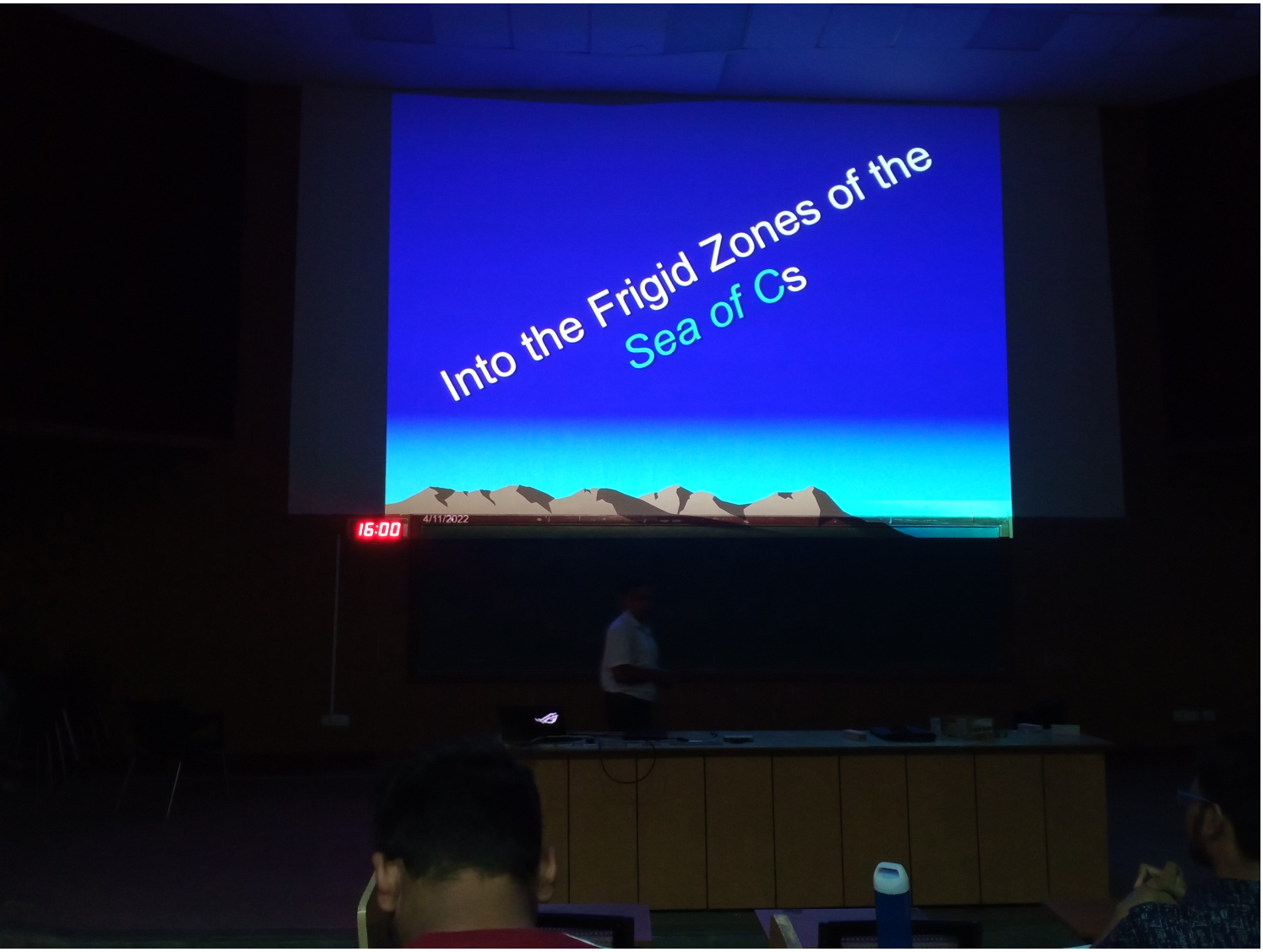
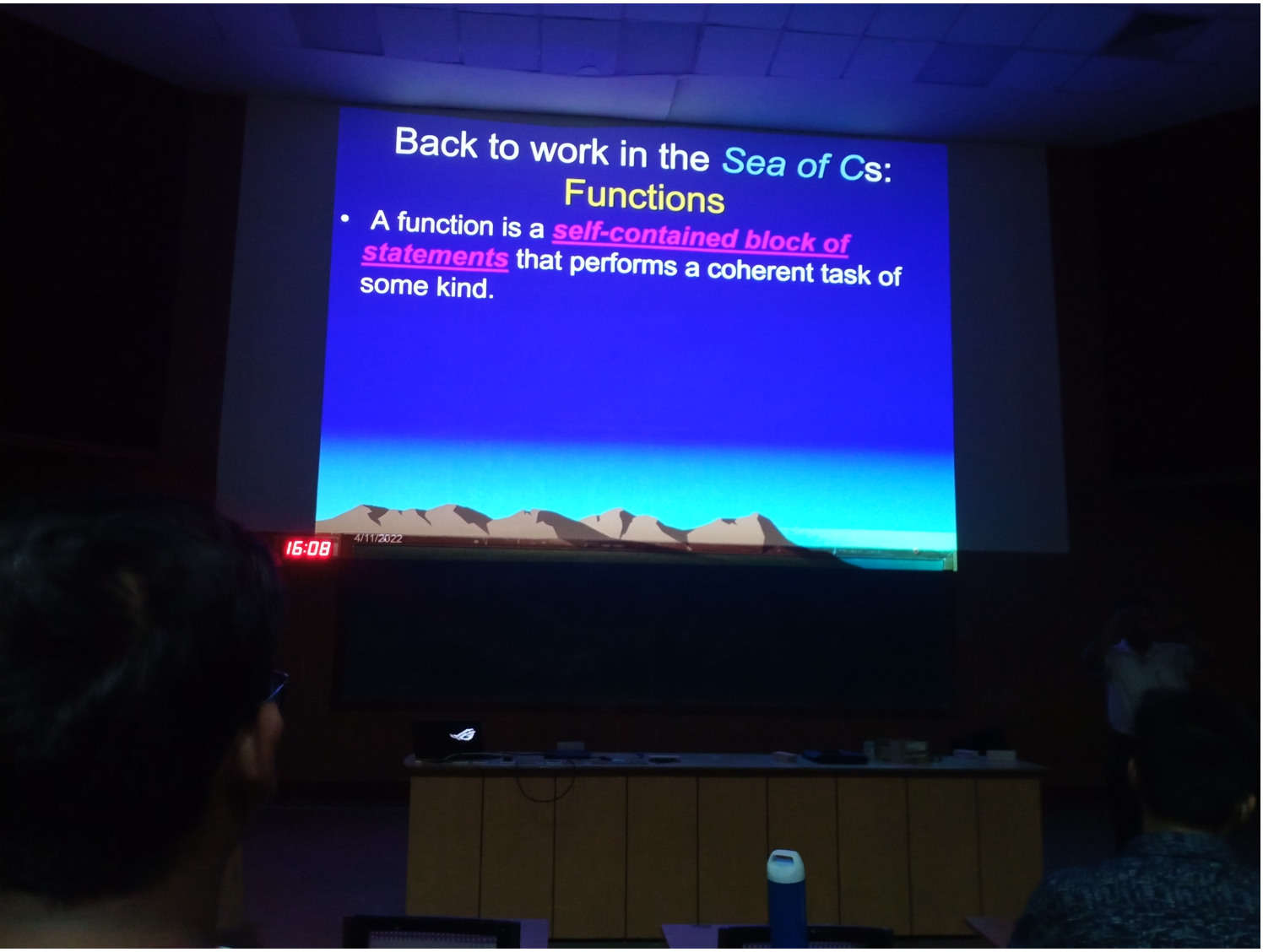
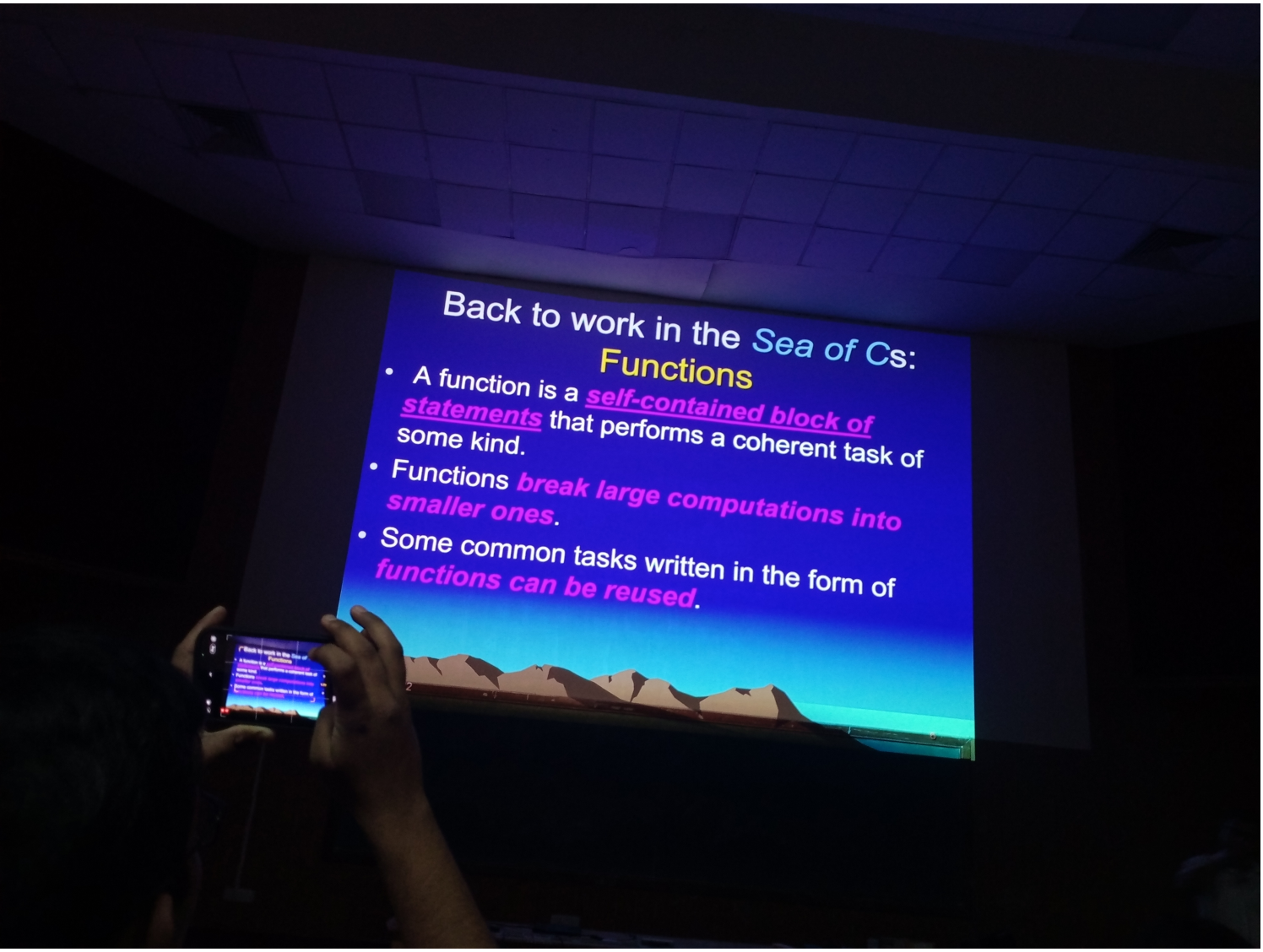
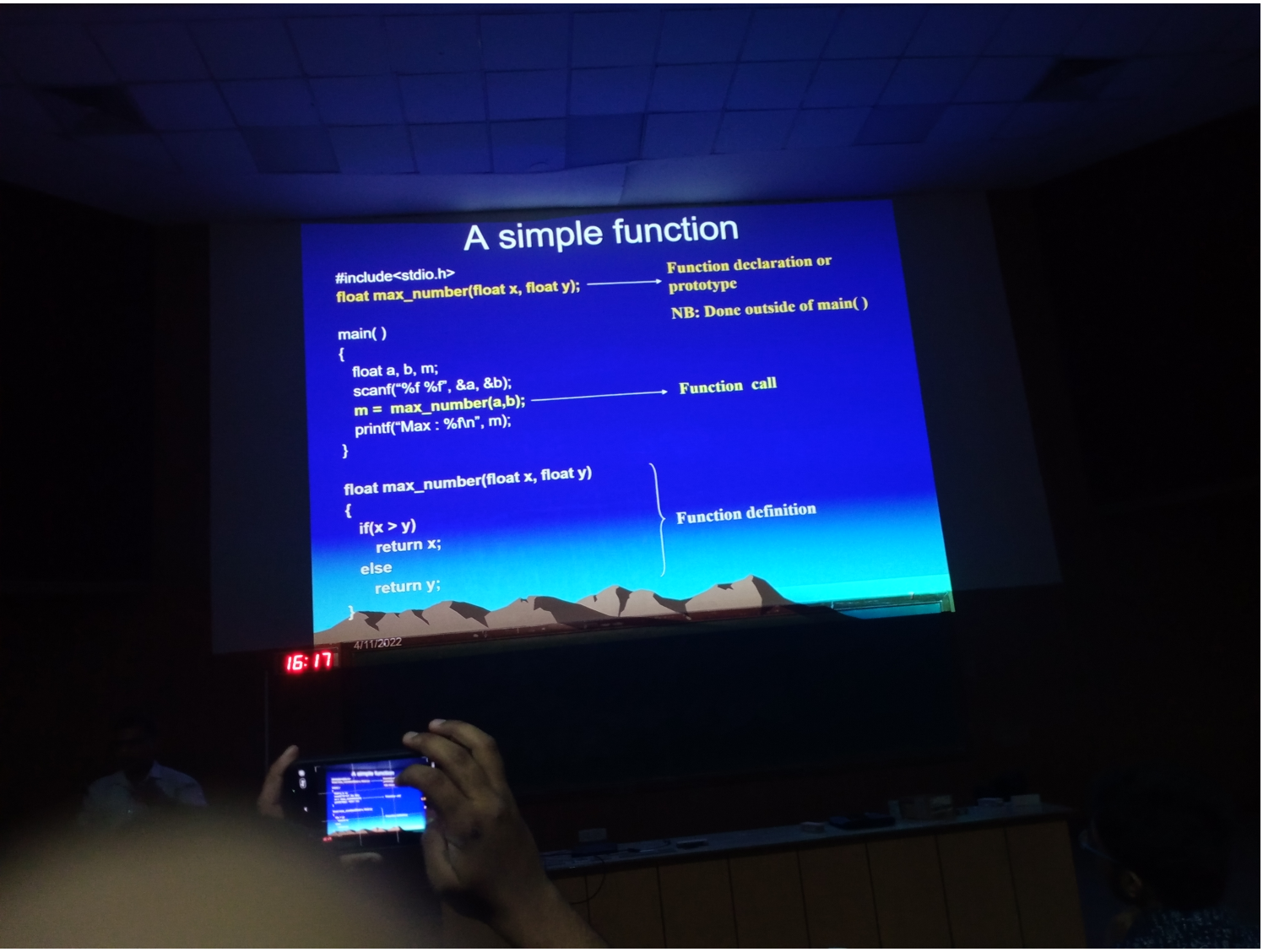
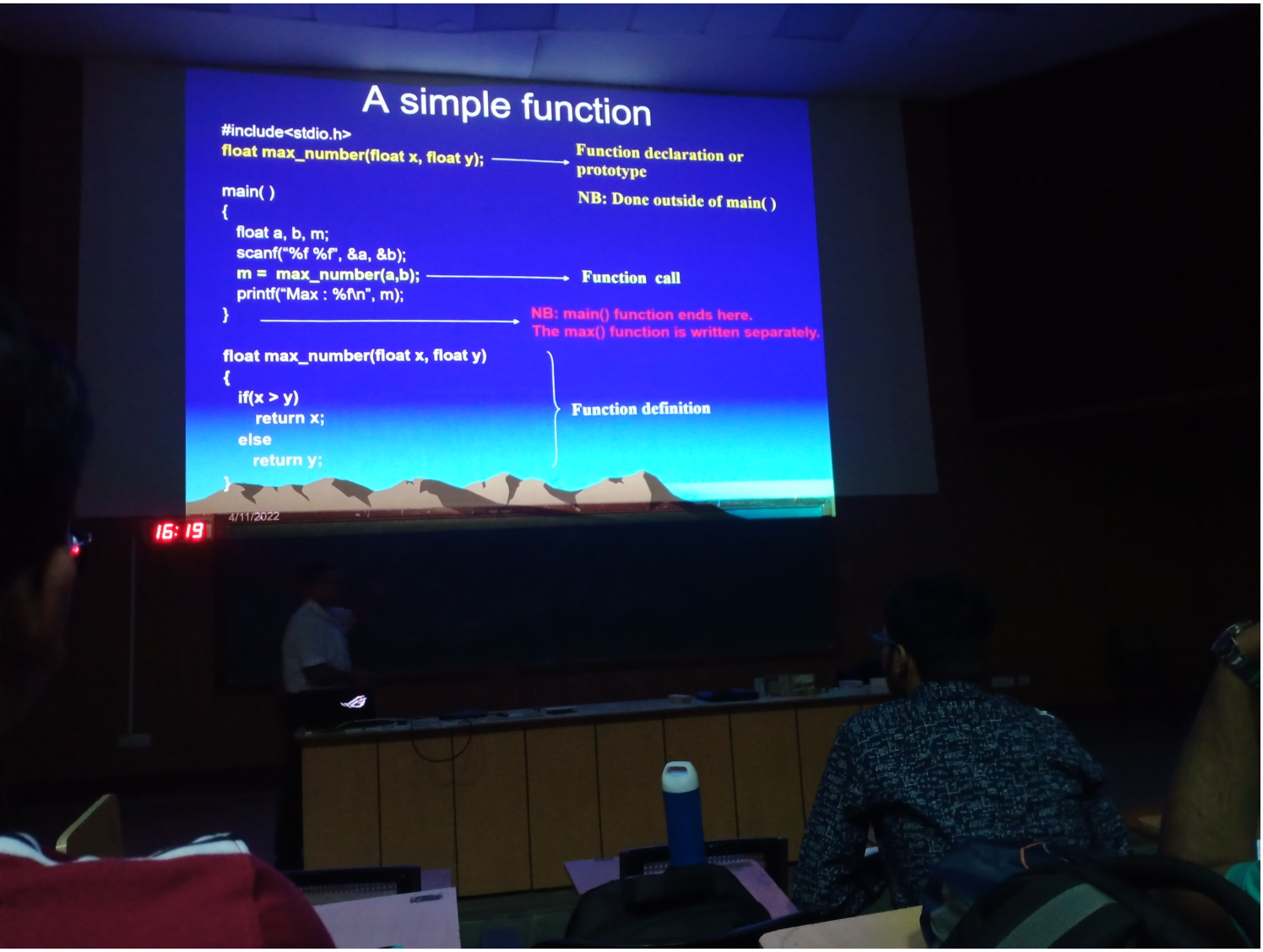
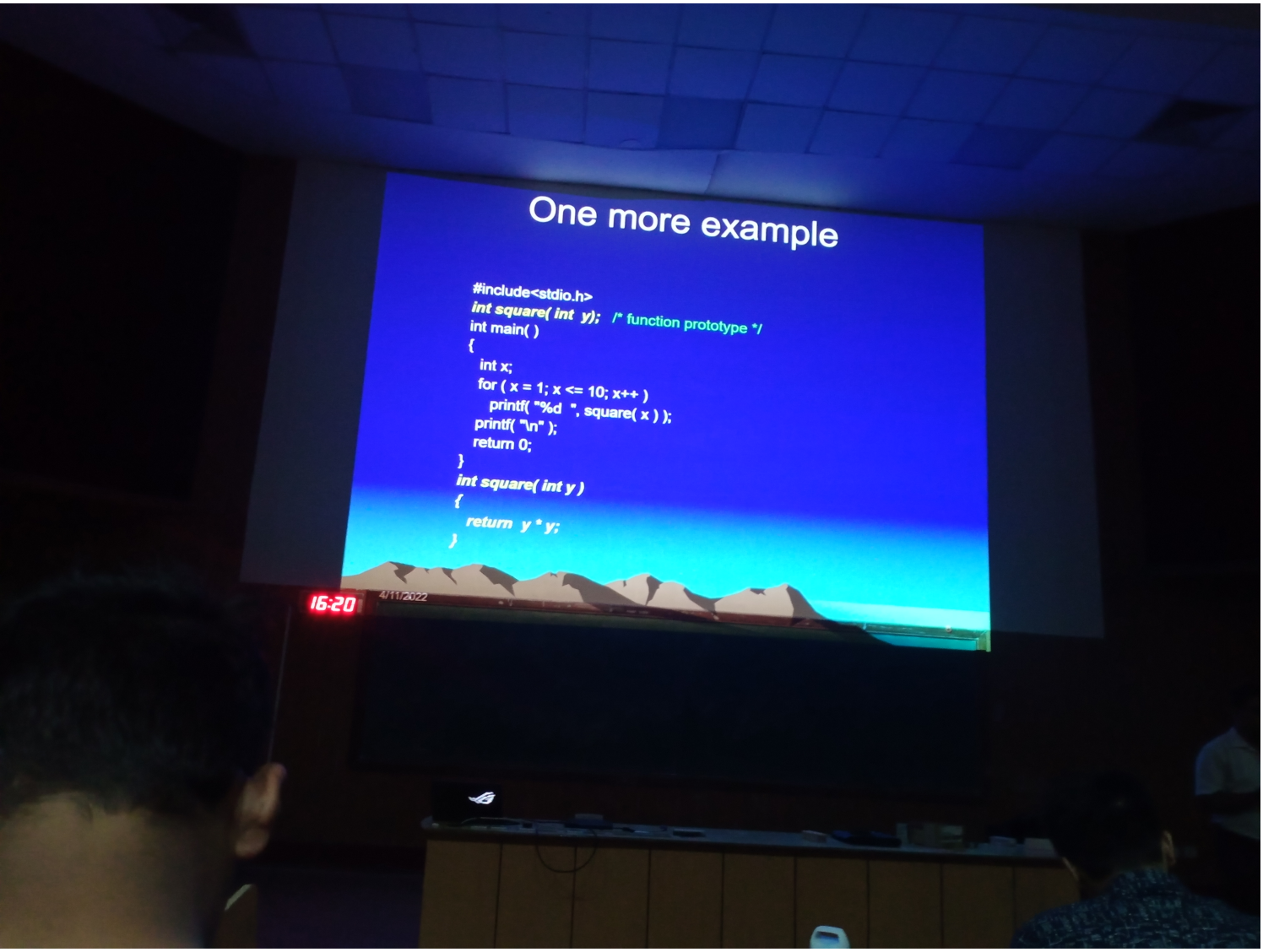

