

*Generic Syllabus of **Programming Basics***

Introduction to Basics of Programming

– from Scratch without Prior Programming Experiences –

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This “**generic syllabus**” is designed to be independent of a programming language used. It should be customized by a coach for a particular programming language that the coach chooses.

Items	weeks
0. Getting Ready for Programming (Environment Setup)	2
• Install IDE (including a compiler or an interpreter)	
• Play with Sample Codes	
• How to Debug Sample Erroneous Codes (Troubleshooting with IDE)	
1. Project	5
Comprehend the Project Explained by a Coach	
Do the Following for the Requirements Specifications of the Product to Be Delivered	
(a) Clarify the Comprehension of Requirements Specifications Acquired from the Coach’s Explanation)	
(b) Design a User Interface	
(c) Decompose the Product into Modules	
(d) Design Algorithms (including recursion if possible) & Data Structures	
(e) Implementation (Coding & In-Line Comments & Debugging & Testing)	
(f) Documentation & Review	
While working on (b) and (c), move onto the following concurrently and asynchronously.	
2. Sub-Goal: How to Process Numbers with Standard I/O and Math Library	4
(a) How to Import Libraries	
(b) Input from Console (Keyboard)	
(c) Output to Console (Monitor)	
(d) Branches (if-then and if-then-else)	
(e) Loops (for and while)	
(f) Calls (function and procedure)	
(g) Arguments, Types, and Parameter Passing Mechanisms	
(h) Debugging Sample Erroneous Codes	
Coach may introduce object classes & libraries related to the following tasks.	

- Task 1.1: Determine Whether a Positive Integer n Given from Keyboard Is a Prime Number
- Task 1.2: Enumerate & Display Prime Numbers between 2 and a Upper Bound K Given from Keyboard
- Task 1.3: Display a Line Chart for a Sequence of Real Numbers Given from Keyboard
- Task 1.4: Draw a Graph of a Quadratic Function $b + cx + dx^2$ in a Graphics Window for Coefficients b, c, d and an Interval between s and t Given from Keyboard
- Task 1.5: Display the Next Prime Number Larger than an Integer Given from Keyboard

3. **Sub-Goal: *How to Process Characters, Strings and Files*** 4

- File Open, Close, and I/O (Read & Write)
- Class String and String Operations

- Task 2.1: Create & Display an Instance of Class “String” from a Text File
- Task 2.2: Compare to Determine Whether Two Given Strings Are Equal (i.e., Identical)
- Task 2.3: Define Class Name, Compare Two Given Names to Determine Which Precedes Another
- Task 2.4: Search a Given String as a Substring in Another Given String
- Task 2.5: Sort ”Full Names” in a Given Text File with the Delimiter $\backslash n$ Full names are assumed in the format “Last, First Middle”
- Task 2.6: Display a Chart for Tab-Delimited Data in a Given Text File
- Task 2.7: Convert a Text File Located at a URL Given from Keyboard into a Sequence of Hexadecimal Symbols by Converting Each Character of the Text File into 8-bit Binary String and Save the HEX String into a File

4. **Sub-Goal: *Classes, Subclasses, and Inheritances*** 3

- How to Define a New Class
- How to Define a Subclass of the Existing Class
- Sample Classes and Subclasses
- Modular Structures and Object-Oriented Programming

- Task 3.1: Create an Object Class “FullName” for Full names from Class String
- Task 3.2: Create an Object Class “PhoneNo” for phone numbers with possibly a country code
- Task 3.3: Add Constructors of FullName and PhoneNo that Instantiate from Keyboard Input and Embed “Input Sanitization” (aka ”Input Validation”) into the Constructors

5. **Cross-Evaluation (Co-Learning)** 2

- Code Review by Peers (Other Trainees)
- Testing by Peers
- Revisions by Author
- Performance Evaluation by Peers

Extra: Have Trainees Participate in *CodeChef* Contests or *TopCoder SRM* Competitions

- <https://www.codechef.com/contests>
- <https://www.topcoder.com/community/arena>

Example Project (Coach May Create a New Project):

Input from Keyboard: Text file’s name [Option: Allow a “relative path” to the file]

The text file is in the format that Microsoft Excel exports in CSV (Comma Separated Value) and hence trainees need to understand the format first.

Output on a graphics window: Display a 2D chart (maybe, multiple lines) of the data with automatic scaling on y-axis