earn Money video here

Watch Best Way video here

Click an image to watch that video right now:

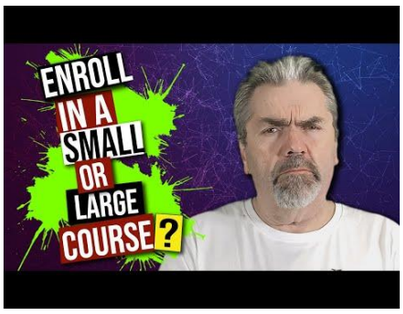
Watch Goal Setting video here



Watch Certification video here

Watch Challenges video here

Watch Smarts video here



Watch Enroll video here

Watch Responsibility video here

Watch Questions video here

Watch Hardware video here

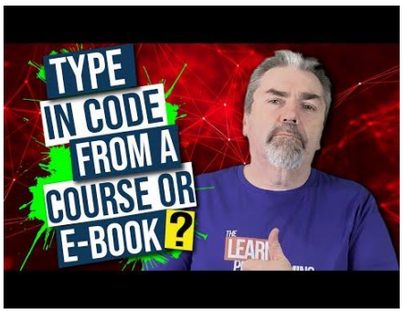
Watch Instructors video here

Watch How Long It Takes video here

Click an image to watch that video right now:

Watch Self-Reliance video here

Watch Software video here



Watch Type Code video here

Watch Opinions video here

Watch Python video here

Watch Kotlin First video here

Watch Java vs JEE video here

Watch Big Apps video here

Watch Languages video here

Watch Ways to Improve video here

Click an image to watch that video right now:

Watch Descriptions video here

Watch Flutter video here

Watch 3 Things video here

Watch JDK, JVM, JRE video here

Watch Tips video here

Watch People Skills video here

Watch Designer vs. Dev video here

Watch Learn Coding video here

Watch Stages video here

Watch Learn Programming video here

Click an image to watch that video right now:

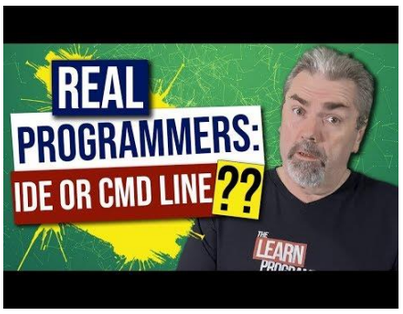
[Watch Front-End video here]

[Watch Back-End video here]

[Watch Full-Stack video here]

[Watch Algorithms video here]

[Watch Pay or Free video here]



[Watch IDE or CMD video here]

[Watch Hardware video here]

[Watch Impostor Syndrome video here]

[Watch Job Specs video here]

[Watch Focus and Plan video here]

Click an image to watch that video right now:

Watch Problems video here

Watch 2 Languages video here

Watch Interview Tips video here

Watch Junior Dev video here

Watch Best Practices video here

Watch Comm Skills video here

Watch Roles video here

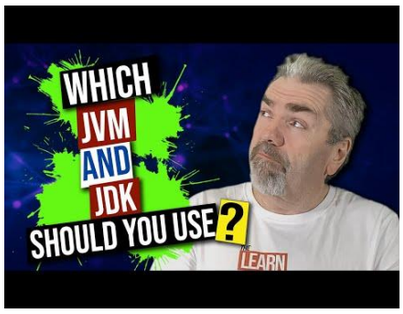
Watch Competitive video here

Watch Persistence video here

Watch Key to Success video here

Click an image to watch that video right now:

Watch JDK Version video here



Watch JVM-JDK video here

Watch Why Fail video here

Watch Questions video here