Into the Frigid Zones of the
Sea of Cs
16:00
4/11/2022

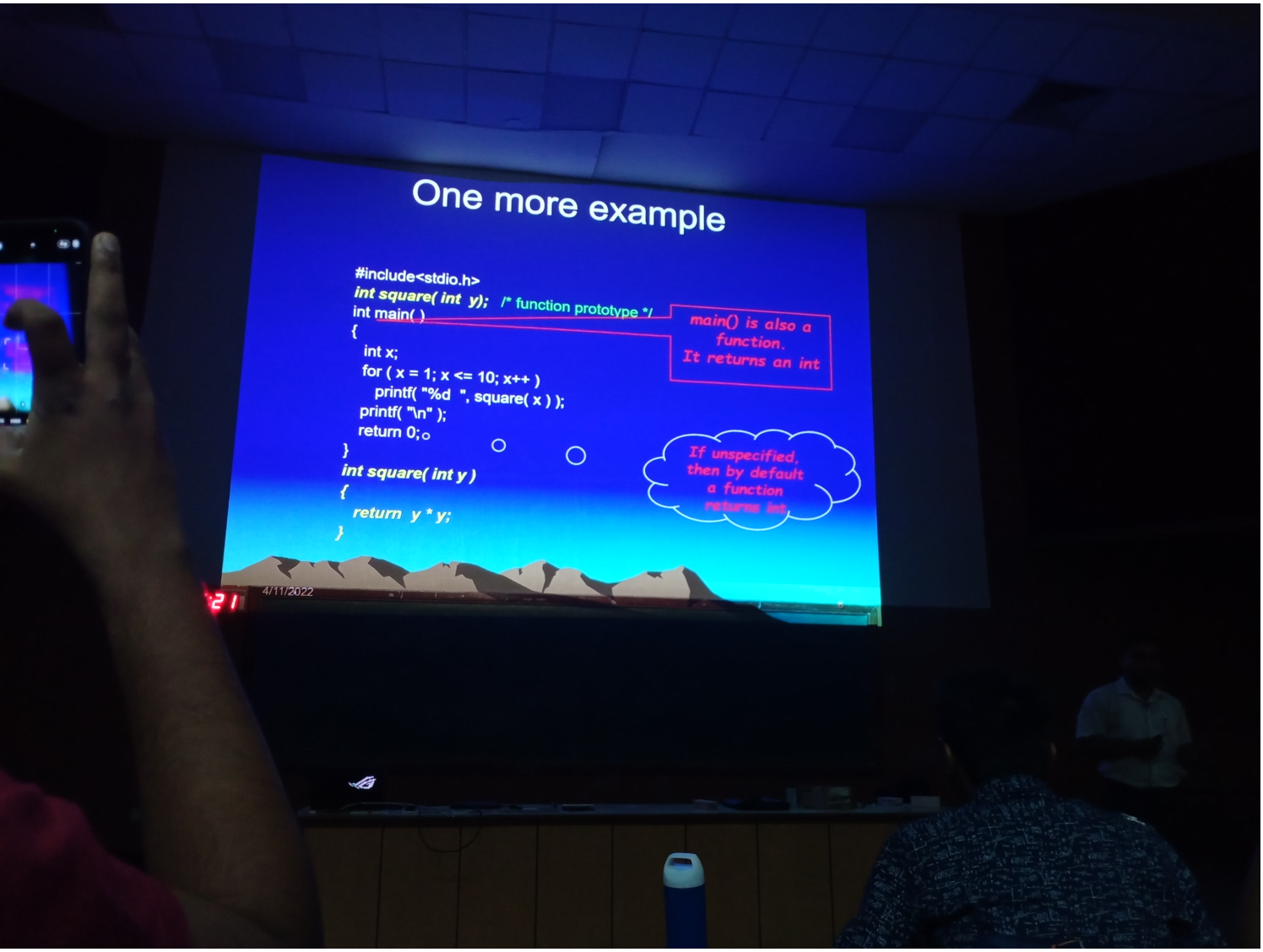

Back to work in the Sea of Cs:
Functions
A function is a self-contained block of statements that performs a coherent task of some kind.
16:08
4/11/2022


Back to work in the Sea of Cs:
Functions
A function is a self-contained block of statements that performs a coherent task of some kind.
Functions break large computations into smaller ones.
Some common tasks written in the form of functions can be reused.


A simple function
#include<stdio.h>
float max_number(float x, float y);
Function declaration or prototype
NB: Done outside of main( )
main( )
{
float a, b, m;
scanf("%f %f", &a, &b);
m = max_number(a,b);
Function call
printf("Max : %f\n", m);
}
float max_number(float x, float y)
{
if(x > y)
return x;
else
return y;
}
Function definition
4/11/2022
16:17


A simple function
#include<stdio.h>
float max_number(float x, float y);
Function declaration or prototype
NB: Done outside of main( )
main( )
{
float a, b, m;
scanf("%f %f", &a, &b);
m = max_number(a,b);
Function call
printf("Max : %f\n", m);
}
NB: main() function ends here.
The max() function is written separately.
float max_number(float x, float y)
{
if(x > y)
return x;
else
return y;
}
Function definition
4/11/2022
16: 19


One more example
#include<stdio.h>
int square(int y); /* function prototype */
int main( )
{
int x;
for (x = 1; x <= 10; x++)
printf("%d ", square(x));
printf("\n");
return 0;
}
int square(int y)
{
return y * y;
}
16:20
4/11/2022


One more example
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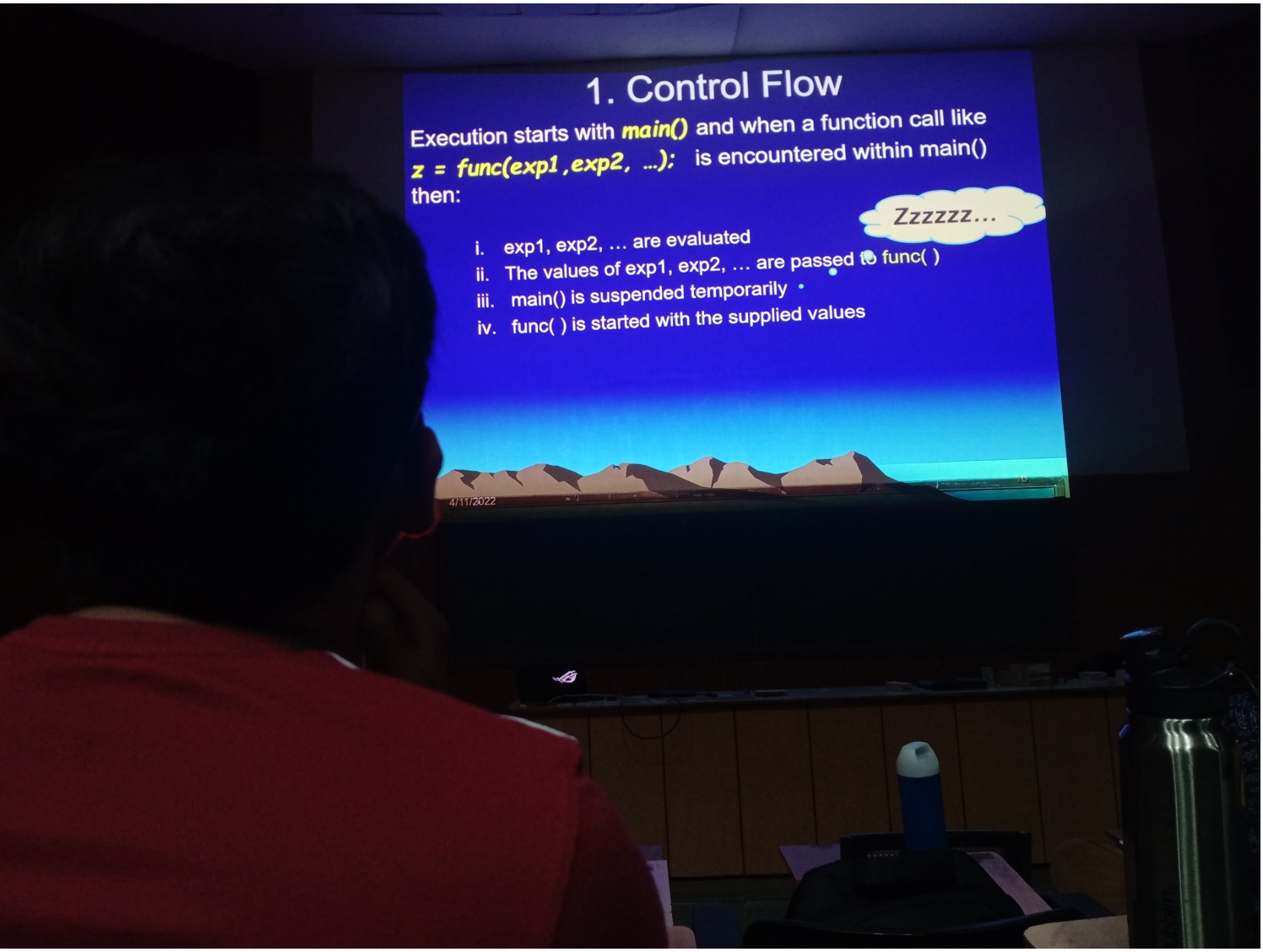
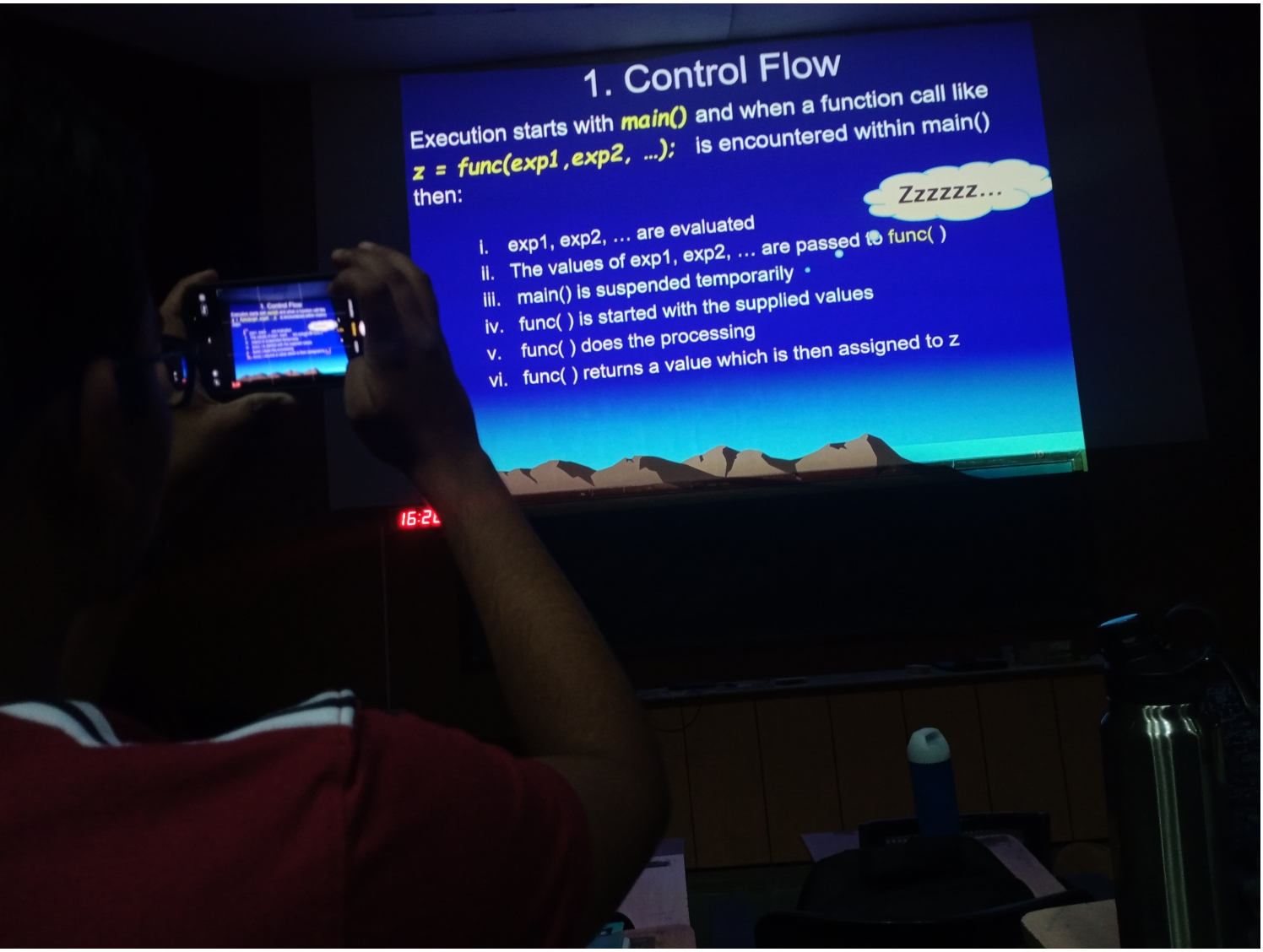
int square(int y); /* function prototype */
int main( )
{
int x;
for (x = 1; x <= 10; x++)
printf("%d ", square(x));
printf("\n");
return 0;
}
int square(int y)
{
return y * y;
}
main() is also a function.
It returns an int
If unspecified, then by default a function returns int
4/11/2022


1. Control Flow
Execution starts with main() and when a function call like
z = func(exp1,exp2, ...); is encountered within main()
then:
Zzzzzz...
i. exp1, exp2, ... are evaluated
ii. The values of exp1, exp2, ... are passed to func( )
iii. main() is suspended temporarily
iv. func( ) is started with the supplied values
4/11/2022


