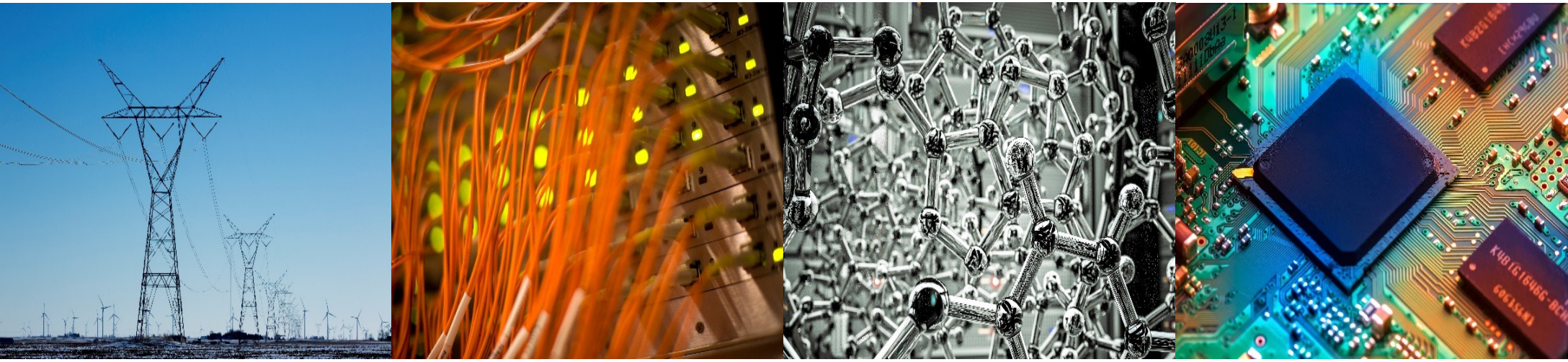
ECE 220 Computer Systems & Programming

Lecture 6 – Introduction to C: Control Structures

February 5, 2026



- **Quiz1 is next week @ CBTF**

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Lecture 5 Review

❖ **global vs. local (scope)**

```
int global_x = 5;
int main(){
   int local_x = 10;
   printf("global=%d, local=%d\n", global_x, local_x);
   {
      int local_x = 15;
      global_x = 20;
   }
   printf("global=%d, local=%d\n", global_x, local_x);
   return 0;
}
```

❖ **const vs. static (qualifier)**

```
const int x = 0;
static int y = 0;
```

❖ **pre vs. post decrement**

```
int x = 5, y = --x;
int x = 5, y = x--;
```

❖ **' = ' vs. ' == '**

```
int x = 1, y = 2;
int result = (x == y);
```

Control Structures

Conditional Constructs

- if
- if - else
- switch

Iteration Constructs (loops)

