SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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DEPARTMENT OF INFORMATION TECHNOLOGY

19ITT101-PROGRAMMING IN C AND DATA STRUCTURES

I YEAR - II SEM

UNIT 4 – STACK AND QUEUE

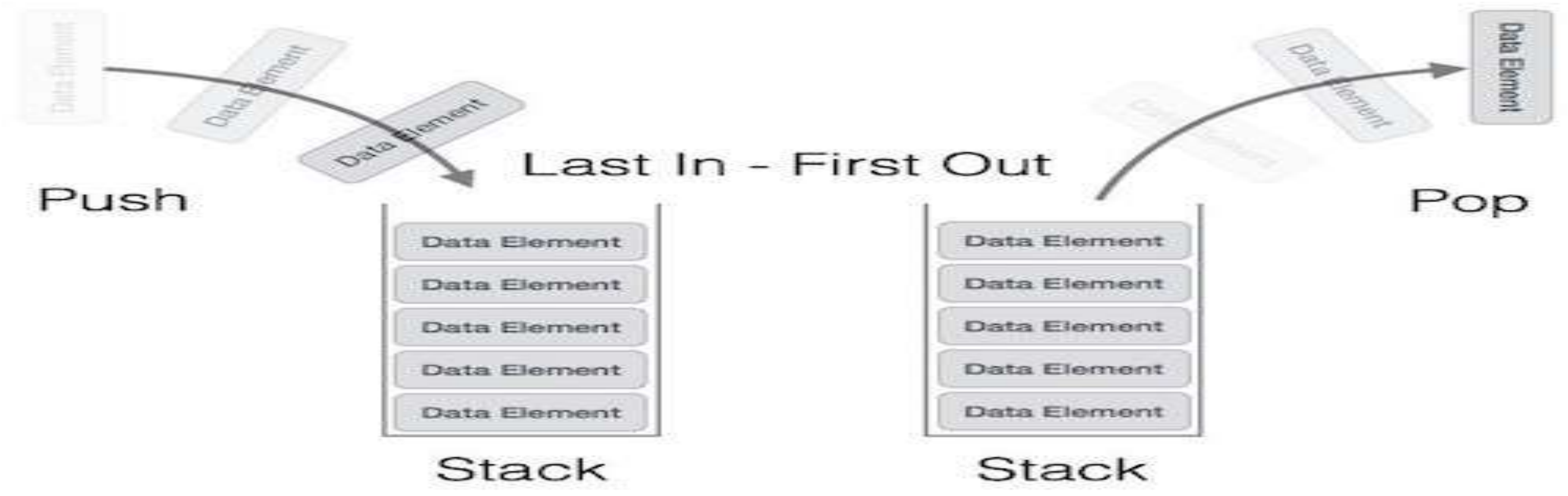
TOPIC 1 – Stack ADT

INTRODUCTION

- A stack is an Abstract Data Type (ADT), commonly used in most programming languages. It is named stack as it behaves like a real-world stack, for example – a deck of cards or a pile of plates, etc.
- A real-world stack allows operations at one end only. For example, we can place or remove a card or plate from the top of the stack only.
- Stack ADT allows all data operations at one end only. At any given time, we can only access the top element of a stack.

Stack Data Structure

- This feature makes it LIFO data structure. LIFO stands for Last-in-first-out.
- Here, the element which is placed (inserted or added) last, is accessed first.
- In stack terminology, insertion operation is Called PUSH operation and removal operation is called POP operation.