1. Control Flow
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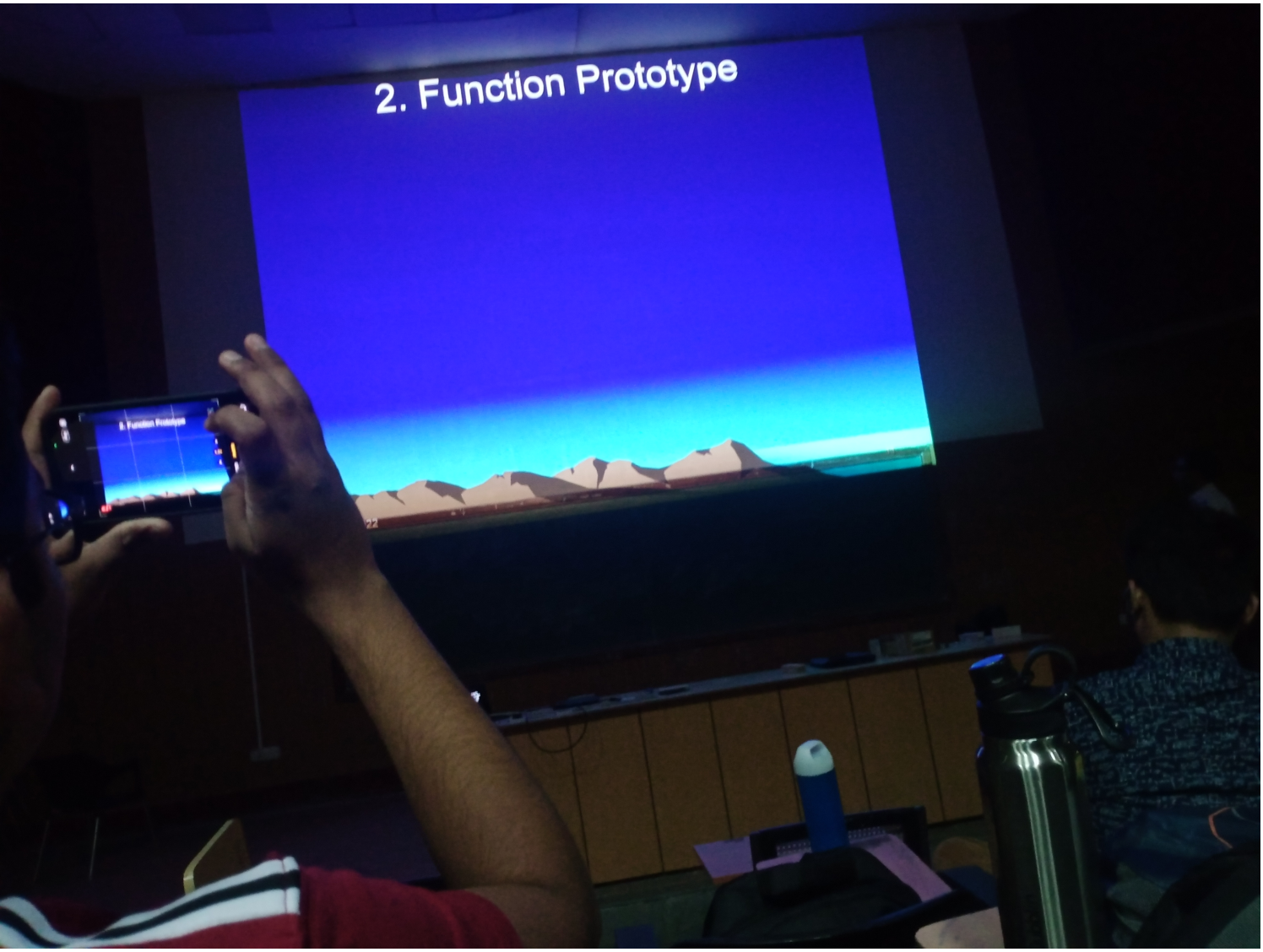
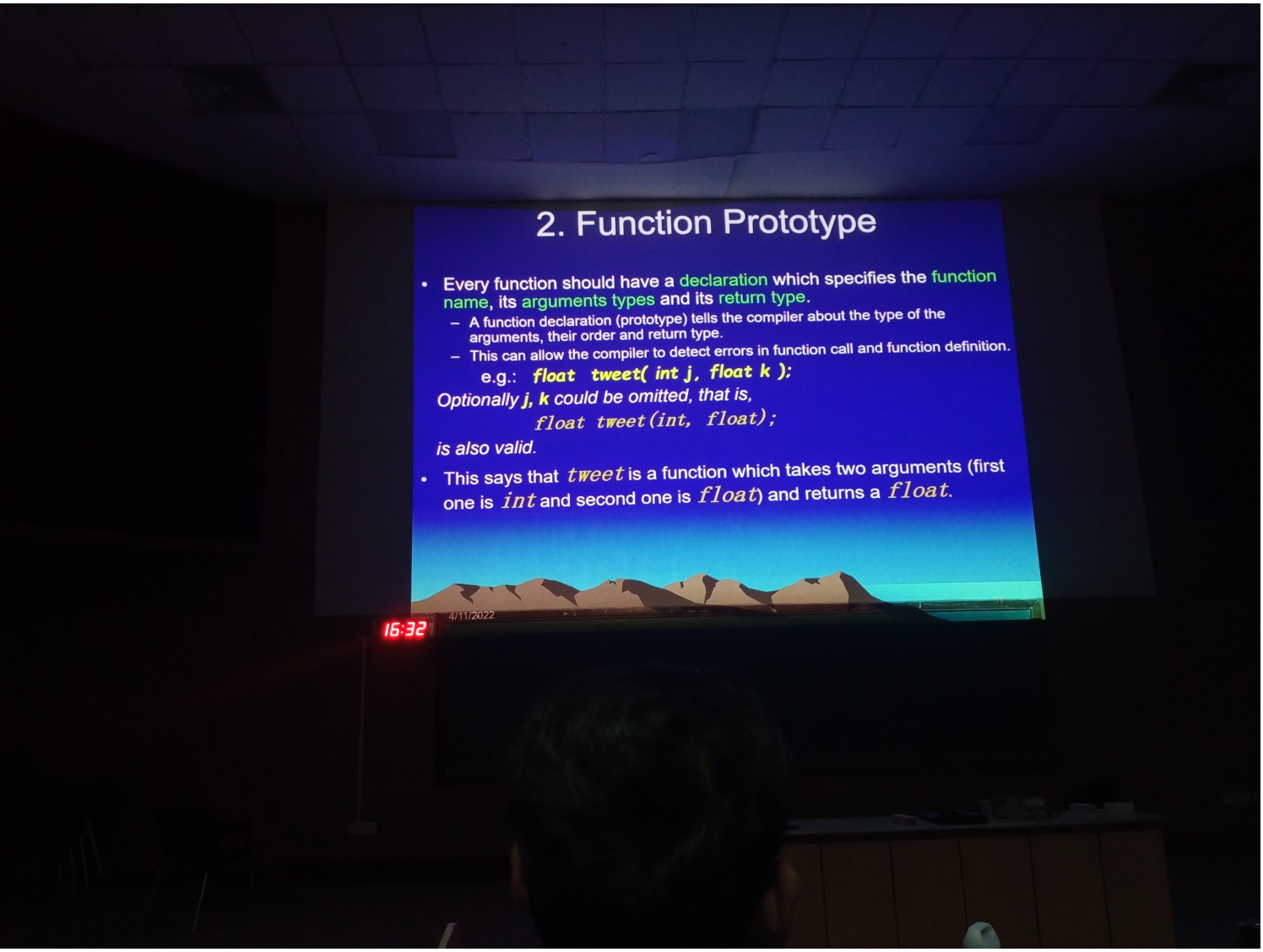
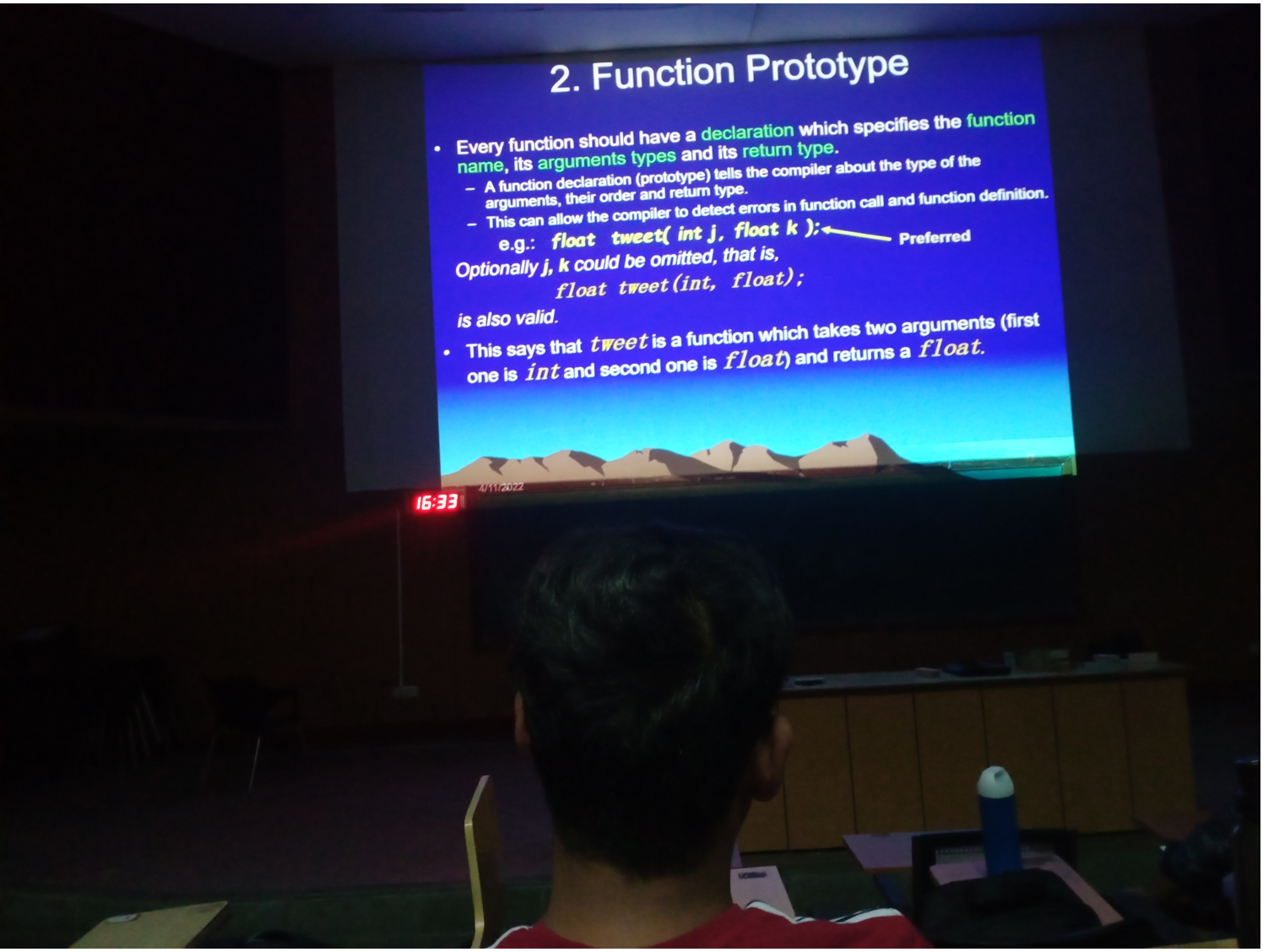
Zzzzzz...
i. exp1, exp2, ... are evaluated
ii. The values of exp1, exp2, ... are passed to func( )
iii. main() is suspended temporarily
iv. func( ) is started with the supplied values
v. func( ) does the processing
vi. func( ) returns a value which is then assigned to z
16:21


2. Function Prototype


2. Function Prototype
• Every function should have a declaration which specifies the function name, its arguments types and its return type.
– A function declaration (prototype) tells the compiler about the type of the arguments, their order and return type.
– This can allow the compiler to detect errors in function call and function definition.
e.g.: float tweet(int j, float k);
Optionally j, k could be omitted, that is,
float tweet(int, float);
is also valid.
• This says that tweet is a function which takes two arguments (first one is int and second one is float) and returns a float.
16:32
4/11/2022


2. Function Prototype
Every function should have a declaration which specifies the function name, its arguments types and its return type.
A function declaration (prototype) tells the compiler about the type of the arguments, their order and return type.
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e.g.: float tweet(int j, float k);
Preferred
Optionally j, k could be omitted, that is,
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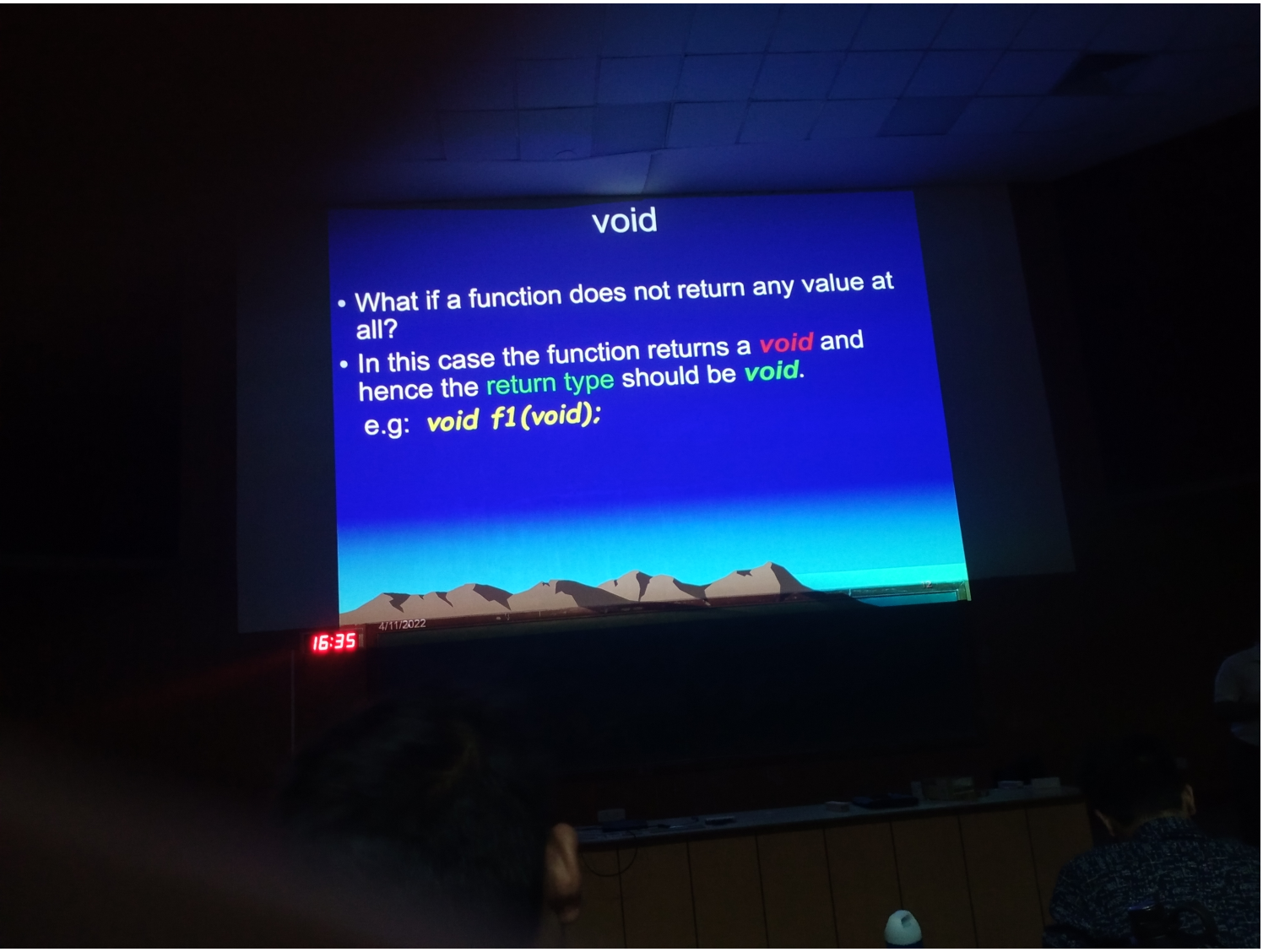
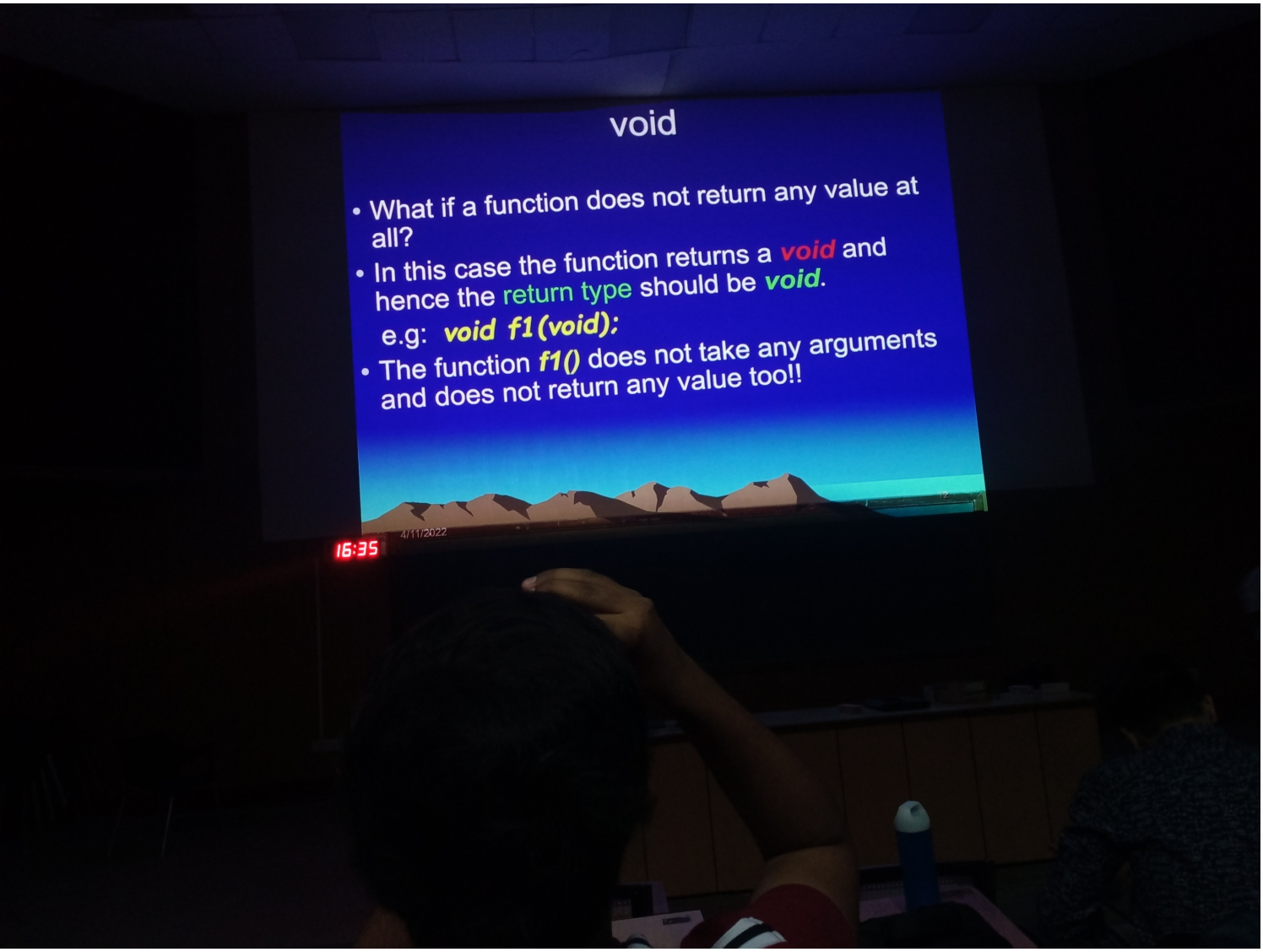
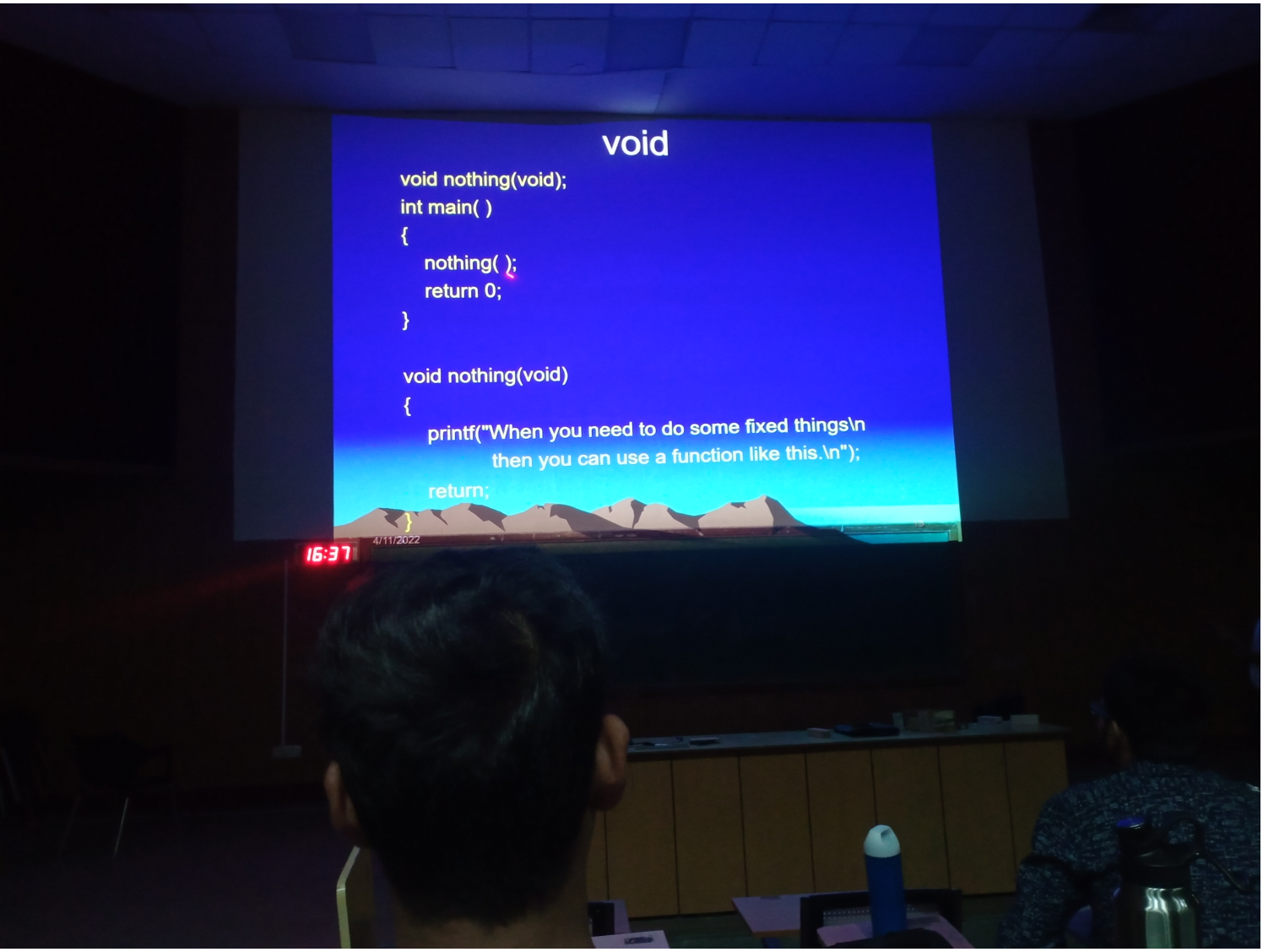
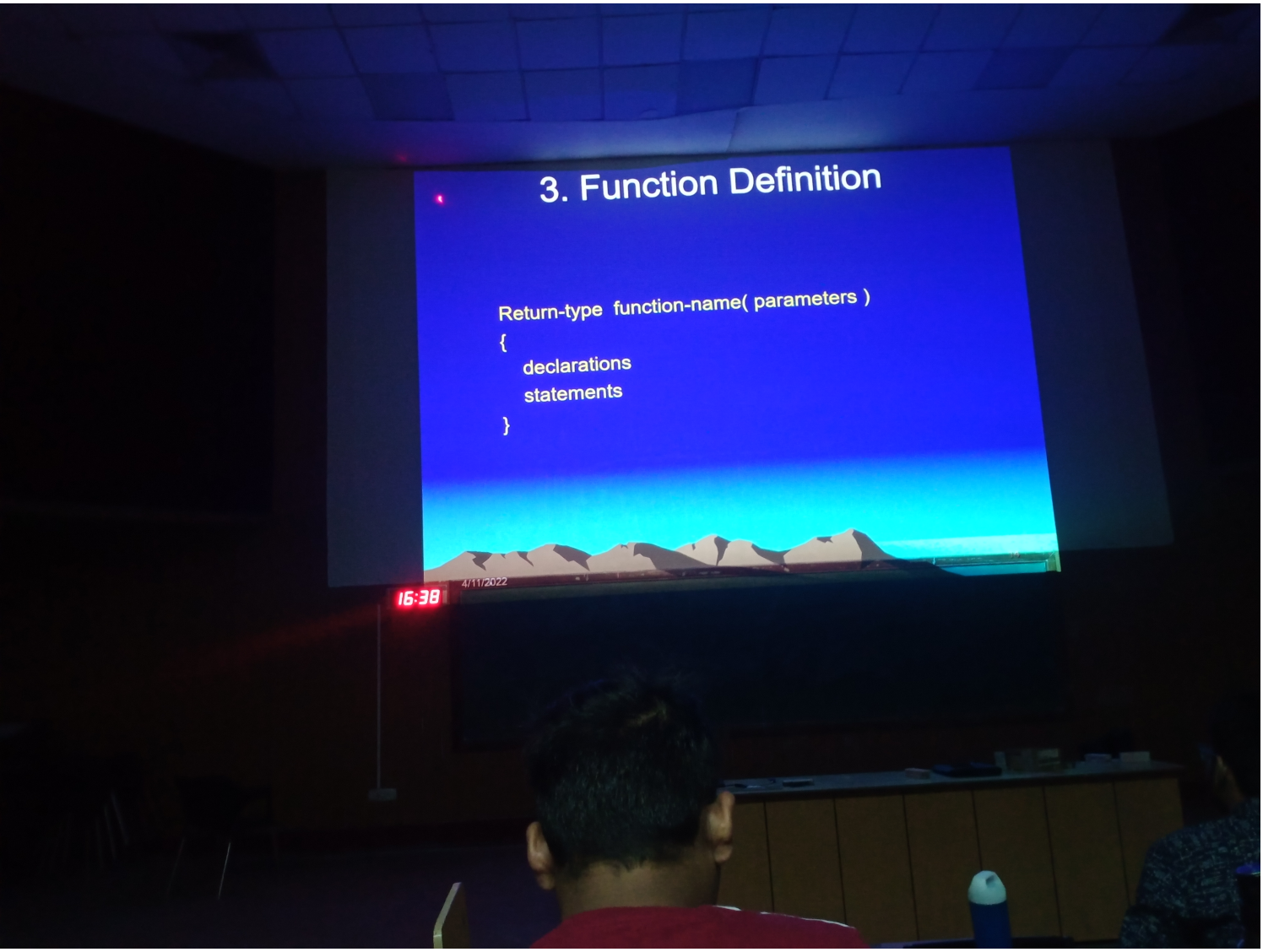
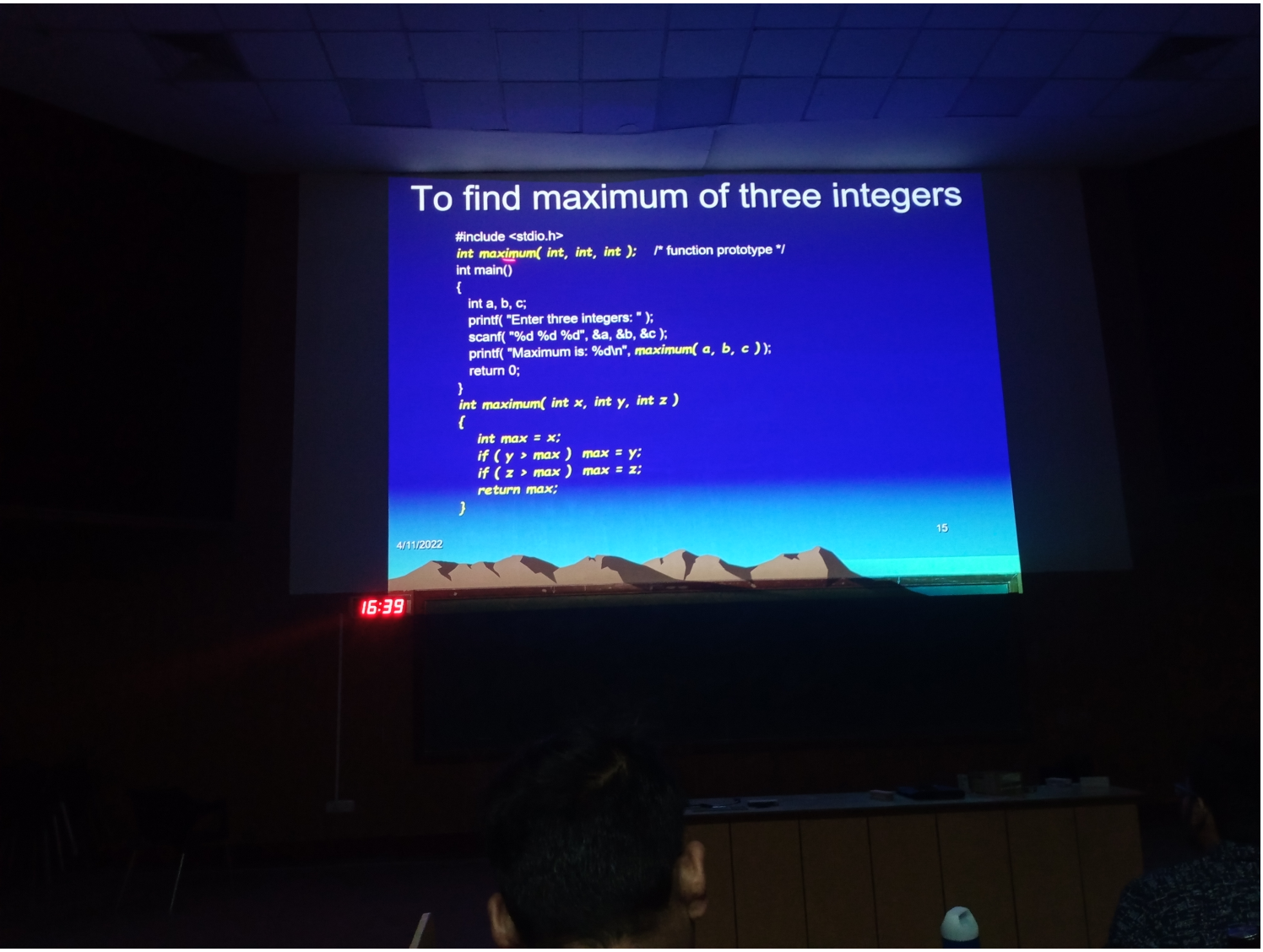
This says that tweet is a function which takes two arguments (first one is int and second one is float) and returns a float.
16:33
4/11/2022