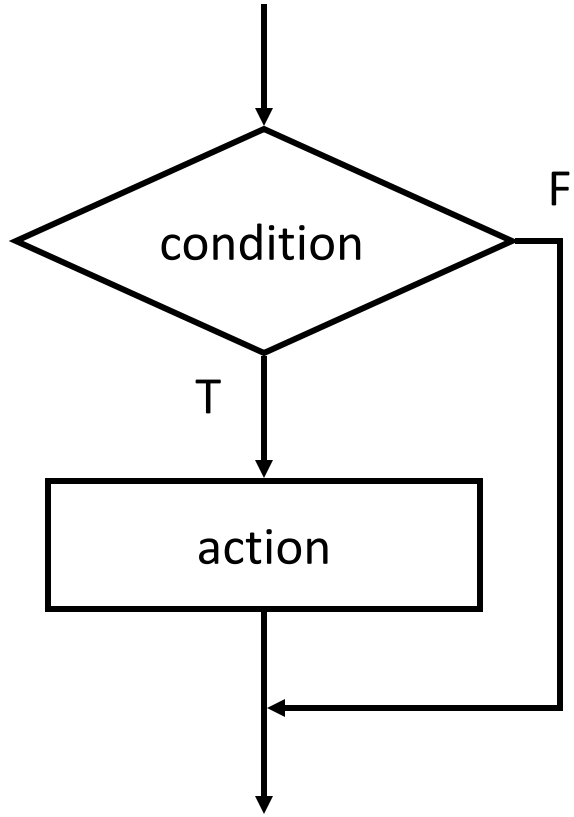
- while
- do - while
- for

The if Statement (similar to BR in LC-3)

```
int x, y;
/* assign some value to x, code omitted */

if (x < 0)
   x = -x; /* negate x only if x < 0 */


if ((x > 10) && (x < 20)){
   y = x % 4;
  /* What would be the value of y? */
   printf("y = %d\n", y);
}
```

