



Introduction

Instructors:  
Abir Das and  
Sourangshu  
Bhattacharya

Introduction

Syllabus

# CS20202: Software Engineering - Introduction

Instructors: Abir Das and Sourangshu Bhattacharya

Department of Computer Science and Engineering  
Indian Institute of Technology, Kharagpur

*{abir, sourangshu}@cse.iitkgp.ac.in*

Slides taken from NPTEL course on Programming in C++  
by Prof. Partha Pratim Das



# Software Engineering

## Introduction

Instructors:  
Abir Das and  
Sourangshu  
Bhattacharya

## Introduction

## Syllabus

- A crucial component of Software Engineering is software development – writing programs.
- Programming paradigms help in writing programs:
  - **Procedural programming**: Data and procedures are separate. Procedures act on data to achieve functionality.
  - **Functional programming**: Functions are first class members, and are composed with each other to achieve a desired function which is then applied on the input data.
  - **Object-oriented programming**: Data and related functions are grouped into objects. Objects interact with each other to achieve the desired functionality.



# Object-oriented programming

## Introduction

Instructors:  
Abir Das and  
Sourangshu  
Bhattacharya

## Introduction

## Syllabus

- Most suited for development of large and complex software systems.
- Many popular programming e.g. C++, Java, Python, etc support this style.
  - These languages also support procedural, and functional programming to some extent.
- C++ is popular for:
  - System programming.
  - Writing high performance programs.
  - Feature rich – good for learning tools.
  - (Negative) Programs can be large.



# OOP concepts

## Introduction

Instructors:  
Abir Das and  
Sourangshu  
Bhattacharya

## Introduction

## Syllabus

- **Objects** and **Classes** – user defined data types.
- **Encapsulation** – Data hiding – Data is hidden inside objects and accessed through member functions or methods.
- **Composition** – objects can contain other objects
- **Inheritance** – objects can borrow properties of other objects
- **Polymorphism** – the function executed depends on the type of objects.



# OOP with C++

## Introduction

Instructors:  
Abir Das and  
Sourangshu  
Bhattacharya

## Introduction

## Syllabus

- Tentative list of features and their applicability:
  - Procedural enhancements in c++ over c
  - Classes
  - Overloading
  - Inheritance
  - Type casting
  - Exceptions
  - Templates



# List of Topics

## Introduction

Instructors:  
Abir Das and  
Sourangshu  
Bhattacharya

## Introduction

## Syllabus

- Procedural Extensions over C in C++
  - Constants and inline functions
  - Reference and pointers
  - Default Parameters Function Overloading
  - Operator overloading
  - Dynamic Memory Management
- Object-oriented Programming in C++
  - Classes and objects
  - Access specifiers
  - Constructor, destructor, object lifetime
  - Copy Constructor and Copy Assignment Operator
  - Const-ness
  - Static Members
  - Friend Function and friend Class
  - Operator overloading for user defined types



# List of Topics

## Introduction

Instructors:  
Abir Das and  
Sourangshu  
Bhattacharya

## Introduction

## Syllabus

- Advanced OOP
  - Inheritance
  - Polymorphism
  - Virtual Functions
  - Type casting
  - Exceptions
  - Function template, Class template
  - Standard Template Library
- Software development life cycle
  - SDLC: Goals, Benefits, Stages
  - SDLC: Models - waterfall, v-shaped, Spiral, Agile
  - SDLC: Testing
- Software Testing
  - Testing: Fundamentals, Black-box, White box
  - Testing: Debugging, Regression, Unit, Integration,
  - Testing / Design Pattern



# List of Topics

Introduction

Instructors:  
Abir Das and  
Sourangshu  
Bhattacharya

Introduction

Syllabus

If time permits:

- Design Pattern
  - Design Pattern: Iterator, Command, Singleton
  - Design Pattern: Factory, Abstract, Visitor
- Software Project Management
- Smart Software Engineering
- Summarisation





# Marks Distribution and Logistics

## Introduction

Instructors:  
Abir Das and  
Sourangshu  
Bhattacharya

## Introduction

## Syllabus

- Class tests - 20% marks
  - Tentative Dates: 17<sup>th</sup> Jan, 7<sup>th</sup> Feb, and 4<sup>th</sup> April
- Mid-sem - 30% marks
- End-sem - 50% marks
- No graded Assignments, but practise problems - important to solve yourself

## Logistics:

- Course website (<https://cs20202sp22.github.io/>) will provide announcements and course materials
- Students with odd Roll Numbers will go to NR313 and those with even Roll Numbers should go to NR314.
- Class tests will be held physically.



# References

Introduction

Instructors:  
Abir Das and  
Sourangshu  
Bhattacharya

Introduction

Syllabus

- Roger S Pressman, **Software Engineering: A Practitioner's Approach**, 7th Edition, McGraw Hill Education, 2009.
- Rajib Mall, **Fundamentals of Software Engineering**, Prentice Hall India, 2014
- Bjarne Stroustrup, **The C++ Programming Language**, 4th Edition, Addison-Wesley, 2013
- Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, **Design Patterns: Elements of Reusable Object-Oriented Software**, Addison Wesley, 1994



## Introduction

Instructors:  
Abir Das and  
Sourangshu  
Bhattacharya

Introduction

Syllabus

Thanks !  
Questions ?