

# Computer Science: Programming in Java

- Coursera (Princeton): [Programming with a Purpose](#)
- Princeton [COS216](#)

Indeling van onderwerpen volgt Coursera.

## 1. Basic Programming Concepts

- Why programming?
- Program development
- Built-in datatypes
- Type conversion

### Assignments

#### COS126

- [Hello, World](#)
- Implement five programs:
  - HelloWorld.java
  - HiFour.java
  - Ordered.java
  - GreatCircle.java
  - RGBtoCYMK.java
- There are two optional challenges:
  - DeluxeOrdered.java
  - DeluxeRGBtoCYMK.java

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- [Hello, World](#)
- [FAQ](#)
- Implement five programs:
  - HelloWorld.java
  - HelloGoodbye.java
  - RightTriangle.java
  - GreatCircle.java
  - CMYKtoRGB.java

## 2. Conditionals and Loops

- Conditionals: the if statement
- Loops: the while statement
- An alternative: the for loop
- Nesting

- Debugging

## Assignments

### COS216

- **Conditionals & loops**
- Implement four programs:
  - Bits.java
  - NoonSnooze.java
  - RandomWalker.java
  - RandomWalkers.java
- There is one optional challenge:
  - DeluxeNoonSnooze.java

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- **Conditionals & loops**
- Implement four programs:
  - GeneralizedHarmonic.java
  - BandMatrix.java
  - RandomWalker.java
  - RandomWalkers.java

## 3. Arrays

- Typical array processing
- Two-dimensional arrays

## Assignments

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- **N-Body**
- Implement a single class:
  - NBody.java
- There are two optional challenges:
  - deluxe-universe.txt
  - DeluxeNBody.java

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- **Arrays**
- Implement four programs:
  - DiscreteDistribution.java
  - ThueMorse.java

- Birthday.java
- Minesweeper.java

## 4. Input and Output

- Standard input and output
- Standard drawing
- Fractal drawing
- Animation

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- **Input and Output**
- Implement four programs:
  - ShannonEntropy.java
  - Checkerboard.java
  - WorldMap.java

## 5. Functions and Libraries

- Case study: Digital audio
- Application: Gaussian distribution
- Modular programming and libraries

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- **Conjunction Function**
- Implement:
  - AudioCollage.java

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- **Functions**
- Implement four programs:
  - ActivationFunction.java
  - Divisors.java
  - AudioCollage.java

## 6. Recursion

- A classic example
- Recursive graphics
- Avoiding exponential waste

- Dynamic programming

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- **Recursive Graphics**
- Implement three functions:
  - Transform2D.java
  - Sierpinski.java
  - Art.java

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- **Recursion**
- Implement four programs:
  - TrinomialBrute.java
  - TrinomialDP.java
  - RevesPuzzle.java
  - RecursiveSquares.java

## **7. Performance**

- Empyirical analysis
- Mathematical models
- Doubling method

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- **Performance**
- Implement three programs
  - Inversions.java
  - Ramanujan.java
  - MaximumSquareSubmatrix.java

## **8. Abstract data-types**

- Image processing
- String processing

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- **Using data types**
- Implement two programs:

- `Huntingtons.java`
- `KernelFilter.java`

## 9. Creating data types

- Point charges
- Turtle graphics
- Complex numbers

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- [Creating data types](#)
- Implement two programs:
  - `ColorHSB.java`
  - `Clock.java`

## 10. Programming languages

- Popular languages
- Java in context
- Object oriented programming
- Type checking
- Functional programming

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- [Bar Chart Racer](#)

## Oefenopgaven

- Replit [Java Exercises](#)
- [CodingBat](#)