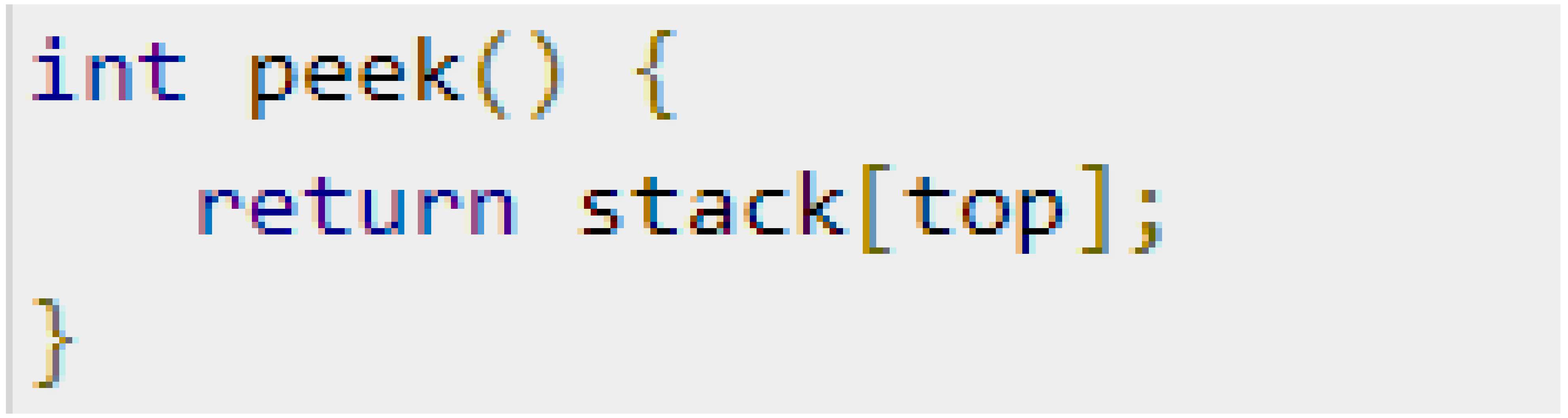


Operation of Stack

- **push()** – Pushing (storing) an element on the stack.
- **pop()** – Removing (accessing) an element from the stack.
- **peek()** – get the top data element of the stack, without removing it.
- **isFull()** – check if stack is full.
- **isEmpty()** – check if stack is empty.

peek()

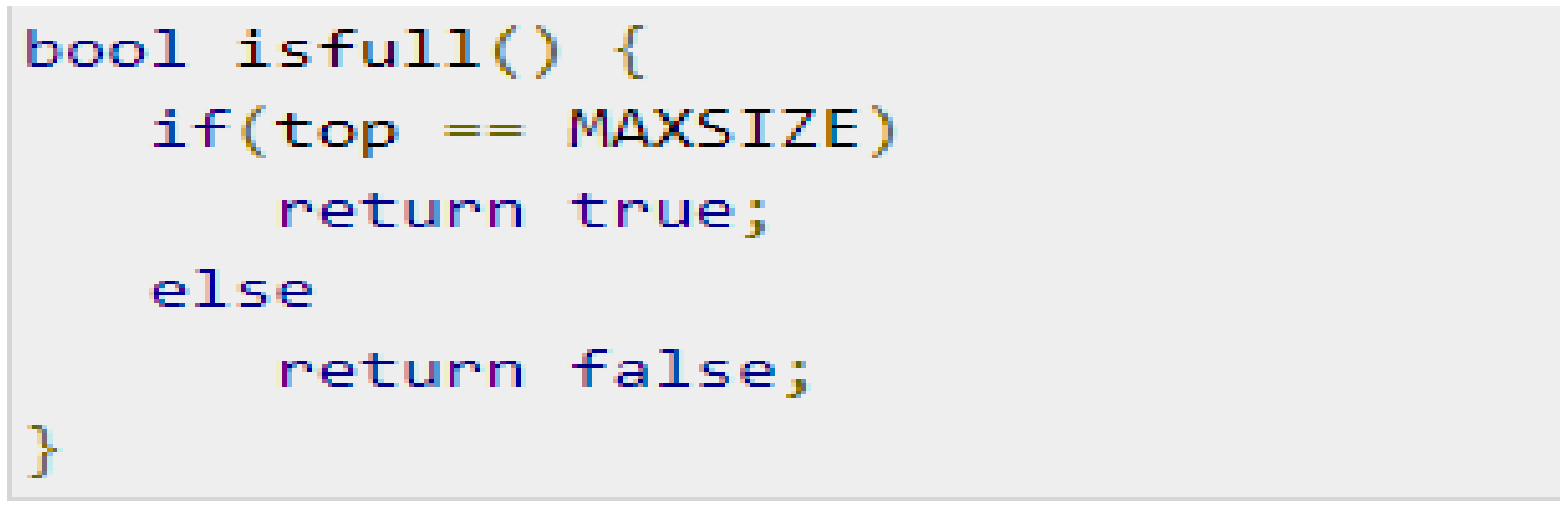
➢ **peek()** − get the top data element of the stack, without removing it.



```
int peek() {
   return stack[top];
}
```

isfull()

