INDEX

(SESSION:- 2022-23)

Syllabus covered

S.No.	Name of VACs	Department
1.	ADVANCED PYTHON	CSE
2.	ADVANCED JAVA	CSE
3.	AWS TRAINING	CSE,IT,MCA
4.	ADVANCED PYTHON	IT
5.	ADVANCED JAVA	IT

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ADVANCED PYTHON

Add On Course for B.Tech (CSE)

SESSION 2022-23

Curriculum objectives

Upon completion of this course, students will be able to do the following:

1. Understanding of advanced Python programming concepts
2. Proficiency in object-oriented programming (OOP)
3. Expertise in data handling and manipulation
4. Mastery of web development with Python
5. Proficiency in machine learning and data science
6. Familiarity with other Python libraries and tools
7. Understanding of Python best practices and code optimization

Duration

Approximately 36 hours, when delivered synchronously by an educator. Detailed timings are providedbelow. Actual delivery times will vary from class to class and depending on the delivery format.

Delivery methods

This course can be delivered in person with synchronous lectures or with digital training models thatstudents can complete independently.

Learning resources

- Lecture materials
- Online multiple-choice knowledge checks
- Lab exercises
- Digital training (optional)
- Video introductions
- Video demos
- Example solutions

Course timing

This table provides the suggested durations for all course activities. Note that the total classroom timefor all the modules in this course is 36 hours. Items that are not applicable are marked NA.

Module Title	Lecture (Hrs)	Activity/Lab/ Demo (Hrs)	Total Module (Hrs)
Course Introduction	1	NA	2
Module 1: **Introduction to OOP**		1	
Module 2: Classes and Objects	1	1	2

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Module 3: Encapsulation	1	1	2
Module 4: Inheritance	1	1	2
Module 5: Polymorphism	1	1	2
Module 6: Advanced Topics in OOP	1	1	2
Module 7: Exception Handling	1	1	2
Module 8: File Input/Output	1	1	2
Module 9: Regular Expressions	1	1	2
Module 10: Debugging	1	1	2
Module 11: Unit Testing	1	1	2
Module 12: GUI Programming with Tkinter	1	1	2
Module 13: Database connectivity with SQLite	1	1	2
Module 14: Web Scrapping	1	1	2
Module 15: Working With JSON	1	1	2
Module 16: Multithreading	1	1	2
Module 17: Networking with Socket	1	1	2
Module 18: Minor Project.	1	1	2
Total Course Time	18	18	36

Module sections

This section lists the module sections in this course.

Course Introduction

- Course objectives and overview

Module 1: Introduction to OOP

- Overview of OOP
- Benefits of OOP
- Terminology (classes, objects, attributes, methods, encapsulation, inheritance, polymorphism)
- Introduction to Python syntax for OOP

Module 2: Classes and Objects

- Creating classes in Python
- Instantiating objects
- Accessing attributes and methods of objects
- Class and instance variables

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Module 3: Encapsulation

- Public, private, and protected access modifiers
- Encapsulation and information hiding
- Properties and getters/setters

Module 4: Inheritance

- Extending classes with inheritance
- Base and derived classes
- Overriding methods
- Super() function

Module 5: Polymorphism

- Polymorphism and dynamic binding
- Method overriding
- Abstract classes and interfaces
- Duck typing

Module 6: Advanced Topics in OOP

- Multiple inheritance
- Method resolution order
- Mixins and composition
- Diamond problem

Module 7: Exception Handling

- Types of exceptions
- Try-except statements
- Handling multiple exceptions
- Raising exceptions

Module 8: File Input/Output

- Reading and writing to files
- File modes
- Text files vs binary files
- Using 'with' statements

Module 9: Regular Expressions

- Regular expression syntax
- Match object
- Search and replace
- Regex in Python

Module 10: Debugging

- Common debugging techniques

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- Sockets in Python
- Creating server and client sockets
- Sending and receiving data

Module 18: Minor Project

- Participants will work on a final project that applies the concepts learned throughout the course. The project should involve OOP principles and at least one other topic covered in the course (e.g. file I/O, web scraping, multithreading, etc.). Participants will present their projects and receive feedback from the instructor and other participants.