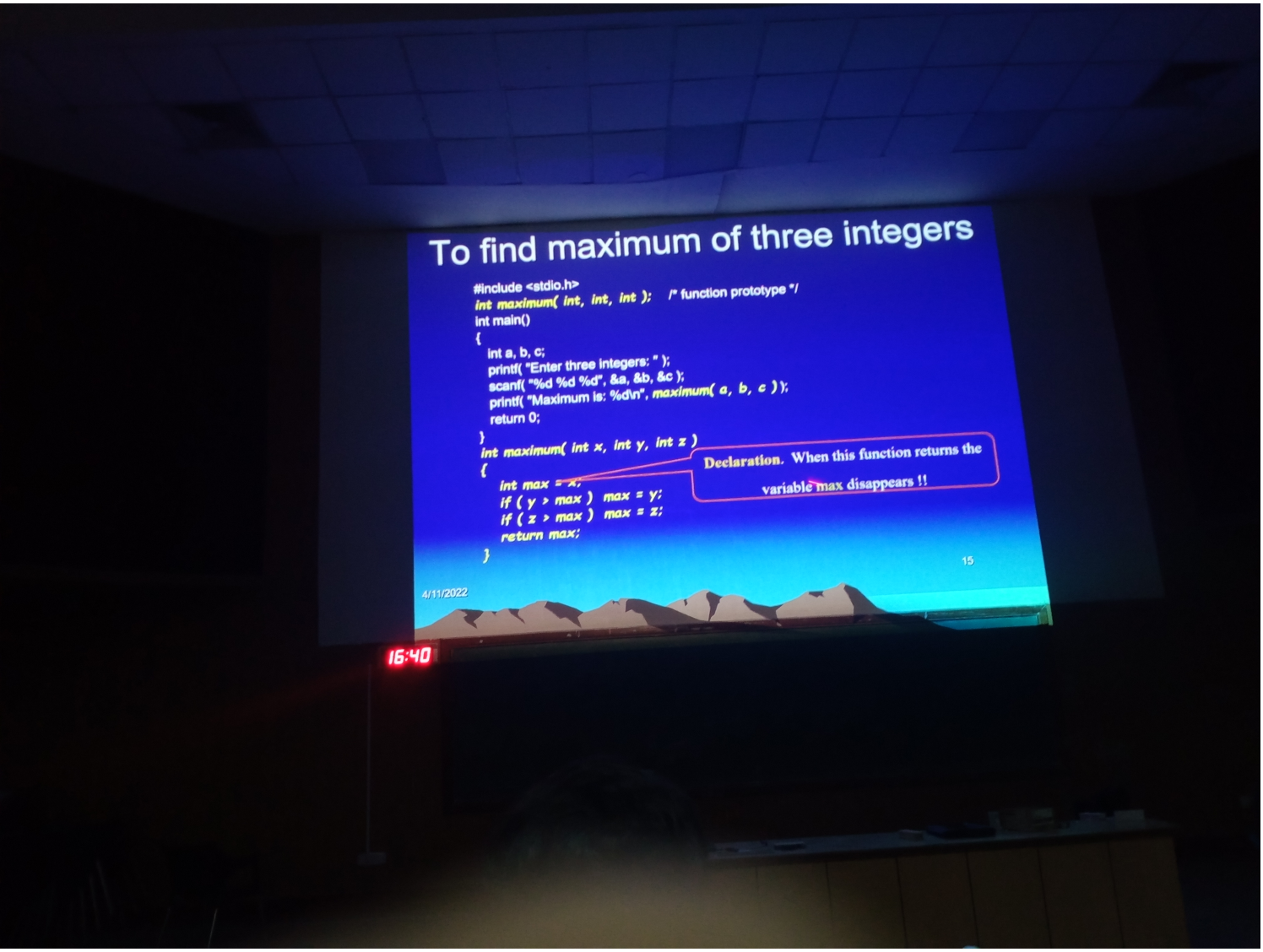

void
• What if a function does not return any value at all?
• In this case the function returns a void and hence the return type should be void.
e.g: void f1(void);
16:35
4/11/2022


void
• What if a function does not return any value at all?
• In this case the function returns a void and hence the return type should be void.
e.g: void f1(void);
• The function f1() does not take any arguments and does not return any value too!!
16:35
4/11/2022


void
void nothing(void);
int main( )
{
nothing( );
return 0;
}
void nothing(void)
{
printf("When you need to do some fixed things\n
then you can use a function like this.\n");
return;
}
16:37
4/11/2022