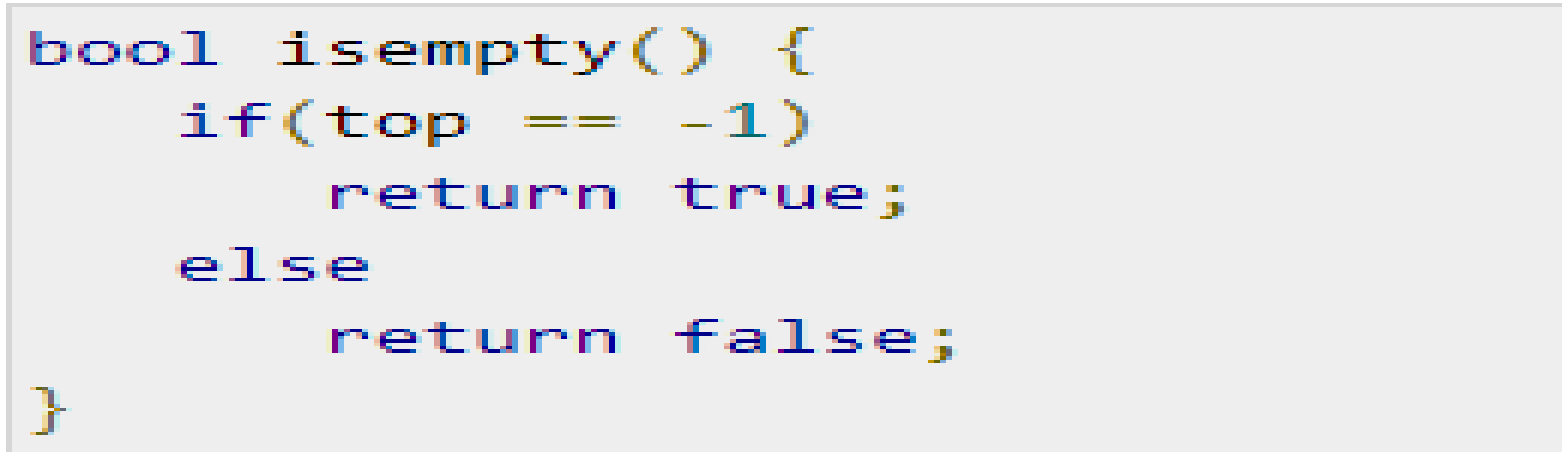
➢ **isFull()** − check if stack is full.



```
bool isfull() {
   if(top == MAXSIZE)
      return true;
   else
      return false;
}
```

isEmpty()

- **isEmpty()** − check if stack is empty.

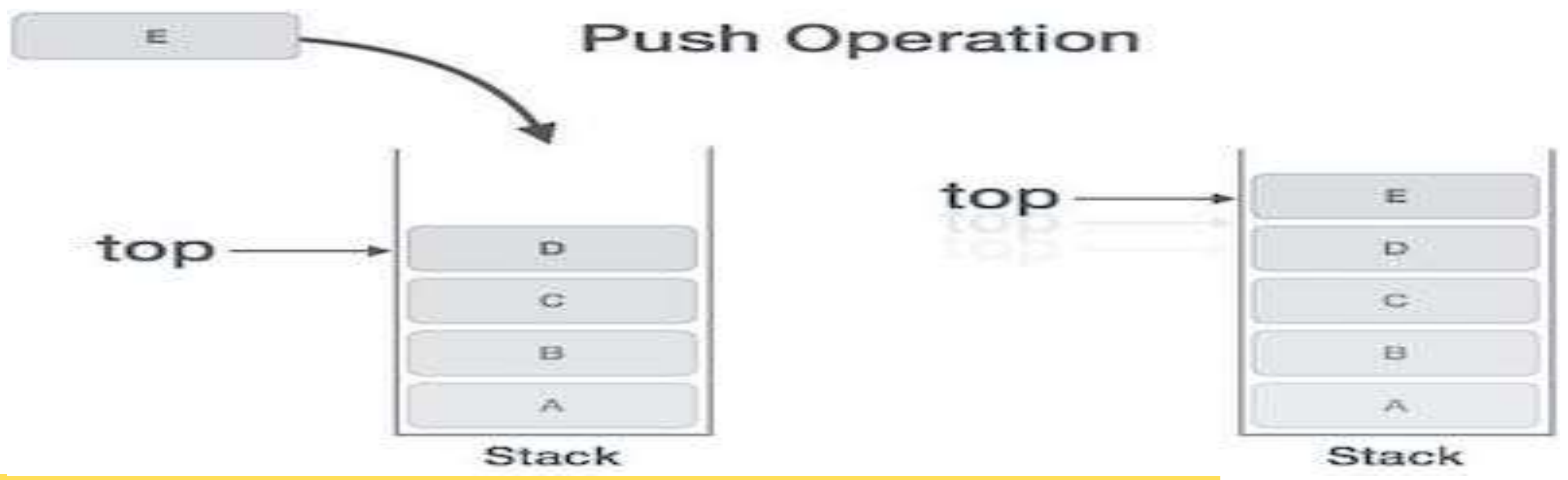


```
bool isempty() {
    if(top == -1)
        return true;
    else
        return false;
}
```

