Course Introduction

Data Structures & Algorithms I (DSA - I)

and

DSA - I LABORATORY

COURSE INSTRUCTOR

SY – DIVISION I

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FIRST THINGS FIRST..

- CRs, please form Division wise WhatsApp groups with respective instructor and both CRs as Admin.
- Name the groups as DSA-I Division I / II 2023
- Please join 'Data Structures and Algorithms - I -odd-sem-23-24' course on Moodle

- WhatsApp will be used for quick, important, and urgent communication relevant to subject only!
- Please avoid 1:1 communication on WA unless confidential !!

ABOUT MOODLE

Online educational content management system

http://moodle.coep.org.in

Moodle will be used for: Discussion Forum

Sharing literature: Syllabus, Textbooks, ppts, pdfs etc

Conducting Online Tests and Quizzes (if any) Submission of Assignments and Project etc.

DO NOT FORGET YOUR MOODLE PASSWORD

Let’s discuss the course

DSA- I Theory

2 Lectures / Week.

(Total 2 hours)

Credits – 2

Total Marks : 100

DSA- I Laboratory

1 Lab /Week

(Total 2 hours)

Credits – 1

Total Marks : 100

LAB SESSIONS

- Every week 1 Lab assignment and 7 days' time to submit it on Moodle
- Late submission will be evaluated out of 50%
- You can start working on the assignment as soon as it is uploaded on Moodle.
- All assignments will be evaluated and marked.
- Follow all instructions for naming your assignments files
- During the Lab Sessions – Instructor will explain the assignment requirements, help solve a specific error etc.

GRADING SCHEME: THEORY (2 CREDITS)

T1 and T2	40 Marks
End Semester Examination	60 Marks
TOTAL	100 Marks

GRADING SCHEME: LAB (1 CREDIT)

Lab Work	Marks
Practical Assignments	40 Marks
Practical Oral Exam	20 Marks
End Sem Practical Exam	20 Marks
Attendance, Quiz, etc	20 Marks
Total	100 Marks

Lab assignments for any week, will be based on lectures of preceding weeks

2 Hours of Lab: NOT to be used for coding only, but for evaluation and discussing your problems.

Marks may be increased/decreased by instructor for each criteria during semester.

IMPORTANT...

- DSA- I syllabus is vast, we would like to take **extra lectures** whenever possible. CRs are requested to intimate us if any other subject lecture is cancelled, if possible we would like to engage those.

- Don't ask take permission if you want to be absent, just maintain the necessary attendance. Its your responsibility!!

- The lecture will be conducted unless announced by us in advance.

NON-RULES (ADVISE)

- Ask Questions !
- Ask doubts !
- Use the discussion forum on Moodle course page for asking help and helping others.

Asking questions is THE way to learn

WHAT WILL YOU LEARN IN DATA STRUCTURES AND ALGORITHMS?

Informally!! Organizing Data in a Structured Manner using Programming Language

WHAT WILL YOU LEARN IN THIS COURSE

In computer science, a data structure is a data organization, management, and storage format that enables efficient access and modification. More precisely, **a data structure is a collection of data values, the relationships among them, and the functions or operations that can be applied to the data.**

-Wikipedia

WHAT WILL YOU LEARN IN THIS COURSE

- Designing and implementing data structures: Variety of implementations and new data structures their Applications
- A “new” approach to programming
- “Object Based” way of C Programming
- “Higher level” programming in C
- Good programming practices
- Modular programming
- Writing Abstract Data Types

THE MILLION ₹ QUESTION

Why should I study DSA ?

THE MILLION ₹ QUESTION

- Why should I study DSA ?
- Data structures is a foundation course.
- It has applications in almost all Computer Engineering Courses
- Being Computer Engineers, programming is supposed to be your bread-and-butter (and cake !)
- (2 Theory + 1 Lab) * 2 , total 6 credit course! (both sem)

Data Structures + One Language = JOB !

BOOKS: THEORY

- **The C Programming Language**
  - By Kernighan and Ritchie
  - Published by Prentice Hall of India
  - Price: Nearly 130 Rs (pdf available on Moodle)
- **Fundamentals of Data Structures in C, second edition**
  - By Horowitz, Sahni, Anderson-freed
  - Published by University Press
  - Price: Around 300 Rs.