3. Function Definition
Return-type function-name(parameters)
{
declarations
statements
}
16:38
4/11/2022


To find maximum of three integers
#include <stdio.h>
int maximum(int, int, int); /* function prototype */
int main()
{
int a, b, c;
printf("Enter three integers: ");
scanf("%d %d %d", &a, &b, &c);
printf("Maximum is: %d\n", maximum(a, b, c));
return 0;
}
int maximum(int x, int y, int z)
{
int max = x;
if (y > max) max = y;
if (z > max) max = z;
return max;
}
4/11/2022
15
16:39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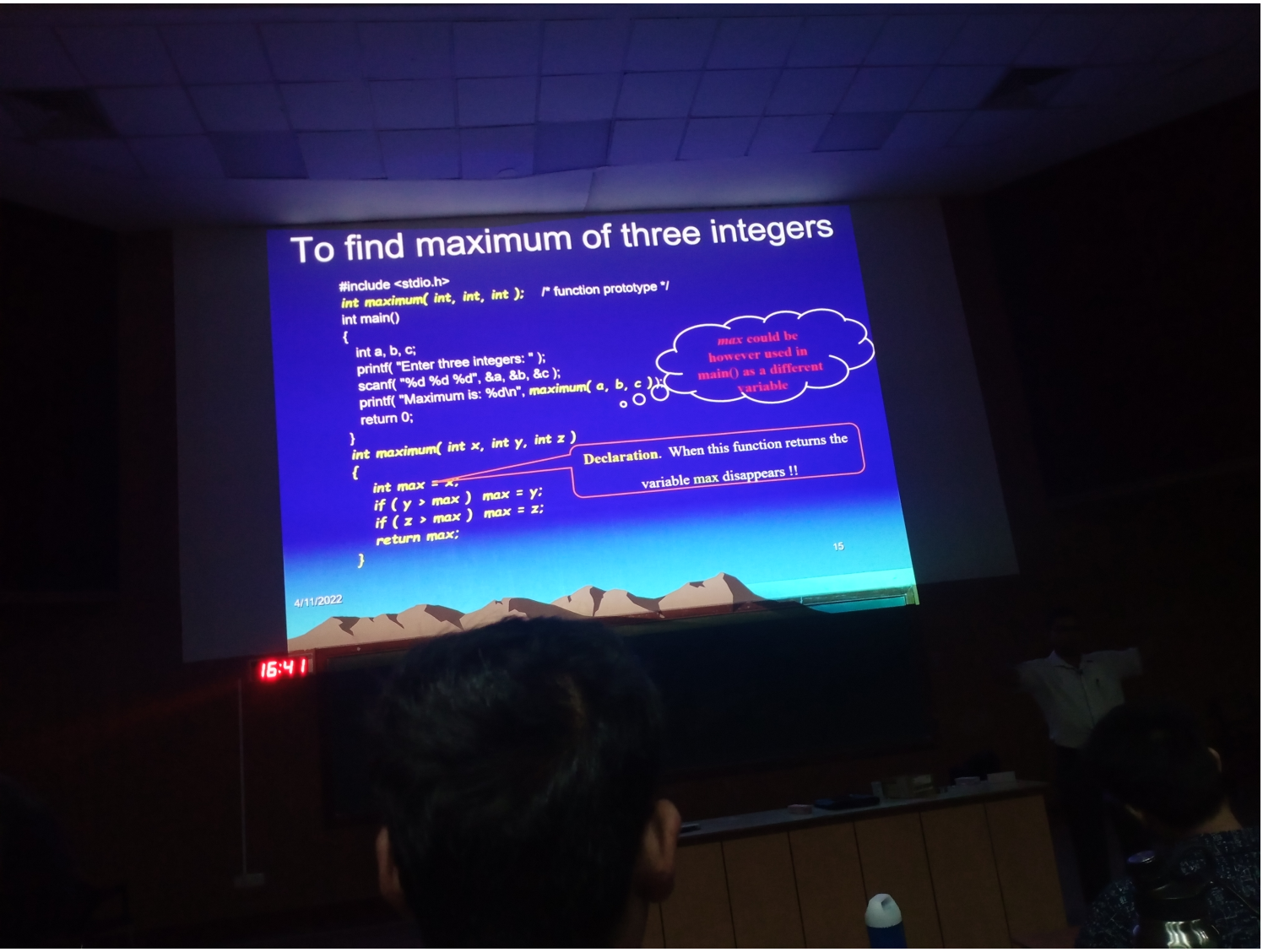
printf("Maximum is: %d\n", maximum(a, b, c));
return 0;
}
int maximum(int x, int y, int z)
{
int max = x;
if (y > max) max = y;
if (z > max) max = z;
return max;
}
Declaration. When this function returns the variable max disappears !!
15
4/11/2022
16:40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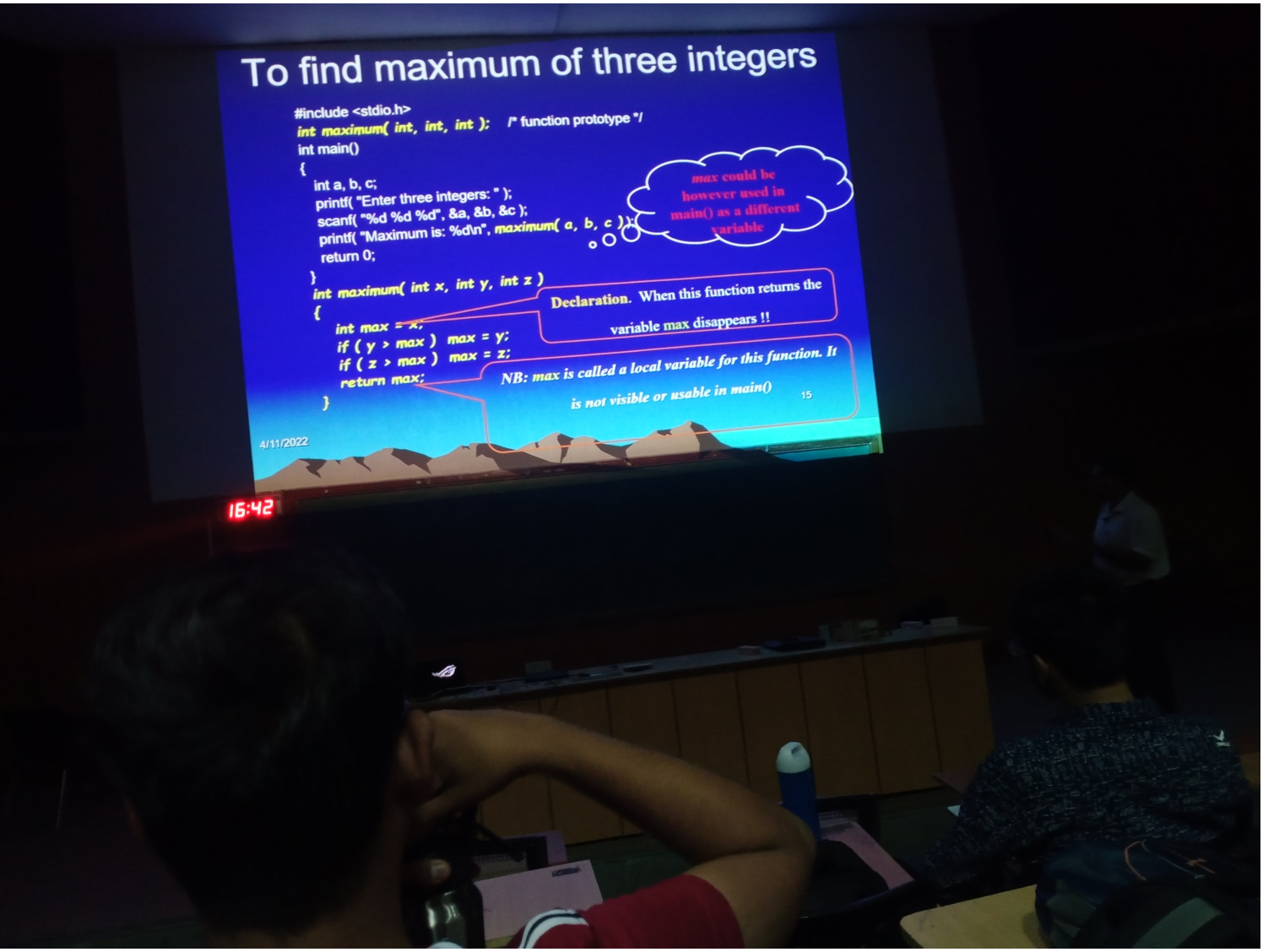
printf("Maximum is: %d\n", maximum(a, b, c));
return 0;
}
int maximum(int x, int y, int z)
{
int max = x;
if (y > max) max = y;
if (z > max) max = z;
return max;
}
max could be however used in main() as a different variable
Declaration. When this function returns the variable max disappears !!
15
4/11/2022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return max;
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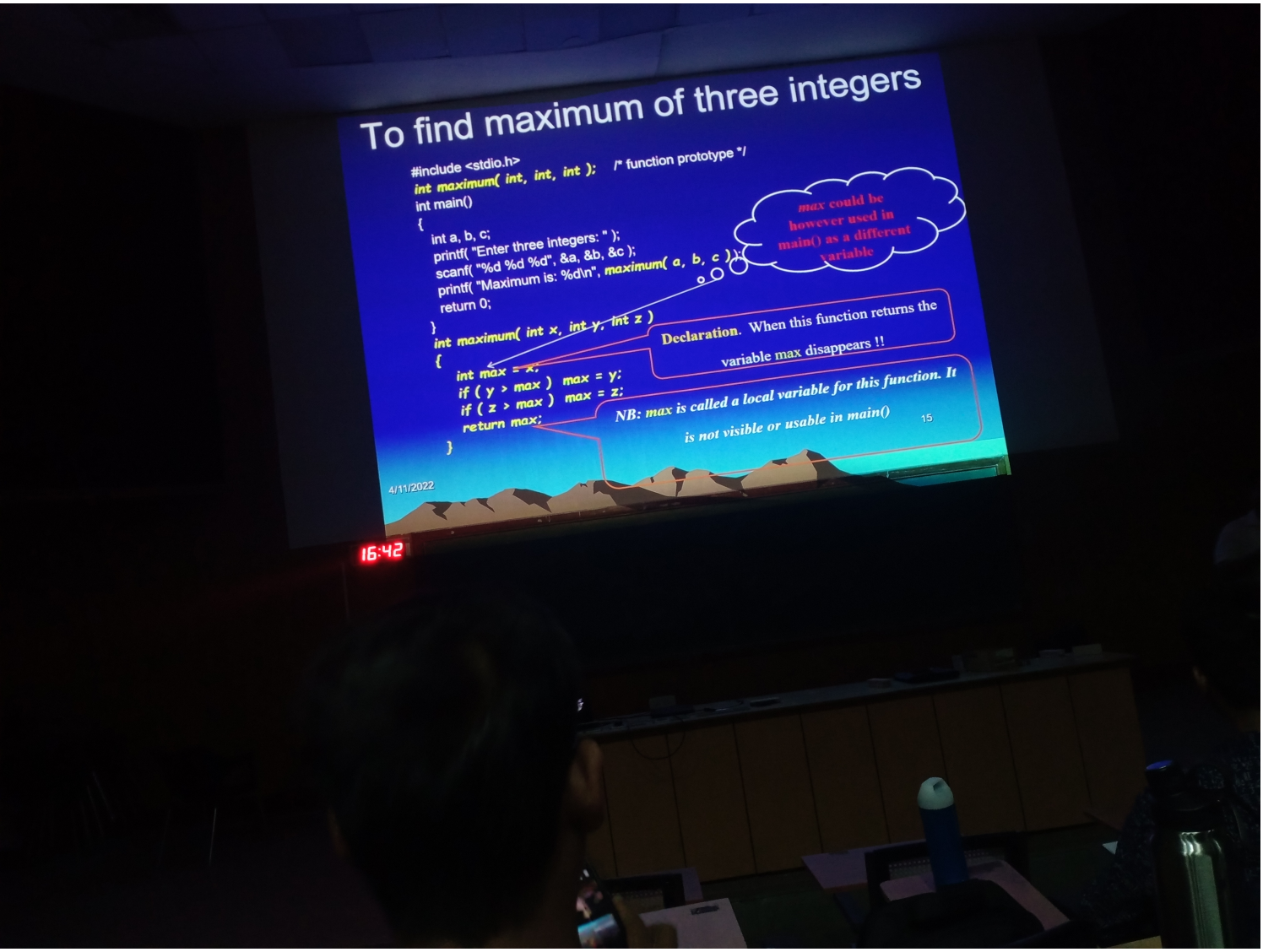
max could be however used in main() as a different variable
Declaration. When this function returns the variable max disappears !!
NB: max is called a local variable for this function. It is not visible or usable in main()
15
4/11/2022
16:42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printf("Maximum is: %d\n", maximum(a, b, c));
return 0;
}
int maximum(int x, int y, int z)
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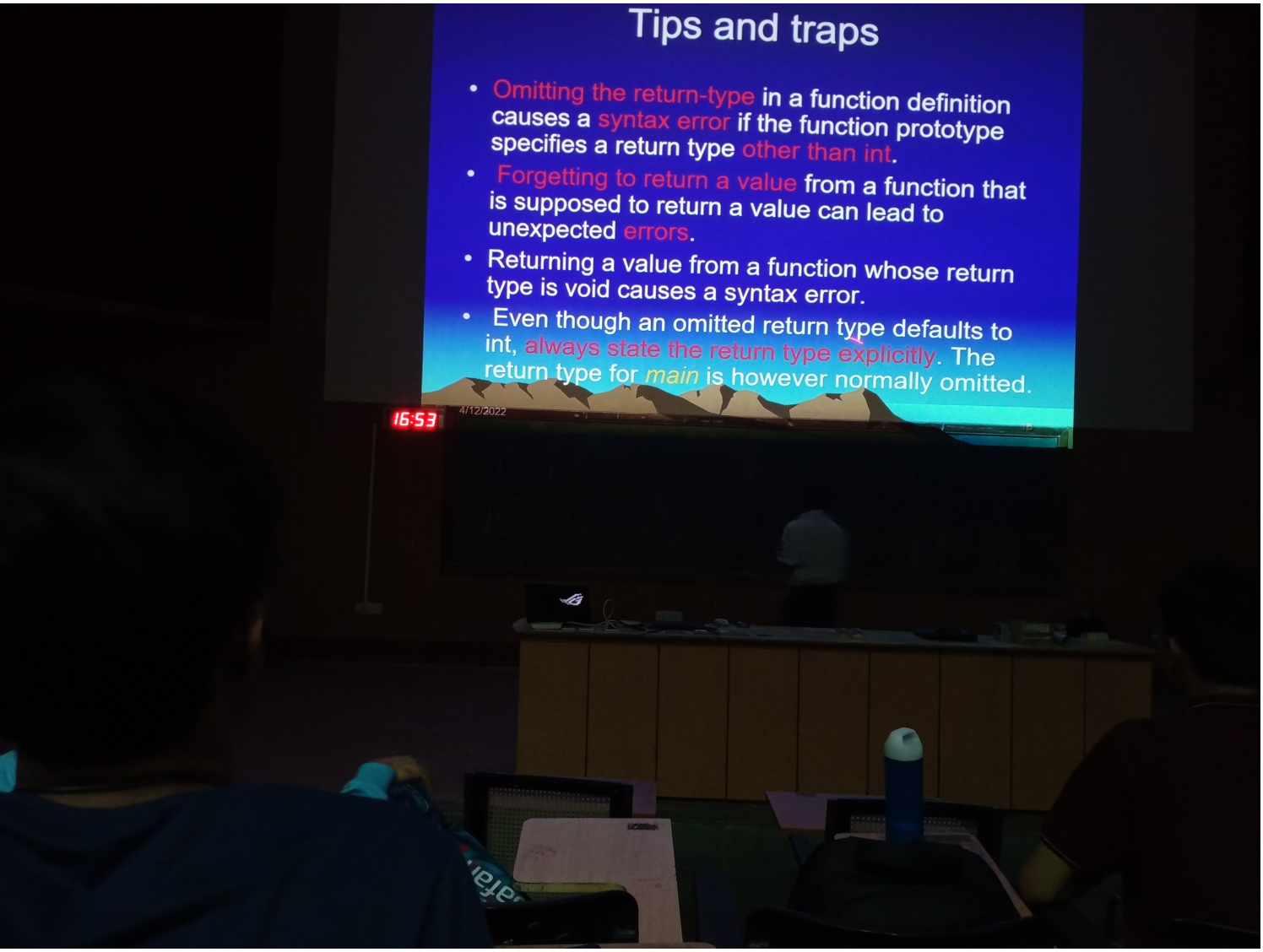
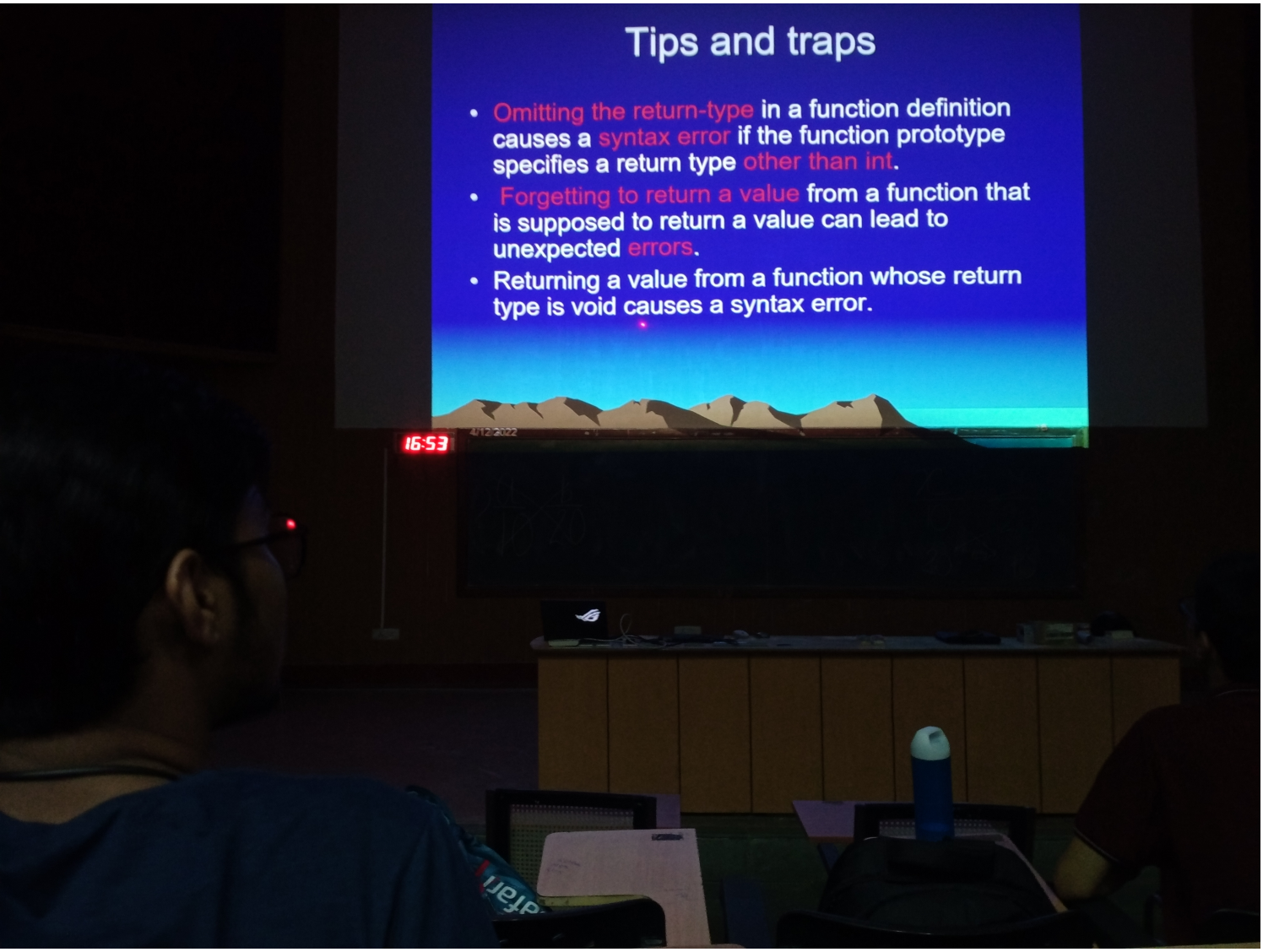

Tips and traps
• Omitting the return-type in a function definition causes a syntax error if the function prototype specifies a return type other than int.
• Forgetting to return a value from a function that is supposed to return a value can lead to unexpected errors.
• Returning a value from a function whose return type is void causes a syntax error.
• Even though an omitted return type defaults to int, always state the return type explicitly. The return type for main is however normally omitted.
16:53
4/12/2022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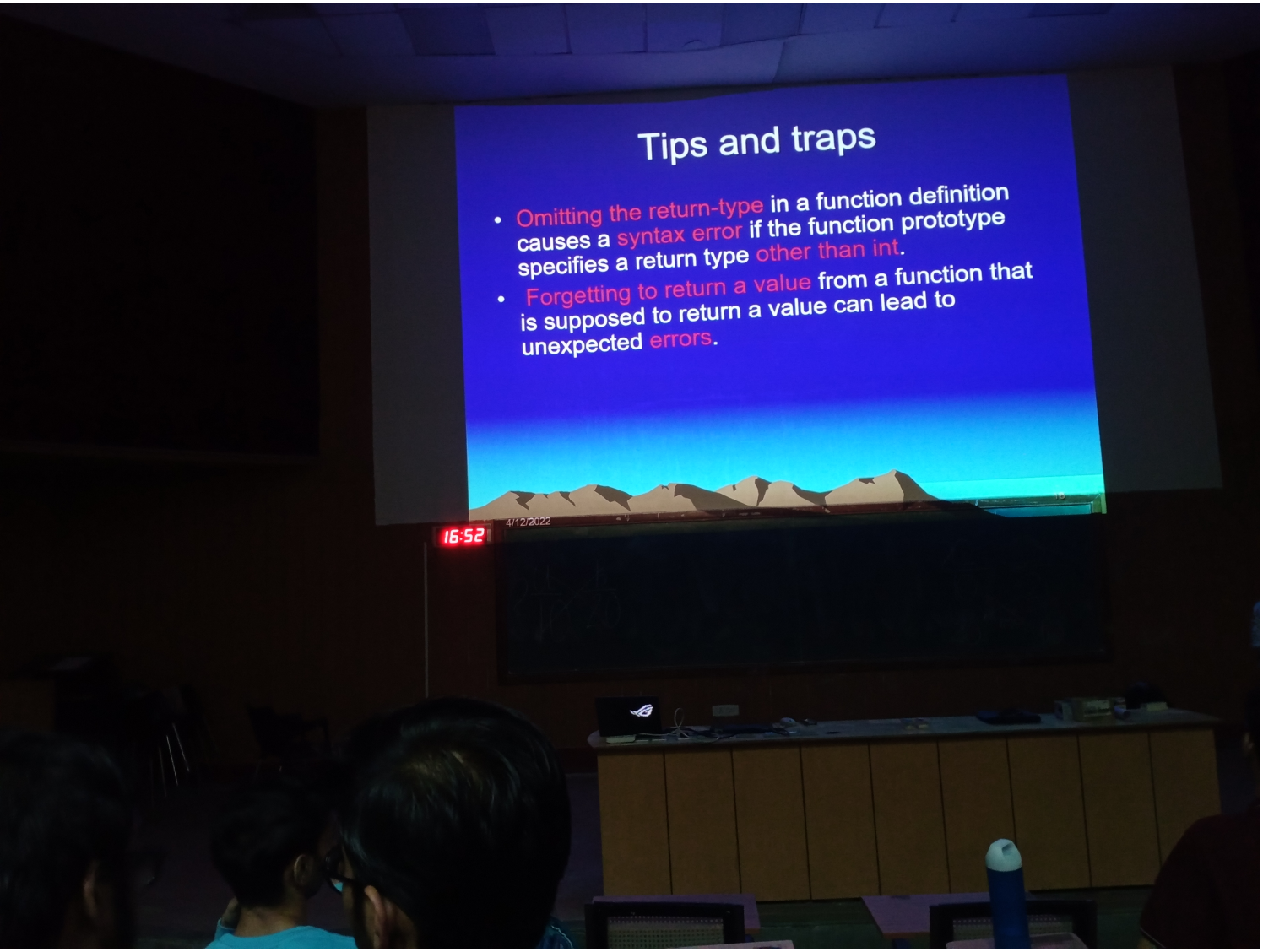
16:53
4/12/2022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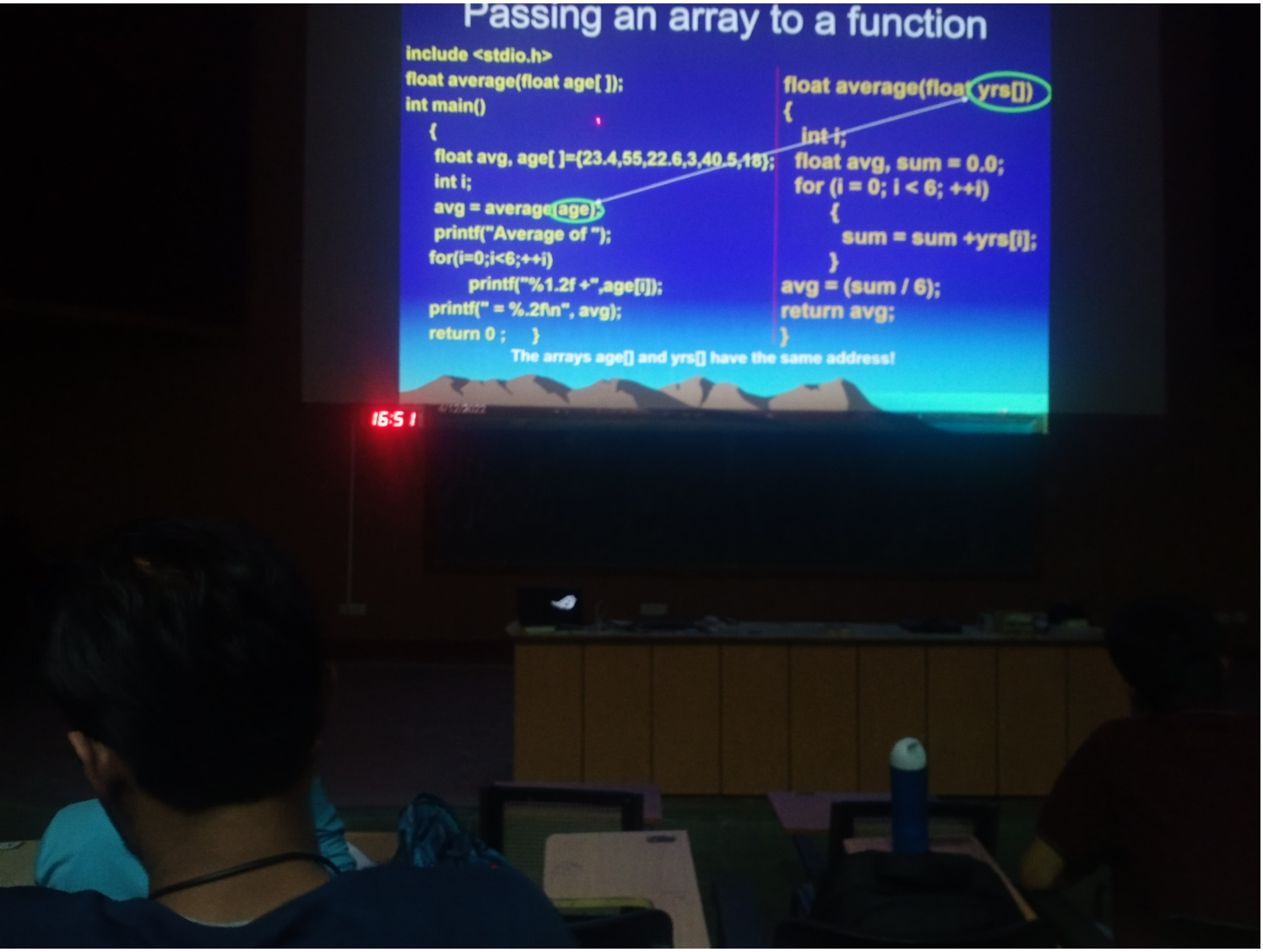
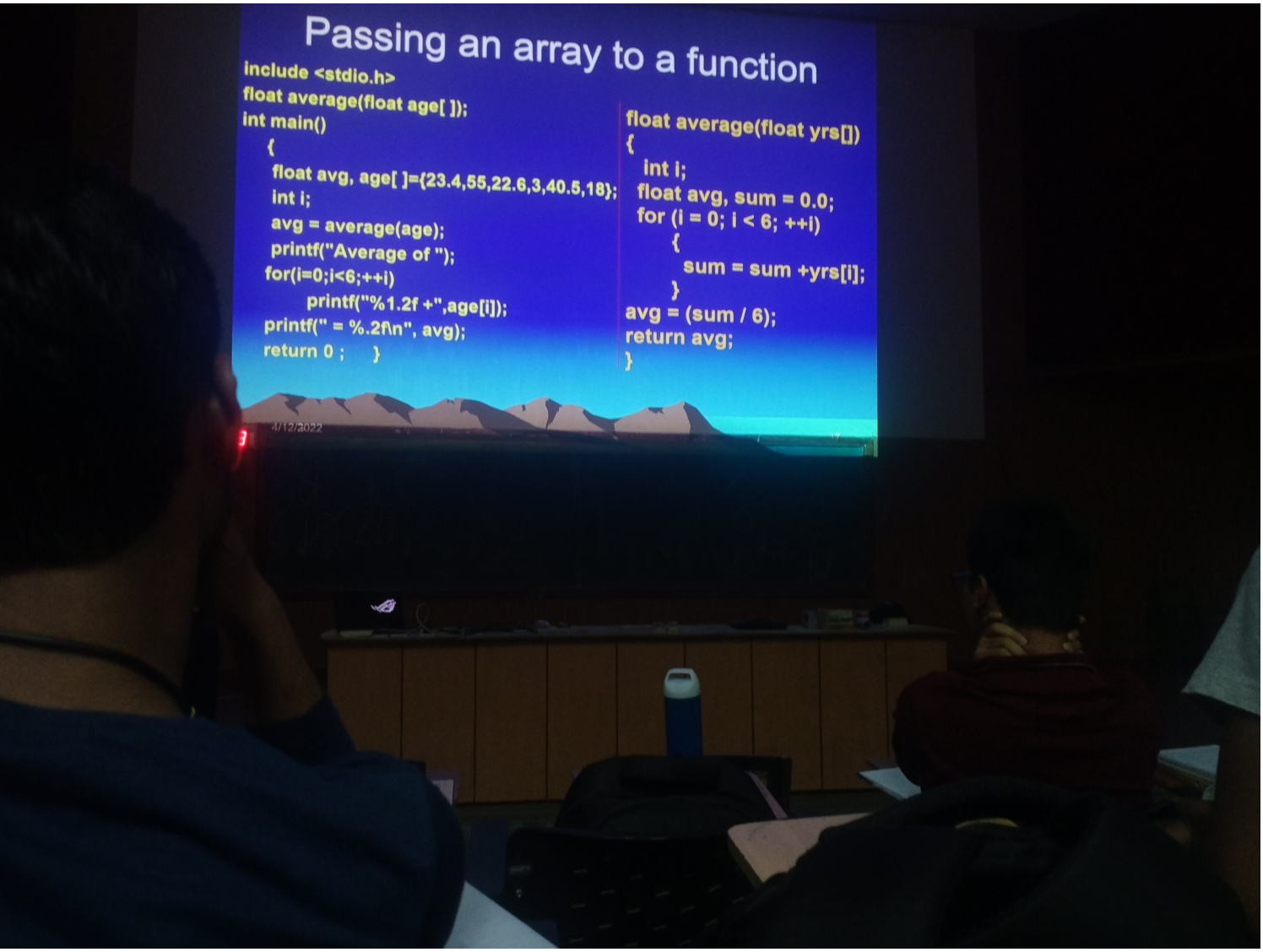

