# Module-1: Competitive Programming Complete Course: Basic C/C++ and Problem Solving

## Course Materials:

**Google Classroom Link:**
https://classroom.google.com/c/NjE0NjY5NTA1MjA3?cjc=s4f2v7r
**Youtube Playlist:**
https://youtube.com/playlist?list=PLoa_roVVsxA32nZVEzcZOcl0r8unKoU5t

## Class Assignment Contest Links:

**Vjudge Contest Link:** https://vjudge.net/contest/566680
**HackerRank Contest Link:**
https://www.hackerrank.com/contests/cpc-batch-2-module-1-assignment-contest/challenges
**Google Classroom:**
https://classroom.google.com/c/NjE0NjY5NTA1MjA3?cjc=s4f2v7r

## Class 1: Intro to the course and QnA

Class Link: https://youtu.be/18FR3vntWZ4

### 🎯 Discussed topics:

1. Introduction to the Course
2. Question and Answer

## Class 2:  Intro to Programming, Problem Solving, Competitive Programming

Class Link: https://youtu.be/CBhyVOfFcxg

### 🎯 Discussed topics:

1. Intro to Programming,
2. Problem-solving,
3. Competitive Programming

## Class 3:  Intro to Codeforces and LightOj

Class Link: https://youtu.be/kqFzGyooCb8

### 🎯 Discussed topics:

1. Intro to online judges
2. Intro to Codeforces
3. Intro to LightOJ

# Class 4:  Intro to Codeforces Contests

Class Link: https://youtu.be/e3V4LDx71zI

### 🎯 Discussed topics:
1. Intro to online judges
2. Intro to Codeforces contests

Slide link:
https://docs.google.com/presentation/d/1lT3dfiaPvvNtmDRGMN2uF6OzFkAD7RLb6AvQc8jRuFg/edit?usp=sharing

# Class 5: Intro to ACM ICPC and IUPC Contests

Class Link: https://youtu.be/gADkhfDBhz0

### 🎯 Discussed topics:
1. Onsite contests
2. ACM ICPC
3. IUPC

Slide link:
https://docs.google.com/presentation/d/1lT3dfiaPvvNtmDRGMN2uF6OzFkAD7RLb6AvQc8jRuFg/edit?usp=sharing

## Class 6: Write your first program "Hello World"

Class Link: https://youtu.be/YYotyBtxzhQ

### 🎯 Discussed topics:

1. Write your first program "Hello World"
https://www.beecrowd.com.br/judge/en/problems/view/1000

### 🎯 Discussed problem:

1. https://www.beecrowd.com.br/judge/en/problems/view/1000

Slide link:
https://docs.google.com/presentation/d/1lT3dfiaPvvNtmDRGMN2uF6OzFkAD7RLb6AvQc8jRuFg/edit?usp=sharing

## Class 7: Introduction to Data Types, variables, and Operators

Class Link: https://youtu.be/3GmYACXKTgo

### 🎯 Discussed topics:

1. Data types
2. Variables
3. int data type and its size
4. Operators (+, -, *, /)

## Class 8: Taking input using Scanf, More Data types, variables, and operators

Class Link: https://youtu.be/6vf9Uk8yIGE

### 🎯 Discussed topics:

1. Taking user input using the Scanf function
2. Data types (int, double, float, char, long long)
3. All essential data types and their sizes
4. Type casting

## Class 9: Practice problems on Data types, variables, and Operations

Class Link: https://youtu.be/V0fj0hlXyeA

### 🎯 Discussed topics:

1. Practice problems on Data types, variables, and Operations
2. Modulus operations

### 🎯 Practice Problems:

1. https://vjudge.net/contest/566680#problem/B
2. https://vjudge.net/contest/566680#problem/C
3. https://vjudge.net/contest/566680#problem/D
4. https://vjudge.net/contest/566680#problem/E
5. https://www.hackerrank.com/contests/cpc-batch-2-module-1-assignment-contest/challenges/class-6-a-task-1-a-addition-subtraction-and-multiplication
6. https://www.hackerrank.com/contests/cpc-batch-2-module-1-assignment-contest/challenges/class-7-a-task-1-a-solve-the-equation-i
7. https://www.hackerrank.com/contests/cpc-batch-2-module-1-assignment-contest/challenges/class-7-a-task-2-a-solve-the-equation-ii