BOOKS: REFERENCE

- How to solve it by Computer
  - By R G Dromey
  - Published by Prentice Hall of India
  - Price: Around 100 Rs.
- http://c-faq.com
- http://www.gowrikumar.com

OTHER STUDY MATERIAL

- Your own class notes
  - We will not provide you notes!
- Some power point presentations
- Programs written in class, available on moodle
- Lots of problems to be solved

LABORATORY
FREE AND OPEN SOURCE SOFTWARE (FOSS) LAB

- Third floor of Electronics extension building
- No laptops in the lab
- Keep the chairs and all computer hardware in place

OR

CODEBLOCKS in Windows OS / online mode

PROGRAMMING ENVIRONMENT

- **Linux**
  - Practical working environment
  - Get it installed on your PC
- **GCC**
  - A compiler on Linux

OR

GCC Compiler – Windows

THINGS NOT TO BE DONE

- Turbo C
  - Ancient compiler, generates lousy machine code, notused for any serious work
- Windows
  - Learn programming the programmer's ways
- Local author's text books !
  - Better books → Better capabilities
- "Let us C"
  - Discouraged!

LECTURES PLAN

- Detailed lecture plan will be made available on Moodle
- One topic in one – two weeks

Rough week-wise outline on right side

- Assignments based on the discussion of current week, will be given in the next week

C

Files

Algorithm Design

Time Complexity

List

Stack

Queue

Searching Sorting Applications

WE FOCUS ON

- Logic development
- Concepts of Data structures
- Efficient programs

FEW WORDS ABOUT CHOICE OF PROGRAMMING LANGUAGE

- **C : not an ideal choice to teach data structures**
  - Messy world of pointers
  - Too much power in the hands of the programmer

→ Too many pitfalls → Need to focus more on language than the Data Structure concept

  - Badly designed I/O (printf, scanf, …)
  - Not a high level language
- Can't understand language features fully without asking questions about the "system"

WHY ‘C’ THEN?

Python code to sort integers

```
numbers = [1, 3, 4, 2]
numbers.sort()
```

LOT of WORK !!

C Code to sort integers

```
#include <stdio.h>
    void main()    {
        int i, j, a, n, number[30];
        prIntf("Enter the value of N \n");
        scanf("%d", &n);
        printf("Ente r the numbers \n");
        for (i = 0; i < n; ++i)
            scanf("%d", &number[i]);
        for (i = 0; i < n; ++i) {
        for (j = i + 1; j < n; ++j)  {
                if (number[i] > number[j])
            // 20 line more !!
```

FEW WORDS ABOUT CHOICE OF PROGRAMMING LANGUAGE

- Still, Why 'C' ?
  - So-called "demand"
  - If not the ideal, not a bad choice either
  - Can be treated as a high level language
  - Less number of available data types make you work more :-D

EMPHASIS ON "TEACHING C"

- Data structures concepts can be learnt in many languages, and even without a programming language
- However for a beginner, the "tool" in inseparable from the "concept"
- So we will teach C concepts also in class
- **You are expected to learn beyond class room teaching!**

Your tools influence and shape your thinking

- Edsger Dijkastra

COURSE OUTCOMES: YOU SHOULD BE ABLE TO

- Proficient in the use of C language, using established coding standards, to solve real life problems using computers
- Able to implement the most important data structures with varying possible implementations
- Typically 100-200 lines of code
- Understand factors that impact the performance of programs
- Algorithms and their analysis
- Design data structures and algorithms for real life applications
- Typically 500 to 1000 lines big code

THREE TECHNIQUES OF LEARNING PROGRAMMING

Write Programs !

Write Programs !!

On paper first!

SOME GOOD PRACTICES

- Learn Typing !
  - That's your first informal assignment!
- Use Pencil and Eraser!
- Run your program on paper first
  - Type it and it should just run, no debugging!
- Don't use the debugger
  - gdb – one of the best tools available!

KERNIGHAN'S LAW

"Debugging is twice as hard as writing the code in the first place.

Therefore, if you write the code as cleverly as possible, you are, by definition, not smart enough to debug it."

LAB REGULAR ASSIGNMENTS

- Time for submission
  - 7 days, evaluated
- Late submission
  - To be evaluated out of 50% marks for the assignment
  - No argument will be entertained for late submission.

Marks are at evaluator's discretion.

- Any attempt to copy from your friends or web or other sources will result in expulsion from the course

LAST BUT NOT THE LEAST

Life is bigger than being a programmer!