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- Debugging tools in Python
- Using pdb module
- Logging

Module 11: Unit Testing

- Introduction to unit testing
- Writing test cases
- Running test cases
- Pytest framework

Module 12: GUI Programming with Tkinter

- Introduction to GUI programming
- Tkinter module
- Creating widgets
- Handling events

Module 13: Database Connectivity with SQLite

- Introduction to databases
- SQLite database
- Connecting to database
- Querying and modifying data

Module 14: Web Scraping with Beautiful Soup

- Introduction to web scraping
- Beautiful Soup module
- Parsing HTML/XML data
- Navigating the parsed data

Module 15: Working with JSON

- Introduction to JSON
- JSON syntax
- Encoding and decoding JSON data
- Using JSON in Python

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Module 16: Multithreading

- Introduction to multithreading
- Creating threads
- Synchronizing threads
- Thread pools

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Module 17: Networking with Sockets

- Introduction to networking

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ADVANCED JAVA

Add On Course for B.Tech (CSE)

SESSION 2022-23

Curriculum objectives

1. Mastery of Java syntax and object-oriented programming (OOP)

Participants should be proficient in Java syntax and be able to design and implement complex class hierarchies, use inheritance and polymorphism effectively, and understand advanced topics such as abstract classes, interfaces, and lambda expressions.

2. Proficiency in concurrency and multithreading

Participants should be able to design and implement concurrent and multithreaded programs using Java's threading model. They should be able to use Java's synchronization constructs such as locks, semaphores, and monitors to ensure thread safety and avoid race conditions.

3. Expertise in Java web development

Participants should be able to develop web applications using Java frameworks such as Spring, Hibernate, and Struts. They should be able to create and deploy web applications, work with databases, and understand web security issues.

4. Mastery of Java collections and data structures

Participants should be able to work with Java collections and data structures such as lists, maps, and queues. They should be able to use Java's built-in collections framework and understand how to implement custom data structures.

5. Familiarity with Java I/O and networking

Participants should be able to work with Java I/O and networking APIs to read and write data from various sources and communicate over network protocols such as TCP/IP and HTTP.

6. Proficiency in software engineering principles and design patterns

Participants should be familiar with software engineering principles such as design patterns, SOLID principles, and code refactoring. They should be able to write maintainable, scalable, and reusable code using these principles.

7. Understanding of Java memory management and garbage collection

Participants should understand Java's memory management and garbage collection model. They should be able to optimize Java applications by reducing memory usage and managing object lifetimes.

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8. Familiarity with Java performance tuning and profiling

Participants should be able to profile and tune the performance of Java applications using tools such as JProfiler and VisualVM. They should be able to identify performance bottlenecks and optimize Java code for speed and efficiency.

Overall, an advanced Java training course should provide participants with a deep understanding of Java programming and enable them to apply their knowledge to solve complex programming problems in various domains.

Duration

Approximately 36 hours, when delivered synchronously by an educator. Detailed timings are providedbelow. Actual delivery times will vary from class to class and depending on the delivery format.

Delivery methods

This course can be delivered in person with synchronous lectures or with digital training models thatstudents can complete independently.

Learning resources

- Lecture materials
- Online multiple-choice knowledge checks
- Lab exercises
- Digital training (optional)
- Video introductions
- Video demos
- Example solutions

Course timing

This table provides the suggested durations for all course activities. Note that the total classroom timefor all the modules in this course is 36 hours. Items that are not applicable are marked NA.

Module Title	Lecture (Hrs)	Activity/Lab/ Demo (Hrs)	Total Module (Hrs)
Course Introduction	1	NA	2
Module 1: **Introduction to Advanced java**		1	
Module 2: Multithreading	1	1	2
Module 3: Exception Handling	1	1	2
Module 4: JAVA IO	1	1	2
Module 5: Netyworking	1	1	2
Module 6: Java Database Connectivity(JDBC)	1	1	2
Module 7: Advanced JDBC	1	1	2
Module 8: Servlets	1	1	2
Module 9: Java Server Pages (JSP)	1	1	2

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Module 10: Java Beans	1	1	2
Module 11: Enterprise Java Beans (EJB)	1	1	2
Module 12: Java Persistence API (JPA)	1	1	2
Module 13: Spring Framework	1	1	2
Module 14: Hibernate	1	1	2
Module 15: Web Services	1	1	2
Module 16: Security	1	1	2
Module 17: Design Patterns	1	1	2
Module 18: Minor project	1	1	2
Total Course Time	18	18	36

Module sections

This section lists the module sections in this course.

