



IIT Madras
BSc Degree

Programming in Python

This is an online textbook on Python and is a companion resource to the course **Programming in Python** offered as a part of the Online Degree Program, IIT-Madras. For more details about the course, check out our [website](#).

Note to students: This book is meant to be used as a reference. You may find content that has not been covered in the video lectures. Likewise, there may be some content that is present in the lectures which is not covered here. Additional content appearing in this book will not be considered for grading. In summary, please refer to chapters that you feel are relevant for the course. But you are under no obligation to read the entire book cover to cover. Interested students are always welcome to read the entire thing!

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Chapter-0: Warm-up

[Lesson-0](#)

Chapter-1: Introduction to Python

[Lesson-1.1](#)

- Python shell | Replit Console
- Prompts | Output
- Emojis
- Literals and Variables
- Basic Data types | type()
- Comments

[Lesson-1.2](#)

- Operators
- Convention
- Expressions
- Type of Expressions

[Lesson-1.3](#)

- Arithmetic Expressions
- Boolean Expressions

[Lesson-1.4](#)

- Replit Editor
- Errors | Debugging
- Exceptions
- Wrong Code Snippets

[Lesson-1.5](#)

- Strings
 - Quotes
 - Length
 - Operations
 - Escape Characters
 - Substrings

[Lesson-1.6](#)

- Strings
 - Indexing
 - Slicing
 - Immutability
 - Methods

Chapter-2: Conditionals

[Lesson-2.1](#)

- Variables | Assignment operator | Dynamic Typing
- Referencing versus Defining | Keywords and Naming Rules
- Reusing Variables | Multiple Assignment | Deleting Variables

[Lesson-2.2](#)

- Input
- Type Conversion | Built-in Functions

[Lesson-2.3](#)

- Conditional Statements
 - `if`
 - `if-else`
 - `if-elif-else`
- Nested Conditional Statements
- Defining Variables inside `if`

[Lesson-2.4](#)

- System libraries

- `calendar`
- `time`
- `this`

Chapter-3: Loops

[Lesson-3.1](#)

- `while` loop
- `break`, `continue`

[Lesson-3.2](#)

- `for` loop
- `range()`
- Iterating through Strings

[Lesson-3.3](#)

- Nested loops
- `while` versus `for`
- `print`
 - `end`
 - `sep`

[Lesson-3.4](#)

- Formatted printing
 - f-strings
 - `format()`
- Format Specifiers

[Lesson-3.5](#)

System libraries

- `math`
- `random`

[Lesson-3.6](#)

Mathematics and Programming

- Limits
- Recurrence relations
- Rational approximation

Chapter-4: Functions

[Lesson-4.1](#)

- Introduction
- Examples

[Lesson-4.2](#)

- Arguments
 - Positional Arguments
 - Keyword Arguments
 - Default Arguments
- Call by Value

[Lesson-4.3](#)

- Scope
 - Local
 - Global
- Namespaces
 - locals
 - globals
- Scope and Namespaces

[Lesson-4.4](#)

- Recursion
- Caution in Recursion

Chapter-5: Lists and Tuples

[Lesson-5.1](#)

- Lists
 - Introduction
 - Iterating through Lists
 - Growing a List
 - Operations on Lists
 - Useful Functions

[Lesson-5.2](#)

- Lists
 - Mutability
 - Call by Reference

[Lesson-5.3](#)

- Lists
 - Simulating an IPL Innings

[Lesson-5.4](#)

- Lists
 - List Methods
 - Stack and Queue
 - Strings and Lists
 - `split`
 - `join`

[Lesson-5.5](#)

- Lists
 - Nested Lists
 - Matrices
 - Shallow and Deep Copy

[Lesson-5.6](#)

- Tuples
 - Introduction
 - More on Tuples
 - Lists and Tuples
 - Packing and Unpacking

Chapter-6: Dictionaries and Sets

[Lesson-6.1](#)

- Dictionaries
 - Introduction
 - Examples
 - Iterating over Dictionaries
 - Growing a Dictionary
 - Mutability

[Lesson-6.2](#)

- Text Processing
 - Number of Sentences
 - Number of Words
 - Number of Unique Words
 - Frequent Words

[Lesson-6.3](#)

- Dictionaries
 - Pangrams and Dictionaries
 - Dictionary Methods

[Lesson-6.4](#)

- Dictionaries in Action: LMS
 - Assignment Model
 - Submission Model
 - Grader

[Lesson-6.5](#)

- Sets
 - Introduction
 - Iterating over Sets
 - Growing Sets
 - Set Operations

Chapter-7: File Handling

[Lesson-7.1](#)

- File Handling
 - Why Files
 - File Handling

[Lesson-7.2](#)

- File Handling
 - Creating a file in Replit
 - Opening and Reading from a file
 - Writing to a file

[Lesson-7.3](#)

- File Handling
 - File object analogy
 - Mode

[Lesson-7.4](#)

- File Handling
 - File methods
 - `read`

- `readline`
- `readlines`
- `write`
- `writelines`

[Lesson-7.5](#)

- File Handling
 - CSV files
 - Reading a CSV file
 - Files to Collections

Chapter-8: Object Oriented Programming

[Lesson-8.1](#)

- Objects and Classes
- OOP in Python: an example

[Lesson-8.2](#)

- Classes and Objects
- `self`
- Class Attributes vs Object Attributes

[Lesson-8.3](#)

- Inheritance
- Concrete Example
- Parent-child relationship
- Method Overriding

[Lesson-8.4](#)

- Vector: Mathematical Preliminaries
- Vector: Specification
- Vector: Definition
- Collection of Vectors