## Class 10: Modulus Operation and its cyclic pattern, Decimal and Binary number system, and its properties

Class Link: https://youtu.be/fitP65qwpG8

### 🎯 Discussed topics:

1. Modulus Operations
2. Cyclic Pattern of Modulus operations
3. Decimal number system
4. Separate the digits of a decimal number using the mod operation
5. Get a decimal number using the digits
6. Binary number system
7. Separate the digits of a binary number using mod operations

### 🎯 Practice Problems:

1. https://atcoder.jp/contests/abc235/tasks/abc235_a?lang=en

## Class 11: +=, -=, *=, /=, %=, increment(++), decrement(--) and (&&, ||)

Class Link: https://youtu.be/puIQ4n8jwQY

### 🎯 Discussed topics:

1. More operators (+=, -=, =, /=, %= )
2. Increment, decrement
3. Pre increment / decreament
4. Post increment / decreament
5. Logical operators OR(||), AND(&&)

# Class 12: Bitwise Operations and Last Five Year ACM ICPC Preliminary Contests Easiest Problem

Class Link: https://youtu.be/1dAlewnHwhQ

### 🎯 Discussed topics:

1. Bitwise Operations and Last Five Year ACM ICPC Preliminary Contests Easiest Problem
2. Bitwise operators OR(|), AND(&), XOR(^)
3. Patterns in XOR
4. An interesting Google interview question with XOR

### 🎯 Discussed Problems:

1. https://algo.codemarshal.org/contests/icpc-dhaka-20-preli/problems/J ( 2020 )
2. https://algo.codemarshal.org/contests/icpc-dhaka-19-preli/problems/I (2019 )
3. https://algo.codemarshal.org/contests/icpc-dhaka-preli-18/problems/A (2018)
4. https://algo.codemarshal.org/contests/icpc-dhaka-preli-2017/problems/F (2017)
5. https://algo.codemarshal.org/contests/icpc-dhaka-2016-preli/problems/A (2016)

# Class 13: Conditions (if, else if, else) and Practice problems

Class Link: https://youtu.be/rq0jYPanhdk

### 🎯 Discussed topics:

Conditions (if, else if, else) and Practice problems

### 🎯 Practice Problems:

1. https://codeforces.com/gym/104491/problem/C
2. https://codeforces.com/group/MWSDmqGsZm/contest/219158/problem/I

## Class 14: Practice problems on if-else conditions

Class Link: https://youtu.be/AzRPnNihb5w

### 🎯 Discussed topics:

1. Practice problems on condition
2. ASCII value of char
3. char to ASCII-type casting
4. Decision in range

### 🎯 Discussed Problems:

1. https://codeforces.com/group/MWSDmqGsZm/contest/219158/problem/K
2. https://codeforces.com/group/MWSDmqGsZm/contest/219158/problem/M
3. https://vjudge.net/problem/AtCoder-abc148_a
4. https://vjudge.net/problem/Aizu-ITP1_2_C
5. https://vjudge.net/problem/Aizu-ITP1_2_B
6. https://vjudge.net/problem/Aizu-ITP1_2_A

## Class 15: How to think of the scenario not the test case

Class Link: https://youtu.be/1E9OFi9IgHE

### 🎯 Discussed topics:

1. Think scenario not test case
2. https://codeforces.com/problemset/problem/4/A
3. https://atcoder.jp/contests/abc149/tasks/abc149_b

### 🎯 Discussed Problems:

1. https://codeforces.com/problemset/problem/4/A
2. https://atcoder.jp/contests/abc149/tasks/abc149_b

# Class 16: Introduction to Loops

Class Link: https://youtu.be/d8cy-8mdVbU

### 🎯 Discussed topics:

1. How human brain works on a loop
2. How human brain strategy is used in for loop
3. For loop
4. While loop
5. continue keyword in the loop
6. break keyword in the loop
7. Infinite loop