Course Introduction

- Course objectives and overview

Module 1: Introduction to Advanced Java

- Overview of Advanced Java
- Benefits of Advanced Java
- Features of Advanced Java
- Terminology (JVM, JRE, JDK, bytecode, etc.)
- Introduction to Eclipse IDE for Java development

Module 2: Multithreading

- Introduction to multithreading
- Creating threads
- Thread synchronization
- Thread pools
- Thread safety and atomicity
- Deadlocks and solutions

Module 3: Exception Handling

- Types of exceptions
- Try-catch statements
- Throwing exceptions
- Checked and unchecked exceptions
- Custom exception handling

Module 4: Java IO

- Introduction to IO operations
- File IO

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- Byte streams vs character streams
- Buffered streams
- Object IO

Module 5: Networking

- Introduction to networking
- Socket programming in Java
- Client-server communication
- Multithreaded servers
- Remote Method Invocation (RMI)

Module 6: Java Database Connectivity (JDBC)

- Introduction to JDBC
- Connecting to databases
- Executing SQL queries
- Working with result sets
- Batch processing

Module 7: Advanced JDBC

- PreparedStatement vs Statement
- Stored procedures
- Transactions
- Connection pooling
- Data source objects

Module 8: Servlets

- Introduction to servlets
- Servlet lifecycle
- Handling HTTP requests and responses
- Session management
- Filters

Module 9: JavaServer Pages (JSP)

- Introduction to JSP
- JSP lifecycle
- JSP directives and actions
- Implicit objects
- Scriptlets and expressions

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Module 10: JavaBeans

- Introduction to JavaBeans
- Properties and methods
- Event handling
- Bound and constrained properties
- Design patterns

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Module 11: Enterprise JavaBeans (EJB)

- Introduction to EJB
- Session beans
- Entity beans
- Message-driven beans
- EJB lifecycle

Module 12: Java Persistence API (JPA)

- Introduction to JPA
- Object-relational mapping (ORM)
- Annotations
- Persistence units
- CRUD operations

Module 13: Spring Framework

- Introduction to Spring Framework
- Inversion of Control (IoC)
- Dependency Injection (DI)
- Spring MVC
- Spring Data JPA

Module 14: Hibernate

- Introduction to Hibernate
- Object-relational mapping (ORM)
- Annotations and mapping files
- HQL and criteria queries
- Caching and lazy loading

Module 15: Web Services

- Introduction to web services
- SOAP vs REST
- Creating SOAP web services in Java
- Creating RESTful web services in Java
- JAX-RS

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Module 16: Security

- Introduction to security
- Authentication and authorization
- Basic authentication
- Digest authentication
- Form-based authentication

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Module 17: Design Patterns

- Introduction to design patterns

- Creational patterns
- Structural patterns
- Behavioral patterns
- Singleton, Factory, Adapter, Observer, Command, and Template Method patterns

Module 18: Minor project

Participants will work on a final project that applies the concepts learned throughout the course. The project should involve Advanced Java principles and at least one other topic covered in the course (e.g. web services, Spring Framework, etc.). Participants will present their projects and receive feedback from the instructor and other participants.

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AWS

Add On Course for B.Tech (CSE)

SESSION 2022-23

Curriculum objectives

Upon completion of this course, students will be able to do the following:

- Define the AWS Cloud
- Explain the AWS pricing philosophy
- Identify the global infrastructure components of AWS
- Describe the security and compliance measures of the AWS Cloud, including AWS Identity and Access Management (IAM)
- Create a virtual private cloud (VPC) by using Amazon Virtual Private Cloud (Amazon VPC)
- Demonstrate when to use Amazon Elastic Compute Cloud (Amazon EC2), AWS Lambda, and AWS Elastic Beanstalk
- Differentiate between Amazon Simple Storage Service (Amazon S3), Amazon Elastic Block Store (Amazon EBS), Amazon Elastic File System (Amazon EFS), and Amazon Simple Storage Service Glacier (Amazon S3 Glacier)
- Demonstrate when to use AWS database services, including Amazon Relational Database Service (Amazon RDS), Amazon DynamoDB, Amazon Redshift, and Amazon Aurora
- Explain the architectural principles of the AWS Cloud
- Explore key concepts related to Elastic Load Balancing, Amazon CloudWatch, and Amazon EC2 Auto Scaling

Duration

Approximately 36 hours, when delivered synchronously by an educator. Detailed timings are provided below. Actual delivery times will vary from class to class and depending on the delivery format.