Passing an array to a function
include <stdio.h>
float average(float age[ ]);
int main()
{
float avg, age[ ]={23.4,55,22.6,3,40.5,18};
int i;
avg = average(age);
printf("Average of ");
for(i=0;i<6;++i)
printf("%1.2f +",age[i]);
printf(" = %.2f\n", avg);
return 0 ; }
float average(float yrs[])
{
int i;
float avg, sum = 0.0;
for (i = 0; i < 6; ++i)
{
sum = sum +yrs[i];
}
avg = (sum / 6);
return avg;
}
The arrays age[] and yrs[] have the same address!


Passing an array to a function
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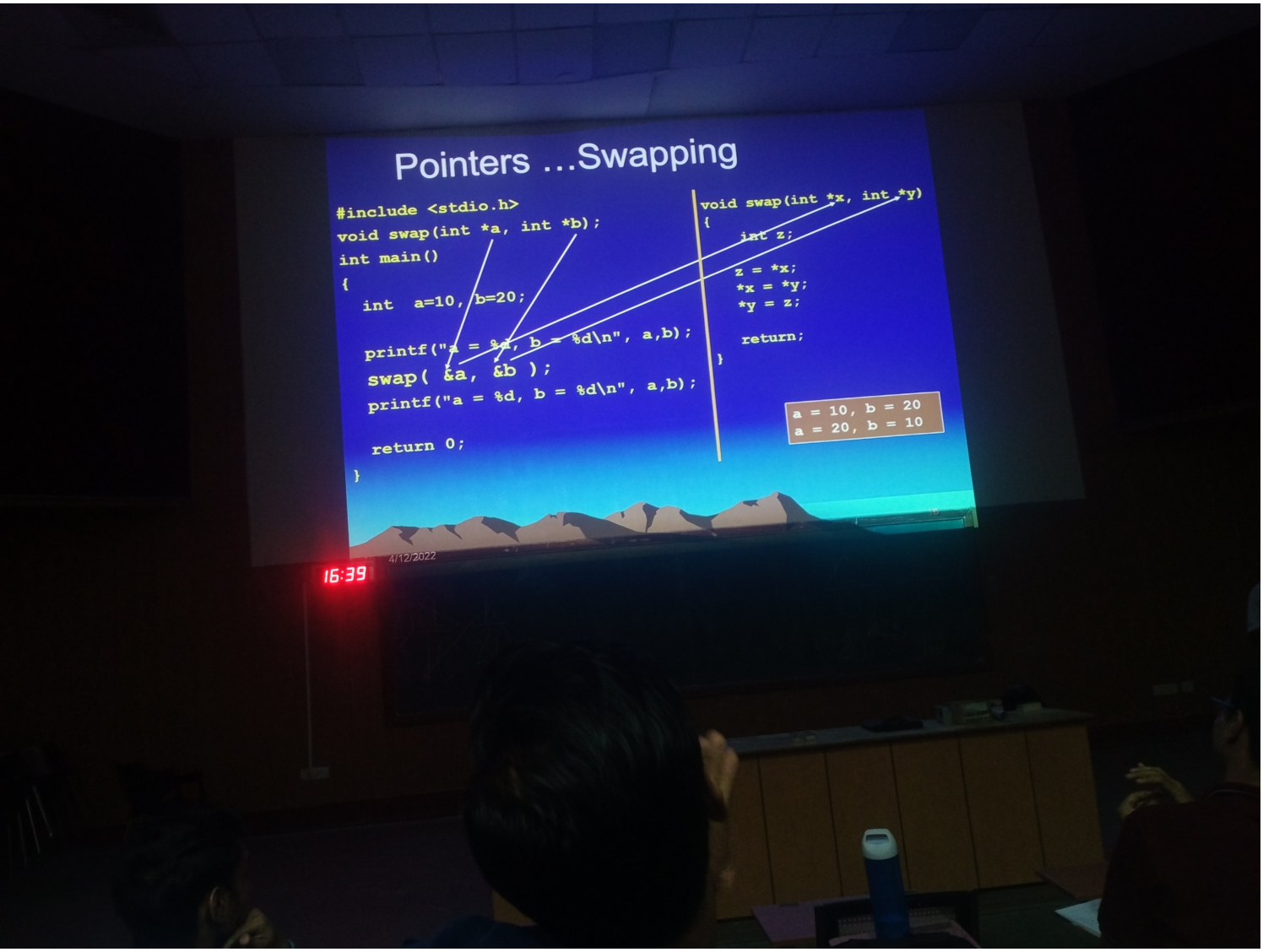
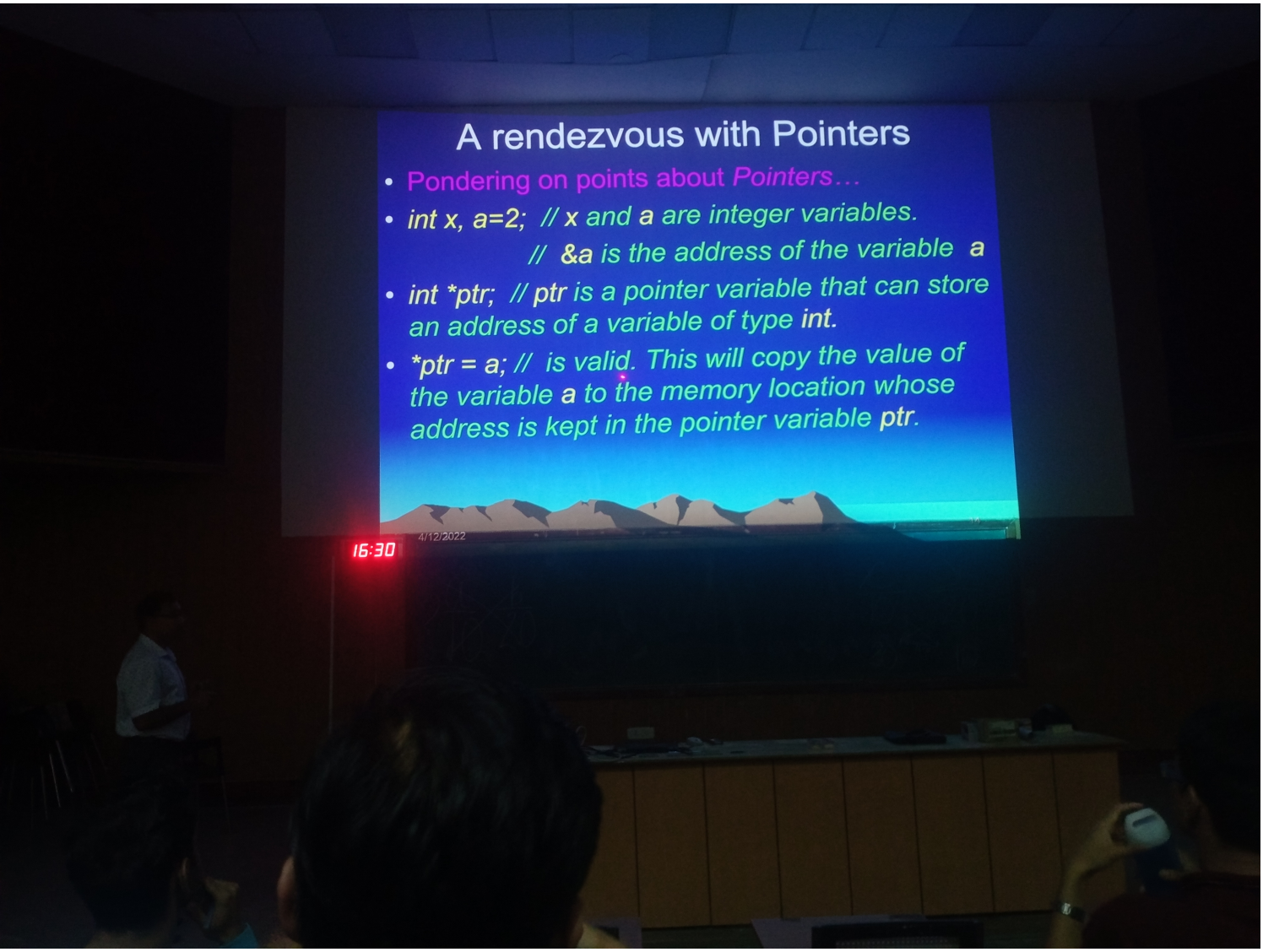
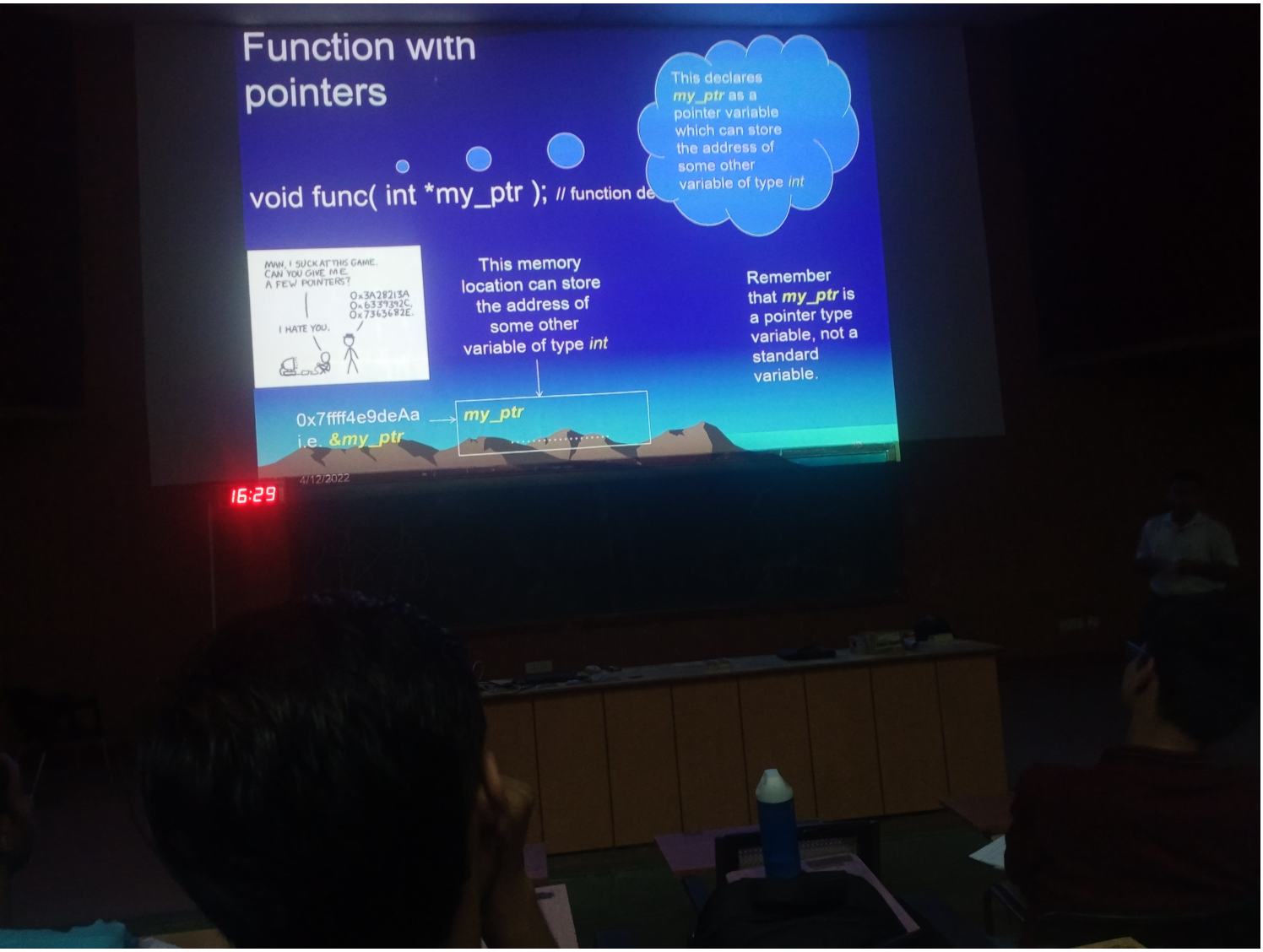
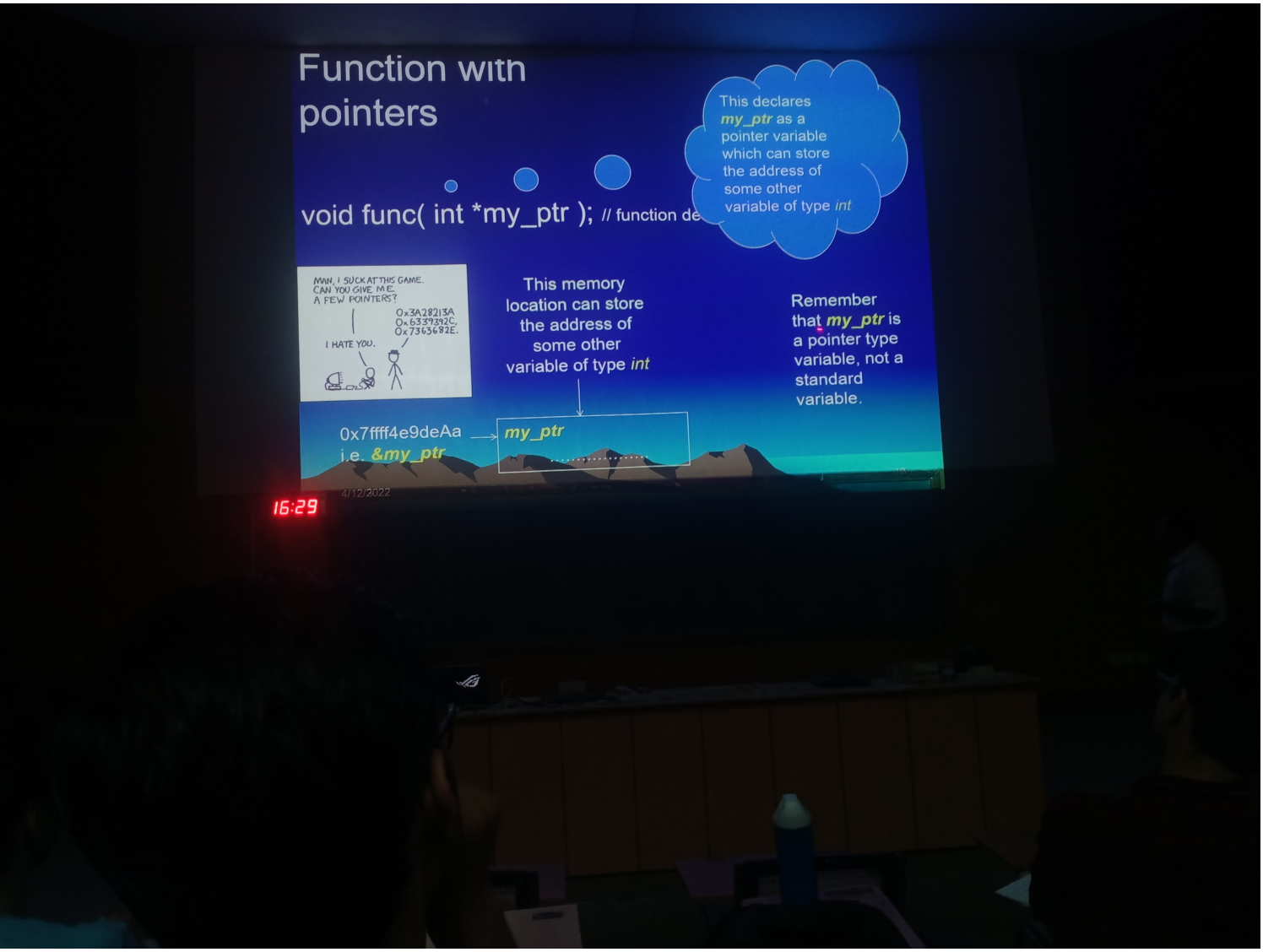
float average(float age[ ]);
int main()
{
float avg, age[ ]={23.4,55,22.6,3,40.5,18};
int i;
avg = average(age);
printf("Average of ");
for(i=0;i<6;++i)
printf("%1.2f +",age[i]);
printf(" = %.2f\n", avg);
return 0 ; }
float average(float yrs[])
{
int i;
float avg, sum = 0.0;
for (i = 0; i < 6; ++i)
{
sum = sum +yrs[i];
}
avg = (sum / 6);
return avg;
}
4/12/2022


