



Introduction

Instructors:
Abir Das and
Sourangshu
Bhattacharya

Introduction

Syllabus

CS20202: Software Engineering - Introduction

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



Software Engineering

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- 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

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- 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

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- **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++

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



List of Topics

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- 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

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- 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

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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

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- Class tests - 20% marks
 - Tentative Dates: 16th Jan, 7th Feb, and 2nd April
- Mid-sem - 30% marks
- End-sem - 50% marks
- No graded Assignments, but practise problems - important to solve yourself

Logistics:

- Course website (https://cse.iitkgp.ac.in/~sourangshu/coursefiles/cs20202_2024s.html) will provide announcements and course materials
- Students with odd Roll Numbers will go to NC343 and those with even Roll Numbers should go to NC344.
- Class tests will be held physically.



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- 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



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Thanks !
Questions ?