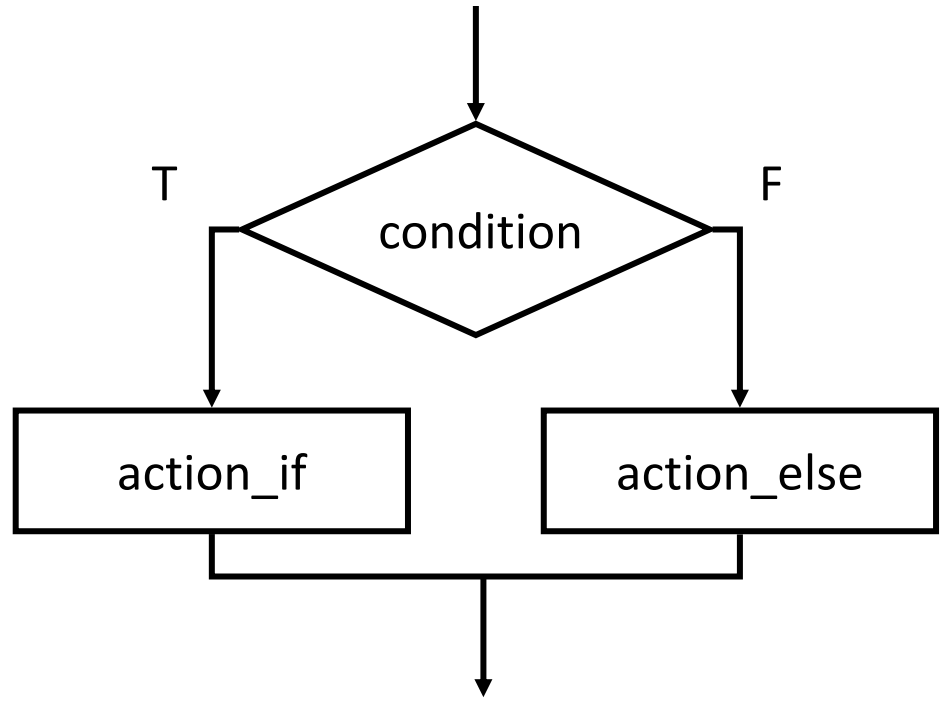


The if - else Statement

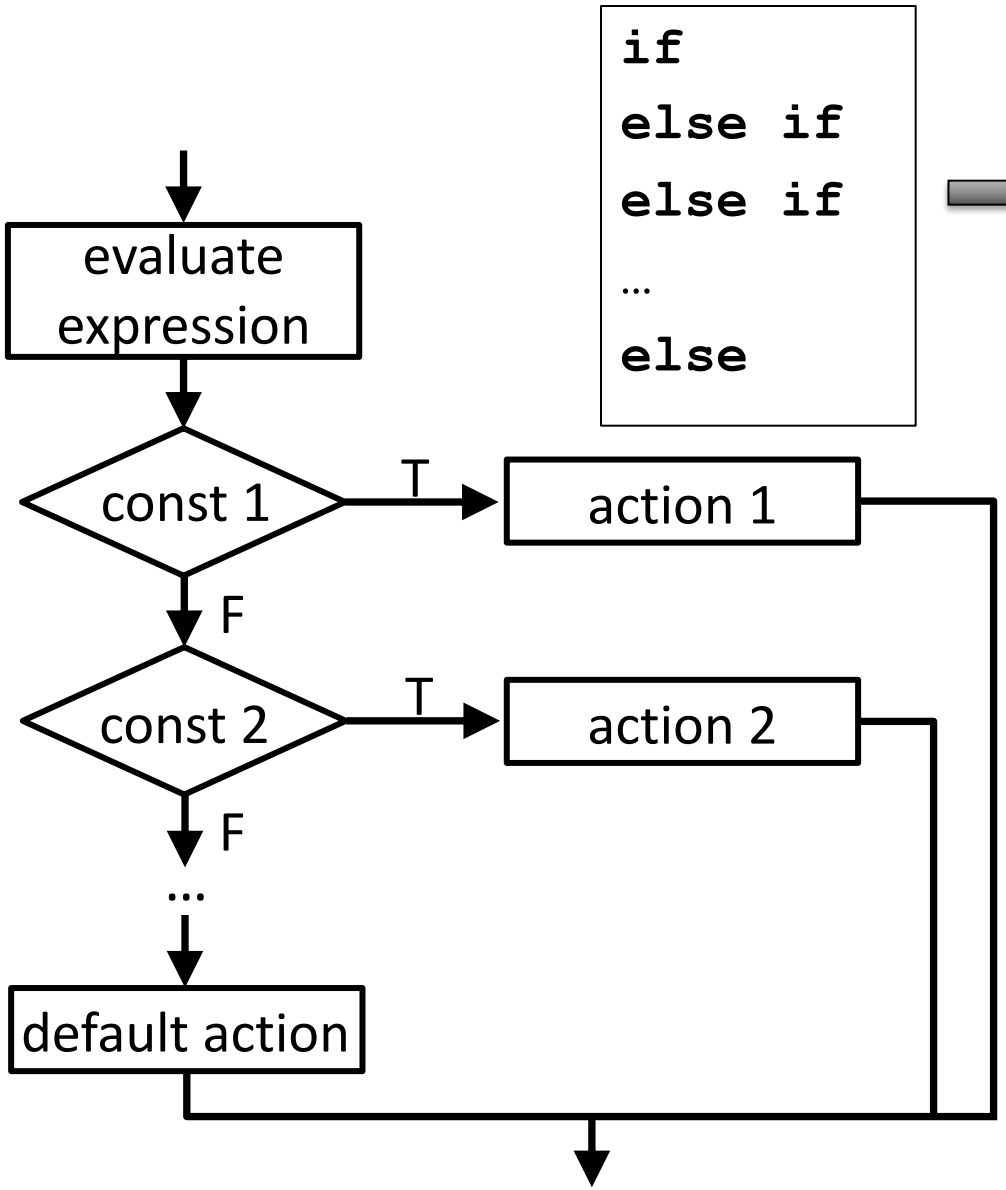
```
int x;
/* assign some value to x,
code omitted */

if (x < 0)
   x = -x;
else
   x = x*x;

if (x%2 == 0)
   printf("x=%d is even\n", x);
else
   printf("x=%d is odd\n", x);
```



The switch Statement



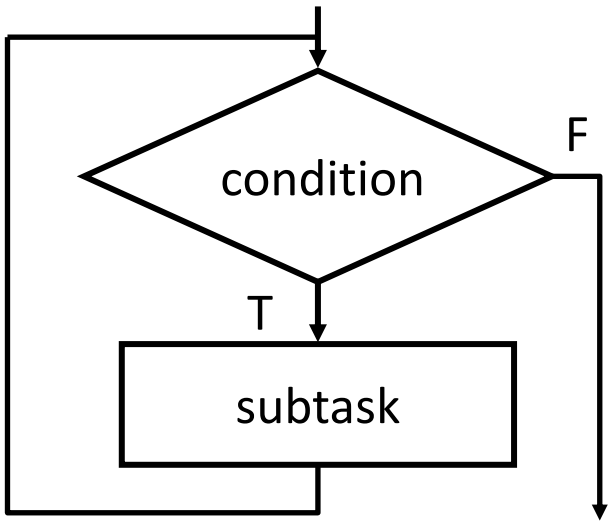

```
if
else if
else if
…
else
```

```
switch (expression){
    case const 1:
            action 1;
            break;
    case const 2:
            action 2;
            break;
    ...
    default:
            default action;
            break;
}

/*notice the use of break*/
```