Pointers …Swapping
#include <stdio.h>
void swap(int *a, int *b);
int main()
{
int a=10, b=20;
printf("a = %d, b = %d\n", a,b);
swap(&a, &b);
printf("a = %d, b = %d\n", a,b);
return 0;
}
void swap(int *x, int *y)
{
int z;
z = *x;
*x = *y;
*y = z;
return;
}
a = 10, b = 20
a = 20, b = 10
4/12/2022
16:39


A rendezvous with Pointers
• Pondering on points about Pointers…
• int x, a=2; // x and a are integer variables.
// &a is the address of the variable a
• int *ptr; // ptr is a pointer variable that can store an address of a variable of type int.
• *ptr = a; // is valid. This will copy the value of the variable a to the memory location whose address is kept in the pointer variable ptr.
16:30
4/12/2022


Function with pointers
void func(int *my_ptr); // function de
This declares my_ptr as a pointer variable which can store the address of some other variable of type int
MAN, I SUCK AT THIS GAME. CAN YOU GIVE ME A FEW POINTERS?
0x3A28213A
0x63373932.
0x73636B2E.
I HATE YOU.
This memory location can store the address of some other variable of type int
Remember that my_ptr is a pointer type variable, not a standard variable.
0x7ffff4e9deAa
i.e. &my_ptr
my_ptr
4/12/2022
16:29


Function with pointers
void func(int *my_ptr); // function de
This declares my_ptr as a pointer variable which can store the address of some other variable of type int
MAN, I SUCK AT THIS GAME. CAN YOU GIVE ME A FEW POINTERS?
0x3A28213A
0x6339392C
0x7363682E
I HATE YOU.
This memory location can store the address of some other variable of type int
Remember that my_ptr is a pointer type variable, not a standard variable.
0x7ffff4e9deAa
i.e. &my_ptr
my_ptr
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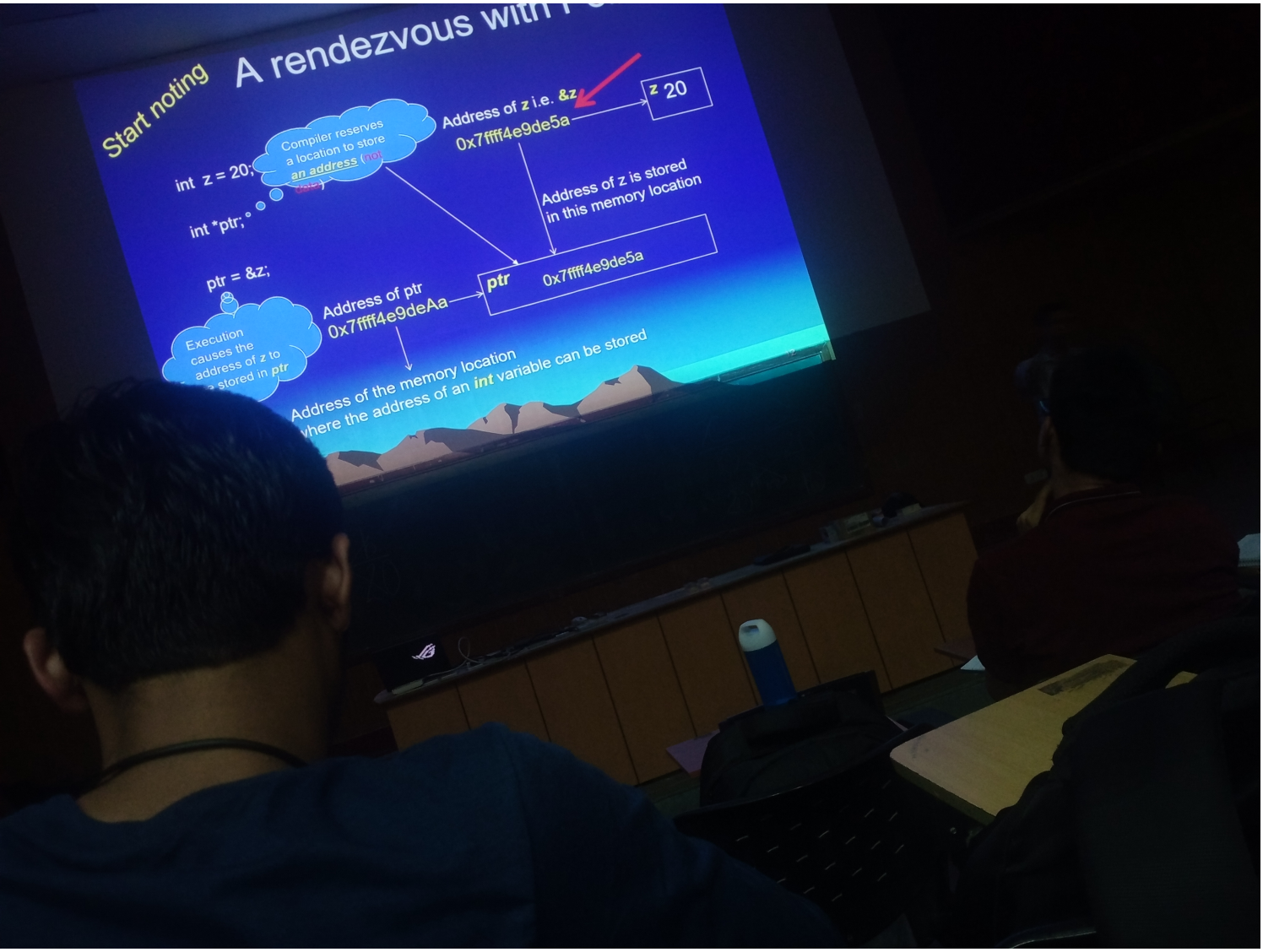
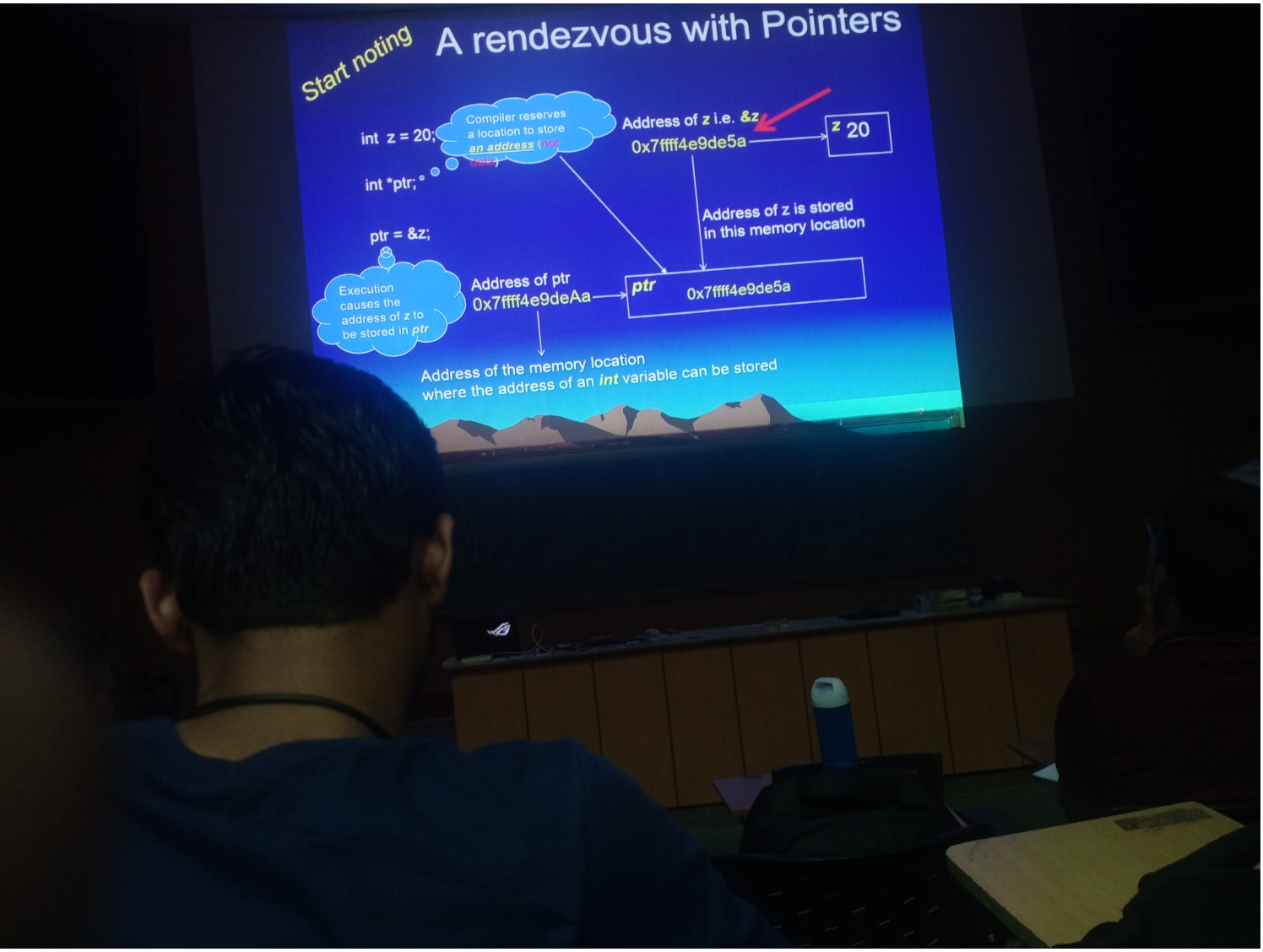

Start noting
A rendezvous with
int z = 20;
Compiler reserves a location to store an address (not
int *ptr; °
ptr = &z;
Execution causes the address of z to stored in ptr
Address of z i.e. &z
0x7ffff4e9de5a
z 20
Address of z is stored in this memory location
Address of ptr
0x7ffff4e9deAa
ptr
0x7ffff4e9de5a
Address of the memory location
where the address of an int variable can be stored