Delivery methods

This course can be delivered in person with synchronous lectures or with digital training models that students can complete independently.

Learning resources

- Lecture materials
- Online multiple-choice knowledge checks
- Lab exercises
- Digital training (optional)
- Video introductions
- Video demos
- Example solutions

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Course timing

This table provides the suggested durations for all course activities. Note that the total classroom time for all the modules in this course is 36 hours. Items that are not applicable are marked NA.

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Module Title	Lecture (Hrs)	Activity/Lab/ Demo (Hrs)	Total Module (Hrs)
Course Introduction	1	NA	1
Module 1: Cloud Concepts Overview	1	1	2
Module 2: Cloud Economics and Billing	1	1	2
Module 3: AWS Global Infrastructure Overview	1	1	2
Module 4: Cloud Security	1	2	3
Module 5: Networking and Content Delivery	2	2	4
Module 6: Compute	2	3	5
Module 7: Storage	2	3	5
Module 8: Databases	2	2	4
Module 9: Cloud Architecture	2	2	4
Module 10: Automatic Scaling and Monitoring	2	2	4
Total Course Time	17	19	36

Module sections

This section lists the module sections in this course.

Course Introduction

- Course objectives and overview
- AWS Certification exam information
- AWS documentation

Module 1: Cloud Concepts Overview

- Introduction to cloud computing
- Advantages of the cloud
- Introduction to AWS
- Moving to the AWS Cloud
- Activity: Sample Exam Question
- Knowledge check

Module 2: Cloud Economics and Billing

- Fundamentals of pricing
- Total cost of ownership
- Activity: Simple Monthly Calculator
- Delaware North case study
- AWS Organizations
- AWS billing and cost management
- Billing dashboards
- Technical support models
- Activity: Support Plan Scavenger Hunt
- Activity: Sample Exam Question
- Knowledge check

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Module 3: AWS Global Infrastructure Overview

- AWS global infrastructure
- Demo: AWS global infrastructure
- AWS services and service categories
- Activity: AWS Management Console Click through
- Activity: Sample Exam Question
- Knowledge check

Module 4: Cloud Security

- AWS shared responsibility model
- Activity: AWS Shared Responsibility Model
- AWS IAM
- Demo: AWS IAM Console
- Securing a new AWS account
- Lab: Introduction to AWS IAM
- Securing accounts
- Securing data
- Working to ensure compliance
- Activity: Sample Exam Question
- Knowledge check

Module 5: Networking and Content Delivery

- Networking basics
- Amazon VPC
- VPC networking
- Activity: Label This diagram
- Demo: Amazon VPC Console
- VPC security
- Activity: Design a VPC
- Lab: Build a VPC and Launch a Web Server
- Route 53
- CloudFront
- Activity: Sample Exam Question
- Knowledge check

Module 6: Compute

- Compute services overview
- Amazon EC2 part 1
- Amazon EC2 part 2
- Amazon EC2 part 3
- Demo: Amazon EC2
- Lab: Introduction to Amazon EC2
- Activity: Amazon EC2 Versus Managed Services
- Demo: Amazon EC2 Part Console
- Amazon EC2 cost optimization
- Container services
- Introduction to AWS Lambda
- Activity: AWS Lambda
- Introduction to AWS Elastic Beanstalk
- Activity: AWS Elastic Beanstalk
- Activity: Sample Exam Question
- Knowledge check

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Module 7: Storage

- AWS EBS
- Demo: Amazon Elastic Block Store Console
- Lab: Working with EBS
- AWS S3
- Demo: AWS S3 Console
- AWS EFS
- Demo: AWS EFS Console
- AWS S3 Glacier
- Demo: AWS S3 Glacier Console
- Activity: Storage Technology Selection
- Activity: Sample Exam Question
- Knowledge check

Module 8: Databases

- Amazon RDS
- Demo: Amazon RDS Console
- Lab: Build a Database Server
- Amazon DynamoDB
- Demo: Amazon DynamoDB
- Amazon Redshift
- Amazon Aurora
- Activity: Database case study
- Activity: Sample Exam Question
- Knowledge check

