uCertify

Course Outline

Algorithms For Beginners

05 Oct 2024

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1. Course Objective

The Algorithms For Beginners course helps you explore fundamental algorithmic concepts, such as time complexity, sorting techniques, and recursive problem-solving. With this course you will learn how to design, analyze, and implement efficient algorithms to tackle a wide range of real-world challenges. Additionally, you'll have the skills and confidence to apply algorithmic principles to your own projects, setting you up for success in any coding-centric career or further studies in computer science.

2. Exercises

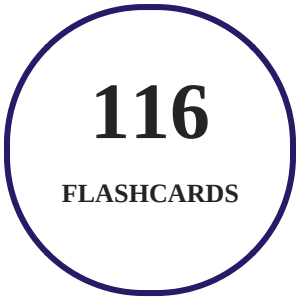
There is no limit to the number of times learners can attempt these. Exercises come with detailed remediation, which ensures that learners are confident on the topic before proceeding.

3. Quiz

Quizzes test your knowledge on the topics of the exam when you go through the course material. There is no limit to the number of times you can attempt it.

4. flashcards

Flashcards are effective memory-aiding tools that help you learn complex topics easily. The flashcard will help you in memorizing definitions, terminologies, key concepts, and more. There is no limit to the number of times learners can attempt these. Flashcards help master the key concepts.



5. Glossary of terms

uCertify provides detailed explanations of concepts relevant to the course through Glossary. It contains a list of frequently used terminologies along with its detailed explanation. Glossary defines the key terms.

6. Expert Instructor-Led Training

uCertify uses the content from the finest publishers and only the IT industry's finest instructors. They have a minimum of 15 years real-world experience and are subject matter experts in their fields. Unlike a live class, you can study at your own pace. This creates a personal learning experience and gives you all the benefit of hands-on training with the flexibility of doing it around your schedule 24/7.

7.  ADA Compliant & JAWS Compatible Platform

uCertify course and labs are ADA (Americans with Disability Act) compliant. It is now more accessible to students with features such as:

- Change the font, size, and color of the content of the course
- Text-to-speech, reads the text into spoken words
- Interactive videos, how-tos videos come with transcripts and voice-over
- Interactive transcripts, each word is clickable. Students can clip a specific part of the video by clicking on a word or a portion of the text.

JAWS (Job Access with Speech) is a computer screen reader program for Microsoft Windows that reads the screen either with a text-to-speech output or by a Refreshable Braille display. Student can easily navigate uCertify course using JAWS shortcut keys.

8.  State of the Art Educator Tools

uCertify knows the importance of instructors and provide tools to help them do their job effectively. Instructors are able to clone and customize course. Do ability grouping. Create sections. Design grade scale and grade formula. Create and schedule assessments. Educators can also move a student from self-paced to mentor-guided to instructor-led mode in three clicks.

9.  Award Winning Learning Platform (LMS)

uCertify has developed an award winning, highly interactive yet simple to use platform. The SIIA CODiE Awards is the only peer-reviewed program to showcase business and education technology's finest products and services. Since 1986, thousands of products, services and solutions have been recognized for achieving excellence. uCertify has won CODiE awards consecutively for last 7 years:

- **2014**
    1. Best Postsecondary Learning Solution

- **2015**
    1. Best Education Solution
    2. Best Virtual Learning Solution
    3. Best Student Assessment Solution
    4. Best Postsecondary Learning Solution
    5. Best Career and Workforce Readiness Solution
    6. Best Instructional Solution in Other Curriculum Areas
    7. Best Corporate Learning/Workforce Development Solution

- **2016**
    1. Best Virtual Learning Solution
    2. Best Education Cloud-based Solution
    3. Best College and Career Readiness Solution
    4. Best Corporate / Workforce Learning Solution
    5. Best Postsecondary Learning Content Solution
    6. Best Postsecondary LMS or Learning Platform
    7. Best Learning Relationship Management Solution

- **2017**
    1. Best Overall Education Solution
    2. Best Student Assessment Solution
    3. Best Corporate/Workforce Learning Solution
    4. Best Higher Education LMS or Learning Platform

- **2018**
    1. Best Higher Education LMS or Learning Platform
    2. Best Instructional Solution in Other Curriculum Areas
    3. Best Learning Relationship Management Solution

- **2019**
    1. Best Virtual Learning Solution
    2. Best Content Authoring Development or Curation Solution
    3. Best Higher Education Learning Management Solution (LMS)

- **2020**
    1. Best College and Career Readiness Solution
    2. Best Cross-Curricular Solution
    3. Best Virtual Learning Solution

10. Chapter & Lessons

uCertify brings these textbooks to life. It is full of interactive activities that keeps the learner engaged. uCertify brings all available learning resources for a topic in one place so that the learner can efficiently learn without going to multiple places. Challenge questions are also embedded in the chapters so learners can attempt those while they are learning about that particular topic. This helps them grasp the concepts better because they can go over it again right away which improves learning.

Learners can do Flashcards, Exercises, Quizzes and Labs related to each chapter. At the end of every lesson, uCertify courses guide the learners on the path they should follow.