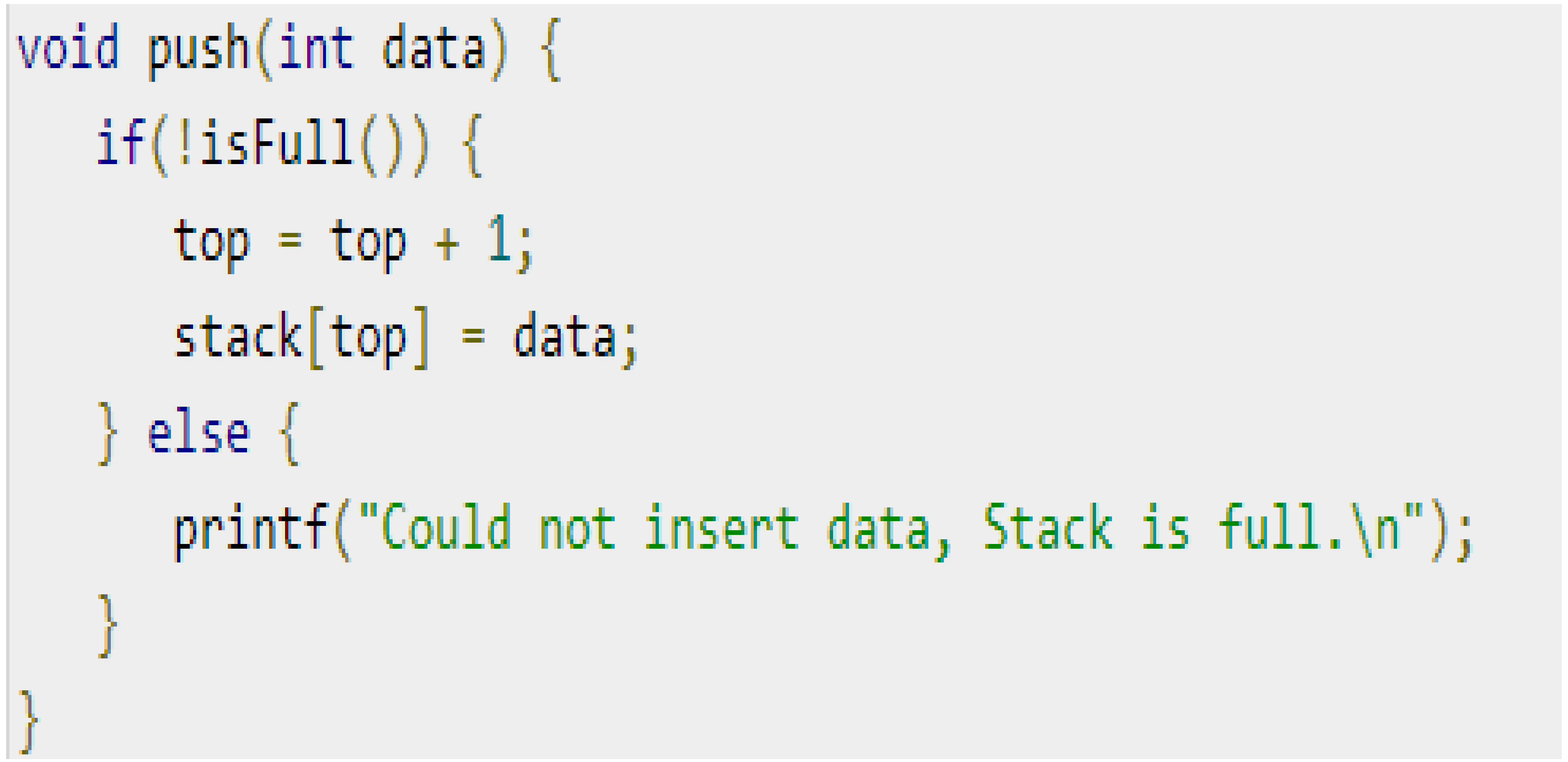
Push()