Module 9: Cloud Architecture

- AWS Well-Architected Framework design principles
- Activity: AWS Well-Architected Framework Design Principles
- Operational excellence
- Security
- Reliability
- Performance efficiency
- Cost optimization
- Reliability & high availability
- AWS Trusted Advisor
- Activity: Interpret AWS Trusted Advisor Recommendations
- Activity: Sample Exam Question
- Knowledge check

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Module 10: Automatic Scaling and Monitoring

- Elastic Load Balancing
- Activity: Elastic Load Balancing
- Amazon CloudWatch
- Activity: Amazon CloudWatch
- Amazon EC2 auto scaling
- Lab: Scale & Load Balance your Architecture
- Activity: Sample Exam Question
- Knowledge check

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AWS

Add On Course for B.Tech (CSE/IT)

SESSION 2022-23

Curriculum objectives

Upon completion of this course, students will be able to do the following:

- Define the AWS Cloud
- Explain the AWS pricing philosophy
- Identify the global infrastructure components of AWS
- Describe the security and compliance measures of the AWS Cloud, including AWS Identity and Access Management (IAM)
- Create a virtual private cloud (VPC) by using Amazon Virtual Private Cloud (Amazon VPC)
- Demonstrate when to use Amazon Elastic Compute Cloud (Amazon EC2), AWS Lambda, and AWS Elastic Beanstalk
- Differentiate between Amazon Simple Storage Service (Amazon S3), Amazon Elastic Block Store (Amazon EBS), Amazon Elastic File System (Amazon EFS), and Amazon Simple Storage Service Glacier (Amazon S3 Glacier)
- Demonstrate when to use AWS database services, including Amazon Relational Database Service (Amazon RDS), Amazon DynamoDB, Amazon Redshift, and Amazon Aurora
- Explain the architectural principles of the AWS Cloud
- Explore key concepts related to Elastic Load Balancing, Amazon CloudWatch, and Amazon EC2 Auto Scaling

Duration

Approximately 36 hours, when delivered synchronously by an educator. Detailed timings are provided below. Actual delivery times will vary from class to class and depending on the delivery format.

Delivery methods

This course can be delivered in person with synchronous lectures or with digital training models that students can complete independently.

Learning resources

- Lecture materials
- Online multiple-choice knowledge checks
- Lab exercises
- Digital training (optional)
- Video introductions
- Video demos
- Example solutions

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Course timing

This table provides the suggested durations for all course activities. Note that the total classroom time for all the modules in this course is 36 hours. Items that are not applicable are marked NA.

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Module Title	Lecture (Hrs)	Activity/Lab/ Demo (Hrs)	Total Module (Hrs)
Course Introduction	1	NA	1
Module 1: Cloud Concepts Overview	1	1	2
Module 2: Cloud Economics and Billing	1	1	2
Module 3: AWS Global Infrastructure Overview	1	1	2
Module 4: Cloud Security	1	2	3
Module 5: Networking and Content Delivery	2	2	4
Module 6: Compute	2	3	5
Module 7: Storage	2	3	5
Module 8: Databases	2	2	4
Module 9: Cloud Architecture	2	2	4
Module 10: Automatic Scaling and Monitoring	2	2	4
Total Course Time	17	19	36

Module sections

This section lists the module sections in this course.

Course Introduction

- Course objectives and overview
- AWS Certification exam information
- AWS documentation

Module 1: Cloud Concepts Overview

- Introduction to cloud computing
- Advantages of the cloud
- Introduction to AWS
- Moving to the AWS Cloud
- Activity: Sample Exam Question
- Knowledge check

Module 2: Cloud Economics and Billing

- Fundamentals of pricing
- Total cost of ownership
- Activity: Simple Monthly Calculator
- Delaware North case study
- AWS Organizations
- AWS billing and cost management
- Billing dashboards
- Technical support models
- Activity: Support Plan Scavenger Hunt
- Activity: Sample Exam Question
- Knowledge check

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Module 3: AWS Global Infrastructure Overview

- AWS global infrastructure
- Demo: AWS global infrastructure
- AWS services and service categories
- Activity: AWS Management Console Click through
- Activity: Sample Exam Question
- Knowledge check