Start noting
A rendezvous with Pointers
int z = 20;
Compiler reserves a location to store an address (int)
int *ptr;
Address of z i.e. &z
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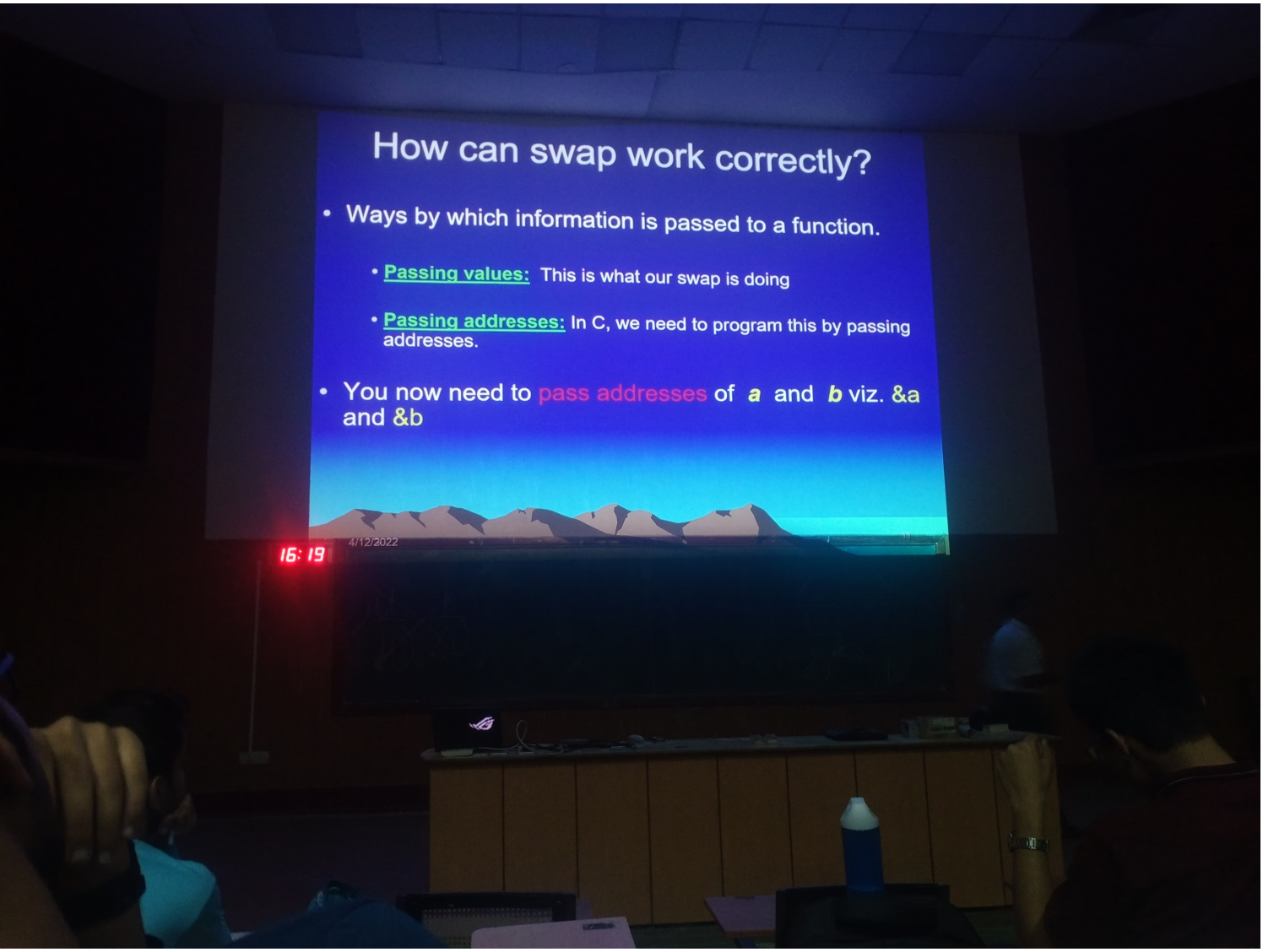
How can swap work correctly?
• Ways by which information is passed to a function.
• Passing values: This is what our swap is doing
• Passing addresses: In C, we need to program this by passing addresses.
• You now need to pass addresses of a and b viz. &a and &b
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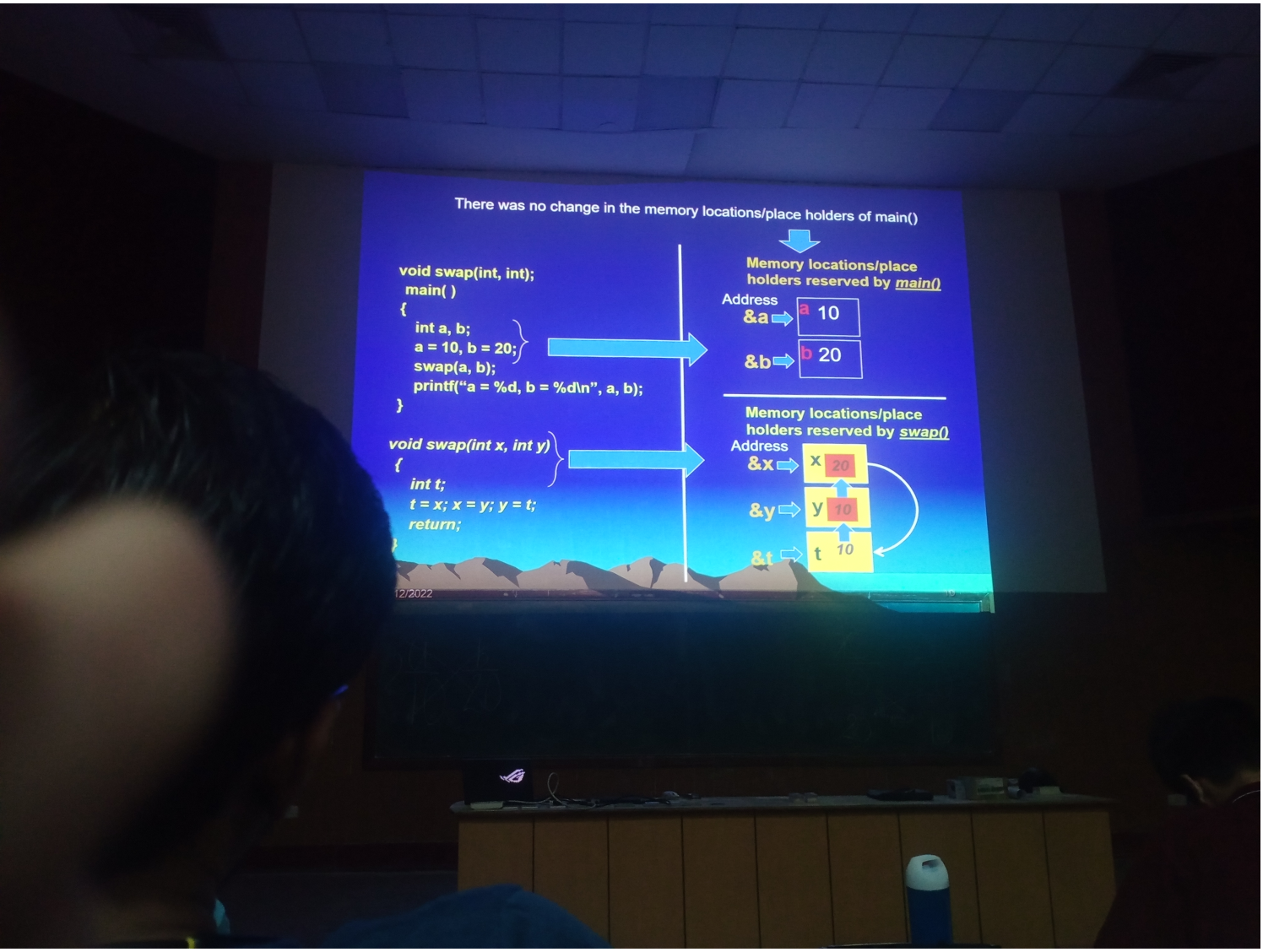
There was no change in the memory locations/place holders of main()
void swap(int, int);
main( )
{
int a, b;
a = 10, b = 20;
swap(a, b);
printf("a = %d, b = %d\n", a, b);
}
void swap(int x, int y)
{
int t;
t = x; x = y; y = t;
return;
}
Memory locations/place holders reserved by main()
Address
&a
a 10
&b
b 20
Memory locations/place holders reserved by swap()
Address
&x
x 20
&y
y 10
&t
t 10
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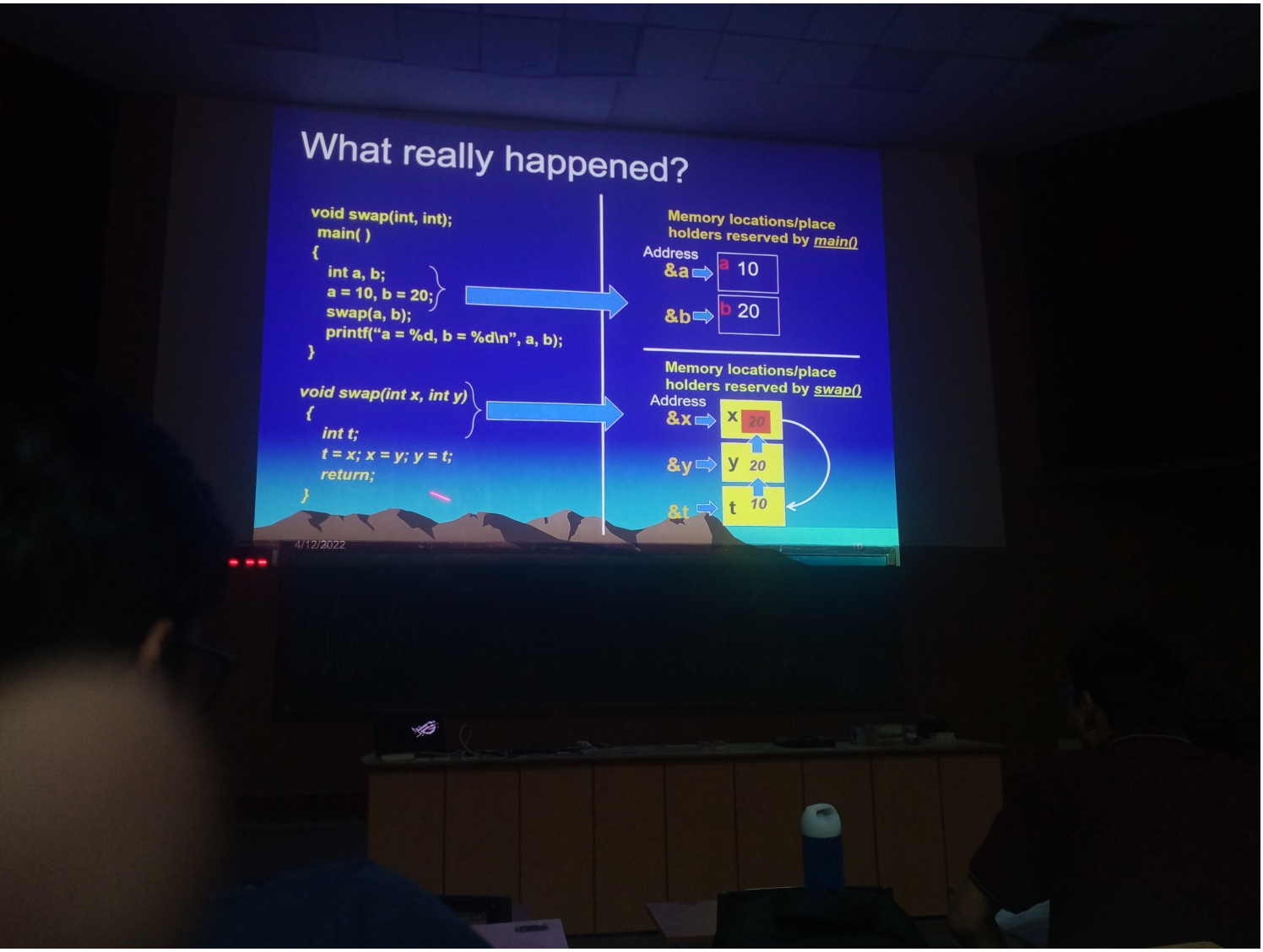
What really happened?
void swap(int, int);
main( )
{
int a, b;
a = 10, b = 20;
swap(a, b);
printf("a = %d, b = %d\n", a, b);
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void swap(int x, int y)
{
int t;
t = x; x = y; y = t;
return;
}
Memory locations/place holders reserved by main()
Address
&a
a 10
&b
b 20
Memory locations/place holders reserved by swap()
Address
&x
x 20
&y
y 20
&t
t 10
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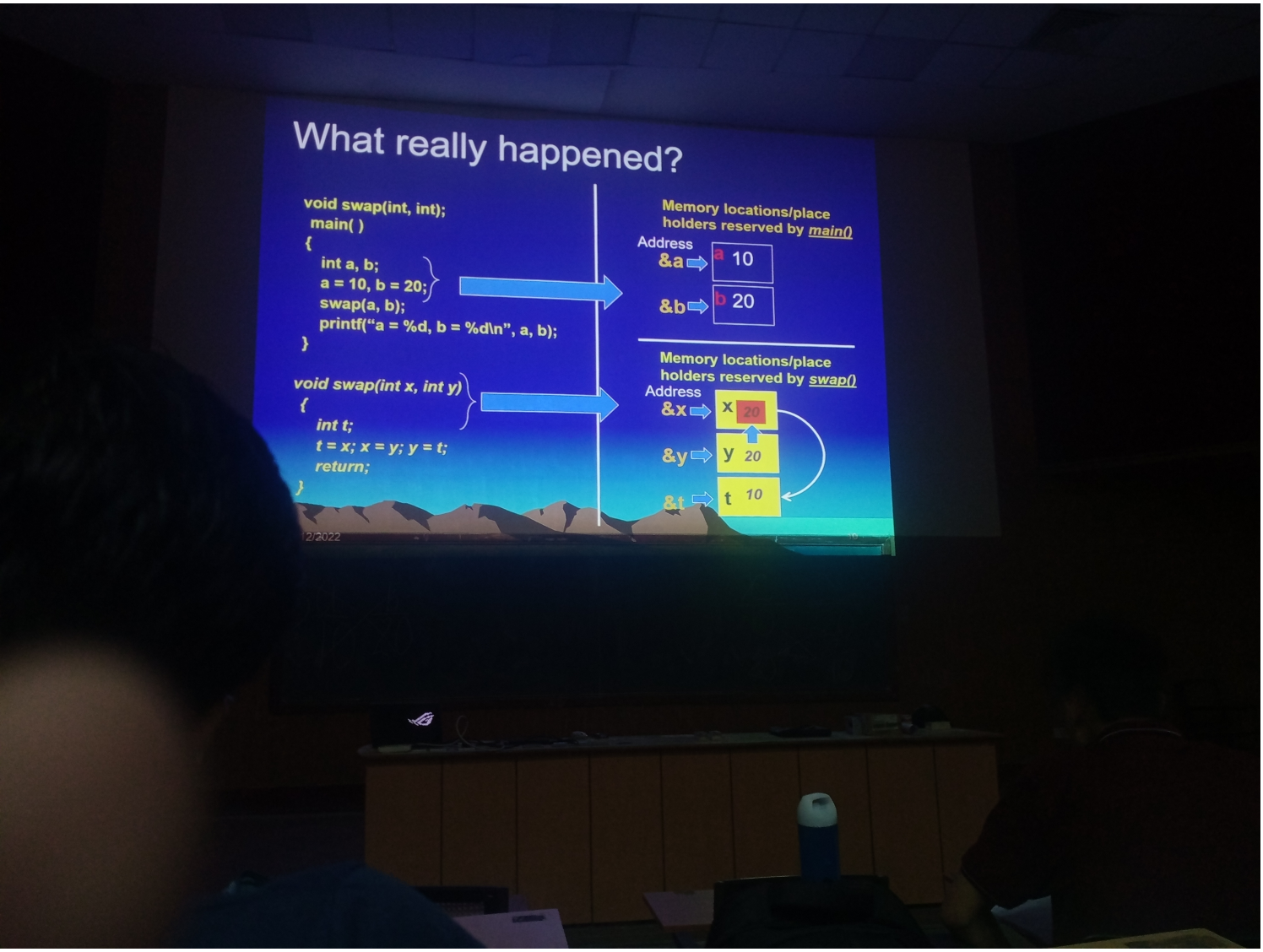
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&a
a 10
&b
b 20
Memory locations/place holders reserved by swap()
Address
&x
x 20
&y
y 20
&t
t 10
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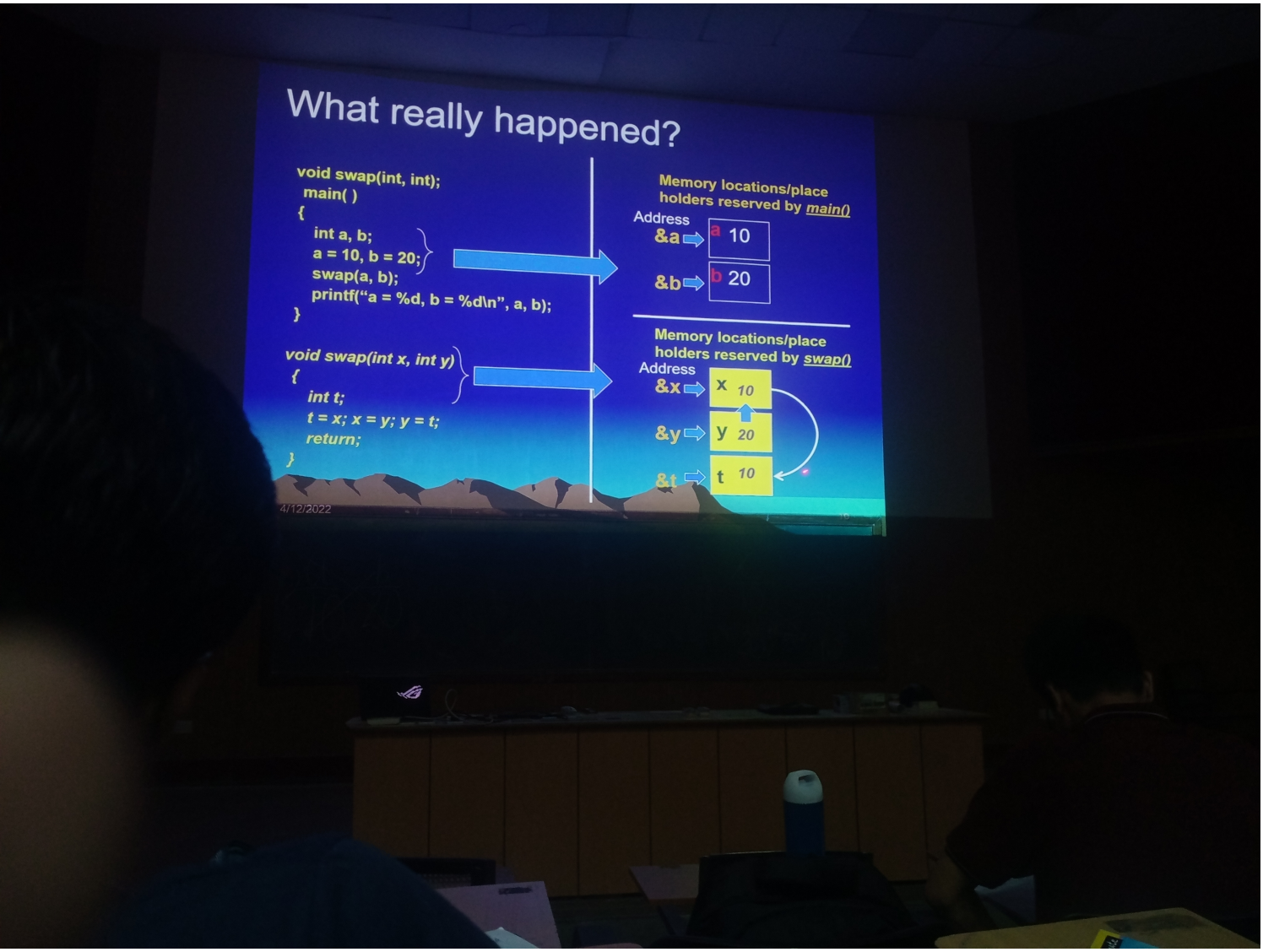
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Address
&a
a 10
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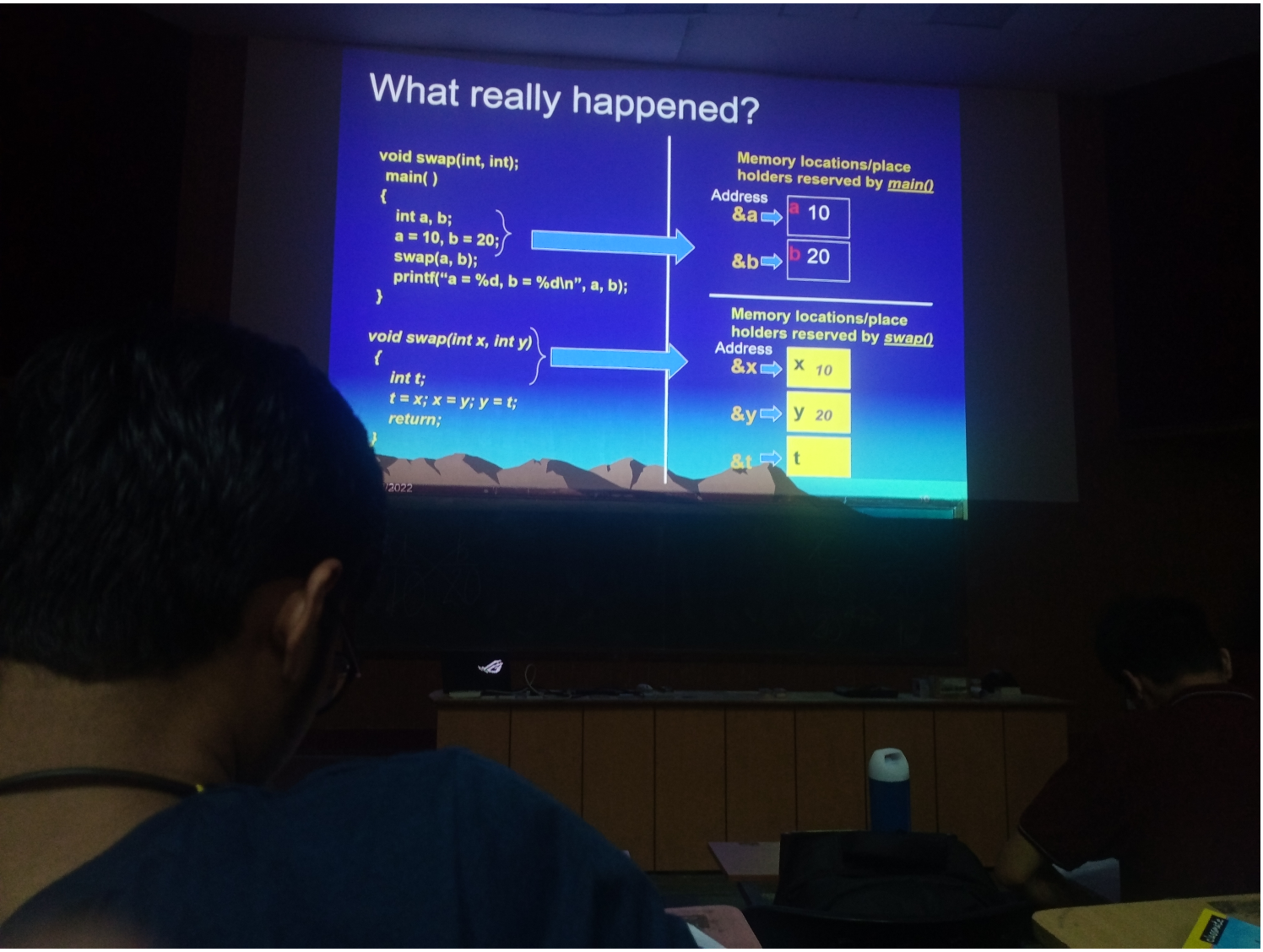
Memory locations/place holders reserved by swap()
Address
&x
x 10
&y
y 20
&t
t 10
4/12/2022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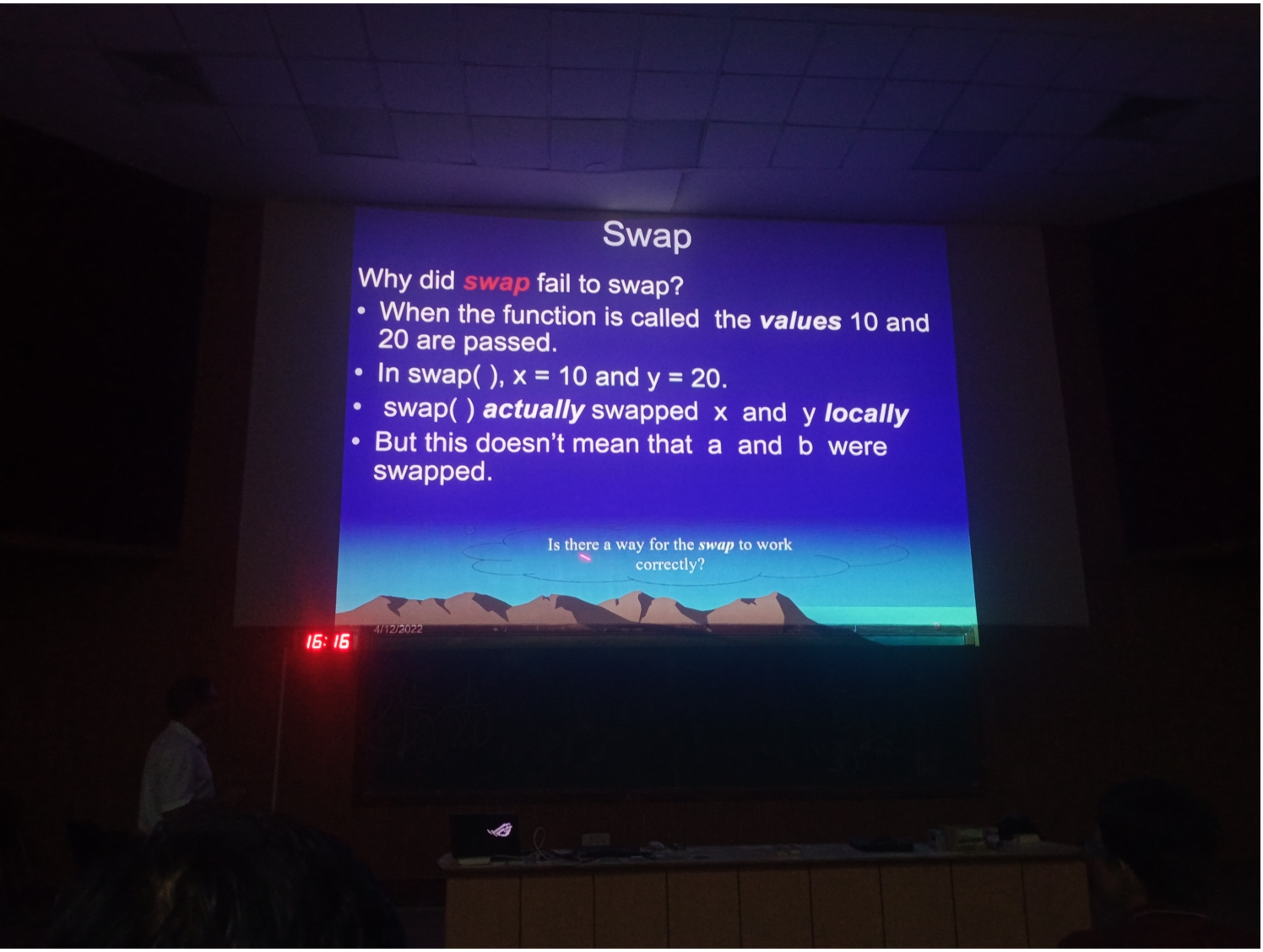
t


Swap
Why did swap fail to swap?
• When the function is called the values 10 and 20 are passed.
• In swap( ), x = 10 and y = 20.
• swap( ) actually swapped x and y locally
• But this doesn't mean that a and b were swapped.
Is there a way for the swap to work correctly?
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