# Class 17: Practice Problems of loop

Class Link: https://youtu.be/0AWurCwgdWY

### 🎯 Discussed topics:

1. Do while loop
2. How to process test cases
3. When to use for loop and while loop for test case
4. Take input until a specific condition
5. What is infinite value and how to use it
6. Take maximum from a list
7. Take a minimum from a list
8. Practice problems of loop

### 🎯 Vjudge Contest Problem:

https://vjudge.net/problem/Aizu-ITP1_3_A
https://vjudge.net/problem/LightOJ-1001
https://vjudge.net/problem/Aizu-ITP1_3_B
https://lightoj.com/problem/greetings-from-lightoj
https://vjudge.net/problem/Aizu-ITP1_3_C
https://vjudge.net/problem/Aizu-ITP1_4_C
https://vjudge.net/problem/Aizu-ITP1_4_D

### 🎯 Google Classroom Task:

https://lightoj.com/problem/dimik-factorial
https://lightoj.com/problem/dimik-descending-number
https://lightoj.com/problem/dimik-run-rate-1
https://lightoj.com/problem/dimik-small-to-large
https://lightoj.com/problem/dimik-summation
https://lightoj.com/problem/dimik-even-odd-1

## Class 18: Nested Loops and More practice problems on loop

Class Link: https://youtu.be/iOzUT_0TCbE

### 🎯 Discussed topics:

1. Nested loops
2. Nested if-else
3. 2D Grid
4. Print 2D Grid
5. Print 2D Grid Dimension

### 🎯 Discussed Problems:

1. https://vjudge.net/problem/Aizu-ITP1_5_A
2. https://vjudge.net/problem/Aizu-ITP1_5_B
3. https://vjudge.net/problem/Aizu-ITP1_5_C
4. https://lightoj.com/problem/opposite-task
5. https://atcoder.jp/contests/abc151/tasks/abc151_b?lang=en

# Class 19: Practice problems of loop

Class Link: https://youtu.be/HarEaMILD0E

### 🎯 Discussed topics:

1. Check is a number perfect square
2. Count the number of divisors
3. Sum of digits of a number

### 🎯 Discussed Problems:

1. https://codeforces.com/contest/1560/problem/A
2. https://www.hackerrank.com/contests/cpc-batch-2-module-1-assignment-contest/challenges/class-13-aa-task-1-aa-is-perfect-square-i
3. https://www.hackerrank.com/contests/cpc-batch-2-module-1-assignment-contest/challenges/class-13-aa-task-2-aa-count-number-of-divisors-i

# Class 20: Introduction to Array

Class Link: https://youtu.be/8dztljQlsbA

### 🎯 Discussed topics:

1. What is an array
2. How to declare an array
3. How does an array work same as a declaration of a series of variables
4. How to input the array
5. How to process an array
6. How to output an array
7. Best way to declare an array
8. Global variables
9. Constant variables
10. Memory Complexity Analysis

## Class 21: Practice Problems on Array

Class Link: https://youtu.be/HoCnxXw9LvI

### 🎯 Discussed topics:

1. How to use an array as a map
2. How to count frequency using an array
3. Pre-calculation 4. Reverse an Array

### 🎯 Discussed problems:

1. https://atcoder.jp/contests/abc236/tasks/abc236_b?lang=en
2. https://vjudge.net/problem/Aizu-ITP1_6_A
3. https://vjudge.net/problem/Aizu-ITP1_6_B
4. https://vjudge.net/problem/CSES-1083
5. https://atcoder.jp/contests/abc235/tasks/abc235_b?lang=en

## Class 22: Multidimensional array and its practice problems

Class Link: https://youtu.be/qKEcMRBsx14

### 🎯 Discussed topics:

1. 2D array
2. 3D array
3. Input Grid
4. Process Grid
5. Output Grid
6. Matrix multiplication using a 2D array
7. Practice problems of 2D array