Syllabus

Chapter 1: Introduction

- About This Course
- False Assumptions
- Icons Used in This Course
- Where to Go from Here

Chapter 2: Introducing Algorithms

- Describing Algorithms

- Using Computers to Solve Problems
- Distinguishing between Issues and Solutions
- Structuring Data to Obtain a Solution

Chapter 3: Considering Algorithm Design

- Starting to Solve a Problem
- Dividing and Conquering
- Learning that Greed Can Be Good
- Computing Costs and Following Heuristics
- Evaluating Algorithms

Chapter 4: Working with Google Colab

- Defining Google Colab
- Working with Notebooks
- Performing Common Tasks
- Using Hardware Acceleration
- Executing the Code
- Getting Help

Chapter 5: Performing Essential Data Manipulations Using Python

- Performing Calculations Using Vectors and Matrixes
- Creating Combinations the Right Way
- Getting the Desired Results Using Recursion
- Performing Tasks More Quickly

Chapter 6: Developing a Matrix Computation Class

- Avoiding the Use of NumPy
- Understanding Why Using a Class is Important
- Building the Basic Class
- Manipulating the Matrix

Chapter 7: Structuring Data

- Determining the Need for Structure
- Stacking and Piling Data in Order
- Working with Trees
- Representing Relations in a Graph

Chapter 8: Arranging and Searching Data

- Sorting Data Using Merge Sort and Quick Sort
- Using Search Trees and the Heap
- Relying on Hashing

Chapter 9: Understanding Graph Basics

- Explaining the Importance of Networks
- Defining How to Draw a Graph
- Measuring Graph Functionality
- Putting a Graph in Numeric Format

Chapter 10: Reconnecting the Dots

- Traversing a Graph Efficiently
- Sorting the Graph Elements
- Reducing to a Minimum Spanning Tree
- Finding the Shortest Route

Chapter 11: Discovering Graph Secrets

- Envisioning Social Networks as Graphs
- Navigating a Graph

Chapter 12: Getting the Right Web page

- Finding the World in a Search Engine
- Explaining the PageRank Algorithm
- Implementing PageRank
- Going Beyond the PageRank Paradigm

Chapter 13: Managing Big Data

- Transforming Power into Data
- Streaming Flows of Data
- Sketching an Answer from Stream Data

Chapter 14: Parallelizing Operations

- Managing Immense Amounts of Data
- Working Out Algorithms for MapReduce

Chapter 15: Compressing and Concealing Data

- Making Data Smaller
- Hiding Your Secrets with Cryptography

Chapter 16: Working with Greedy Algorithms

- Deciding When It Is Better to Be Greedy
- Finding Out How Greedy Can Be Useful

Chapter 17: Relying on Dynamic Programming

- Explaining Dynamic Programming
- Discovering the Best Dynamic Recipes

Chapter 18: Using Randomized Algorithms

- Defining How Randomization Works
- Putting Randomness into your Logic

Chapter 19: Performing Local Search

- Understanding Local Search
- Presenting Local Search Tricks
- Solving Satisfiability of Boolean Circuits

Chapter 20: Employing Linear Programming

- Using Linear Functions as a Tool

- Using Linear Programming in Practice

Chapter 21: Considering Heuristics

- Differentiating Heuristics
- Routing Robots Using Heuristics
- Explaining Path Finding Algorithms

Chapter 22: Ten Algorithms That Are Changing the World

- Using Sort Routines
- Looking for Things with Search Routines
- Shaking Things Up with Random Numbers
- Performing Data Compression
- Keeping Data Secret
- Changing the Data Domain
- Analyzing Links
- Spotting Data Patterns
- Dealing with Automation and Automatic Responses
- Creating Unique Identifiers

Chapter 23: Ten Algorithmic Problems Yet to Solve

- Solving Problems Quickly
- Solving 3SUM Problems More Efficiently
- Making Matrix Multiplication Faster
- Determining Whether an Application Will End
- Creating and Using One-Way Functions
- Multiplying Really Large Numbers
- Dividing a Resource Equally
- Reducing Edit Distance Calculation Time
- Playing the Parity Game
- Understanding Spatial Issues

11.  Performance Based Labs

uCertify's performance-based labs are simulators that provides virtual environment. Labs deliver hands on experience with minimal risk and thus replace expensive physical labs. uCertify Labs are cloud-based, device-enabled and can be easily integrated with an LMS. Features of uCertify labs:

- Provide hands-on experience in a safe, online environment
- Labs simulate real world, hardware, software & CLI environment
- Flexible and inexpensive alternative to physical Labs
- Comes with well-organized component library for every task
- Highly interactive - learn by doing

- Explanations and remediation available
- Videos on how to perform

Lab Tasks

- Performing Logical Operations
- Using Comparison Operators
- Performing Data Manipulations
- Finding the Factorial of a Number Using Recursion
- Using Matrix Operations
- Flattening a Matrix
- Dealing with Missing Values
- Removing the Duplicate Records
- Creating and Traversing a Binary Tree
- Implementing Quick Sort
- Implementing Merge Sort
- Building and Searching a Binary Heap
- Implementing a Graph
- Adding a Graph to a Matrix
- Using Sparse Representations
- Creating a Minimum Spanning Tree
- Adding a Negative Edge to a Graph
- Using the Floyd-Warshall Algorithm
- Creating a Network with a Spider Trap
- Demonstrating the Bloom Filter
- Using the lambda Function
- Setting up a MapReduce Simulation
- Using Compression
- Using Encryption
- Using the change Function
- Printing a Fibonacci Sequence Using Recursion
- Using Dynamic Programming
- Creating a Histogram

- Creating a Monte Carlo Simulation
- Implementing the Quick Select Algorithm
- Computing the Median of a Series
- Visualizing Data Using Python Plotting Functions
- Creating a Maze

Here's what you get

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PERFORMANCE BASED LAB

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