- **push()** − Pushing (storing) an element on the stack.

  - **Step 1** − Checks if the stack is full.
  - **Step 2** − If the stack is full, produces an error and exit.
  - **Step 3** − If the stack is not full, increments top to point next empty space.
  - **Step 4** − Adds data element to the stack location, where top is pointing.
  - **Step 5** − Returns success.



Push()



```
void push(int data) {
   if(!isFull()) {
      top = top + 1;
      stack[top] = data;
   } else {
      printf("Could not insert data, Stack is full.\n");
   }
}
```

Pop()

➢ **pop()** – Removing (accessing) an element from the stack.

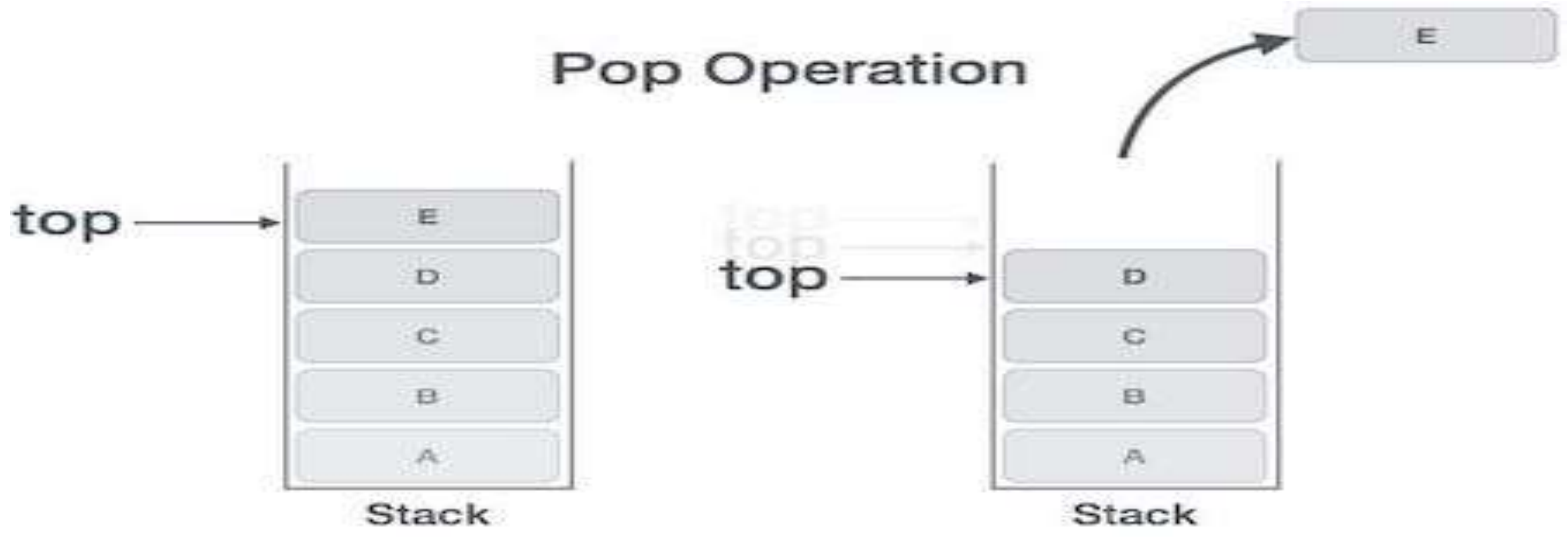
❖**Step 1** – Checks if the stack is empty.

❖**Step 2** – If the stack is empty, produces an error and exit.