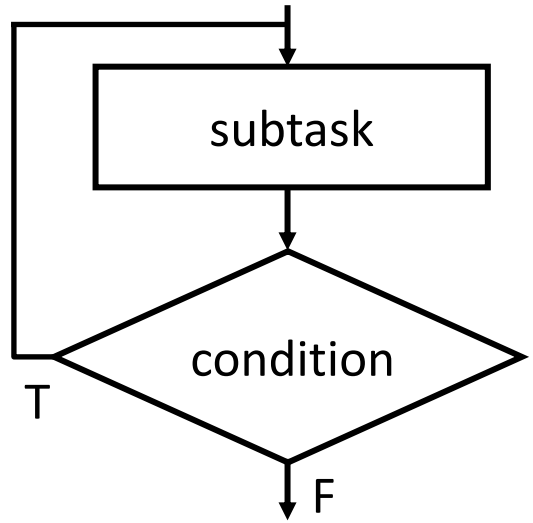
The while and do - while Statements

while: loop body may or may not be executed even once



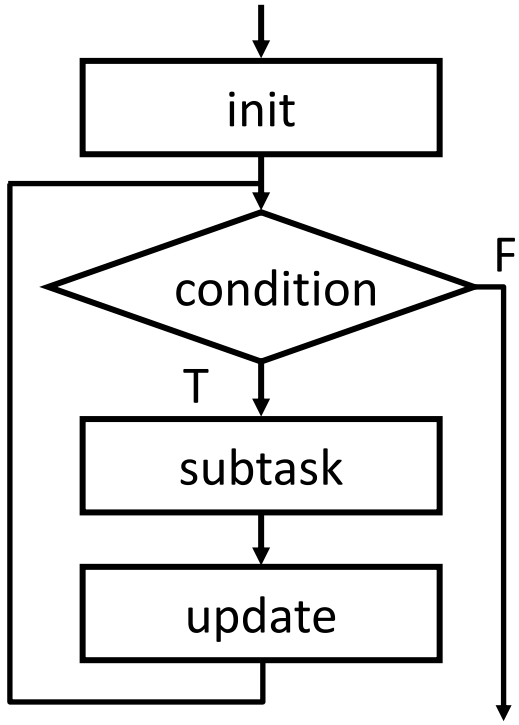

```
int x = 0;
while (x < 10) {
    printf("x=%d\n", x);
    x++;
}
```

do - while: loop body will be executed **at least once**




```
int x = 0;
do {
    printf("x=%d\n", x);
    x++;
} while (x < 10);
```

The for Statement




```
for (x = 0; x < 10; x++){
    if (x == 5)
        break;
    printf("x=%d\n", x);
}
```

```
int x = 0;
while (x < 10) {
    printf("x=%d\n", x);
    x++;
}
```

```
int x;
for (x = 0; x < 10; x++){
   printf("x=%d\n", x);
}
```

- What could cause a loop to become **infinite loop**?

- What is the output of the code above? What if **break** is replaced by **continue**?

Nested Loops

inner loop is nested within the outer loop (similar to print hex example in LC-3)

```
for (){
   for (){
      …
   } /* inner loop to shift 4 bits to calculate each digit */
   …
} /* outer loop to print the 4 digits */
```

Exercise

Write a C program to print an n x n identity matrix using nested loops.

```
#include <stdio.h>
#define N 5
int main(){




}
```

Follow-up Questions

- What are some ways to stop after printing the third '1' on the main diagonal, such as the example below?

  1 0 0 0 0

  0 1 0 0 0

  0 0 1

- How can we take user input for the size of the matrix?

- How can we add a check before printing the matrix to ensure user input is within the valid range of $0 < n < 10$? If user input is invalid, print the message "Number entered is invalid" and prompt the user to enter a number again.