### 🎯 Discussed problems:

1. https://codeforces.com/group/MWSDmqGsZm/contest/219774/problem/S
2. https://codeforces.com/group/MWSDmqGsZm/contest/219774/problem/T
3. https://codeforces.com/group/MWSDmqGsZm/contest/219774/problem/W
4. https://vjudge.net/problem/Aizu-ITP1_6_D

## Class 23: String and Practice problem of string

Class Link: https://youtu.be/70-xZMEO0pQ

### 🎯 Discussed topics:

1. char to Digit conversion
2. Digit to char conversion
3. char indexing
4. char mapping
5. sum of digits
6. char count

### 🎯 Discussed problems:

https://codeforces.com/group/MWSDmqGsZm/contest/219856/problem/F
https://codeforces.com/group/MWSDmqGsZm/contest/219856/problem/E
https://codeforces.com/group/MWSDmqGsZm/contest/219856/problem/J

# Class 24: Practice Problems on string and char grid

Class Link: https://youtu.be/NMR3hFsaqDk

## 🎯 Discussed topics:

1. Reverse string
2. Check if a string is palindrome or not
3. Given a string make it palindrome if possible
4. Given two strings check whether the strings are anagrams or not
5. BruteForce
6. Check a pattern exists in a string using the Bruteforce method
7. Checking grid property using the BruteForce method

## 🎯 Discussed problems:

https://atcoder.jp/contests/abc233/tasks/abc233_b?lang=en

https://cses.fi/problemset/task/1755

https://codeforces.com/group/MWSDmqGsZm/contest/219856/problem/H

https://codeforces.com/group/MWSDmqGsZm/contest/219856/problem/I

https://codeforces.com/group/MWSDmqGsZm/contest/219774/problem/X

# Class 25: Introduction to Bruteforce and Constructive Algorithm

Class Link: https://youtu.be/BLg5dKK5mKU

### 🎯 Discussed topics:

1. Bruteforce
2. Why we can't always use Bruteforce
3. Constructive algorithm

### 🎯 Discussed problems:

1. https://codeforces.com/problemset/problem/304/A
2. https://atcoder.jp/contests/abc234/tasks/abc234_b
3. https://cses.fi/problemset/task/1070/
4. https://codeforces.com/problemset/problem/199/A

# Class 26: Introduction to Greedy

Class Link: https://youtu.be/hI1-JKdUYJM

### 🎯 Discussed topics:

1. Greedy
2. Knapsack problem greedy solution
3. 0-1 Knapsack Problem
4. 0-1 knapsack can't solve using greedy

### 🎯 Discussed problems:

1. https://codeforces.com/contest/514/problem/A
2. https://codeforces.com/contest/1207/problem/A
3. https://cses.fi/problemset/task/1094

# Class 27: Time Complexity Analysis

Class Link: https://youtu.be/kkHV9aeIOgk

## 🎯 Discussed topics:

1. Constant time complexity O(1)
2. Big O notation
3. Constant factor
4. Constant factor effect
5. Polynomial time Complexity (n^a)
6. Linear Time Complexity O(n)
7. O(n^2)
8. O(n^3)
9. O(T*n^3)
10. O(sqrt(n))
11. O(log2(n))
12. Exponential time complexity O(a^n)
13. O(2^n)

## 🎯 References:

1. http://www.shafaetsplanet.com/?p=1313

## Class 28: Introduction to user-defined function

Class Link: https://youtu.be/8w6TM-hb9ow

### 🎯 Discussed topics:

1. Introduction to Function
2. Implement some important functions
3. swap, min, max
4. call by value
5. call by reference
6. Implement pow() function
7. Implement reverse function
8. Implement isPalindrom function

## Class 29: Start C++ Programming

Class Link: https://youtu.be/KTLjtkNUlYQ

### 🎯 Discussed topics:

1. Start C++
2. Take input using cin/cout
3. Make cin/cout faster
4. Set precision
5. #define
6. typedef

**Template:** https://paste.ubuntu.com/p/G6wBD64Gzc/