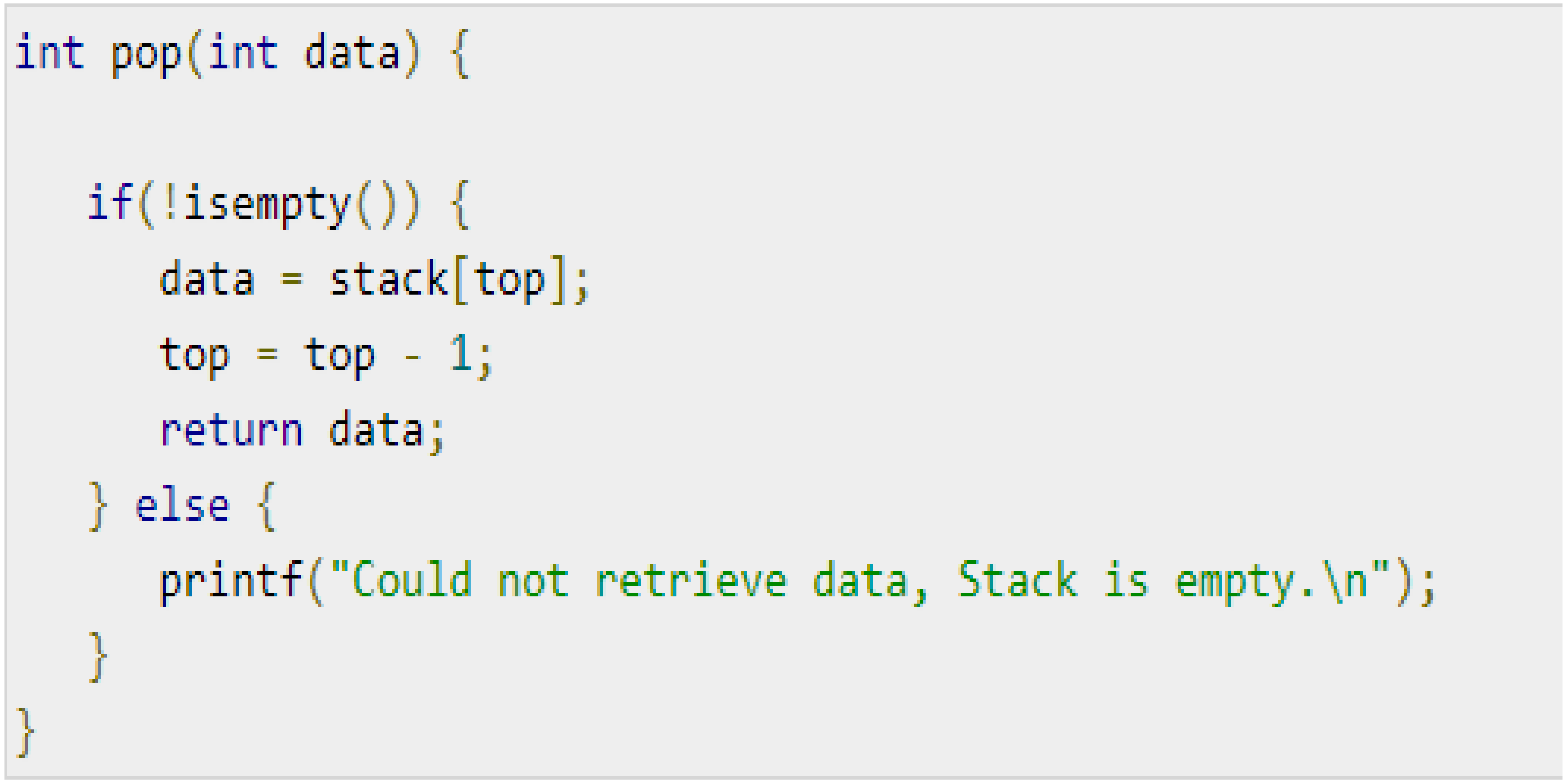
❖**Step 3** – If the stack is not empty, accesses the data element at which top is pointing.

❖**Step 4** – Decreases the value of top by 1.

❖**Step 5** – Returns success.



Pop()



```
int pop(int data) {

   if(!isempty()) {
      data = stack[top];
      top = top - 1;
      return data;
   } else {
      printf("Could not retrieve data, Stack is empty.\n");
   }
}
```

https://www.tutorialspoint.com/data_structures_algorithms/expression_parsing.htm