Module 4: Cloud Security

- AWS shared responsibility model
- Activity: AWS Shared Responsibility Model
- AWS IAM
- Demo: AWS IAM Console
- Securing a new AWS account
- Lab: Introduction to AWS IAM
- Securing accounts
- Securing data
- Working to ensure compliance
- Activity: Sample Exam Question
- Knowledge check

Module 5: Networking and Content Delivery

- Networking basics
- Amazon VPC
- VPC networking
- Activity: Label This diagram
- Demo: Amazon VPC Console
- VPC security
- Activity: Design a VPC
- Lab: Build a VPC and Launch a Web Server
- Route 53
- CloudFront
- Activity: Sample Exam Question
- Knowledge check

Module 6: Compute

- Compute services overview
- Amazon EC2 part 1
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- Demo: Amazon EC2
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- Amazon EC2 cost optimization
- Container services
- Introduction to AWS Lambda
- Activity: AWS Lambda
- Introduction to AWS Elastic Beanstalk
- Activity: AWS Elastic Beanstalk
- Activity: Sample Exam Question
- Knowledge check

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Module 7: Storage

- AWS EBS
- Demo: Amazon Elastic Block Store Console
- Lab: Working with EBS
- AWS S3
- Demo: AWS S3 Console
- AWS EFS
- Demo: AWS EFS Console
- AWS S3 Glacier
- Demo: AWS S3 Glacier Console
- Activity: Storage Technology Selection
- Activity: Sample Exam Question
- Knowledge check

Module 8: Databases

- Amazon RDS
- Demo: Amazon RDS Console
- Lab: Build a Database Server
- Amazon DynamoDB
- Demo: Amazon DynamoDB
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- Amazon Aurora
- Activity: Database case study
- Activity: Sample Exam Question
- Knowledge check

Module 9: Cloud Architecture

- AWS Well-Architected Framework design principles
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- Cost optimization
- Reliability & high availability
- AWS Trusted Advisor
- Activity: Interpret AWS Trusted Advisor Recommendations
- Activity: Sample Exam Question
- Knowledge check

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Module 10: Automatic Scaling and Monitoring

- Elastic Load Balancing
- Activity: Elastic Load Balancing
- Amazon CloudWatch
- Activity: Amazon CloudWatch
- Amazon EC2 auto scaling
- Lab: Scale & Load Balance your Architecture
- Activity: Sample Exam Question
- Knowledge check

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AWS TRAINING

Add On Course for MCA

SESSION 2022-23 EVEN SEM

Curriculum objectives

Upon completion of this course, students will be able to do the following:

- Define the AWS Cloud
- Explain the AWS pricing philosophy
- Identify the global infrastructure components of AWS
- Describe the security and compliance measures of the AWS Cloud, including AWS Identity and Access Management (IAM)
- Create a virtual private cloud (VPC) by using Amazon Virtual Private Cloud (Amazon VPC)
- Demonstrate when to use Amazon Elastic Compute Cloud (Amazon EC2), AWS Lambda, and AWS Elastic Beanstalk
- Differentiate between Amazon Simple Storage Service (Amazon S3), Amazon Elastic Block Store (Amazon EBS), Amazon Elastic File System (Amazon EFS), and Amazon Simple Storage Service Glacier (Amazon S3 Glacier)
- Demonstrate when to use AWS database services, including Amazon Relational Database Service (Amazon RDS), Amazon DynamoDB, Amazon Redshift, and Amazon Aurora
- Explain the architectural principles of the AWS Cloud
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Duration

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Learning resources

- Lecture materials
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- Lab exercises
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- Video introductions
- Video demos
- Example solutions

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Course timing

This table provides the suggested durations for all course activities. Note that the total classroom time for all the modules in this course is 36 hours. Items that are not applicable are marked NA.

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Module 3: AWS Global Infrastructure Overview	1	1	2
Module 4: Cloud Security	1	2	3
Module 5: Networking and Content Delivery	2	2	4
Module 6: Compute	2	3	5
Module 7: Storage	2	3	5
Module 8: Databases	2	2	4
Module 9: Cloud Architecture	2	2	4
Module 10: Automatic Scaling and Monitoring	2	2	4
Total Course Time	17	19	36

Module sections

This section lists the module sections in this course.

Course Introduction

- Course objectives and overview
- AWS Certification exam information
- AWS documentation

Module 1: Cloud Concepts Overview

- Introduction to cloud computing
- Advantages of the cloud
- Introduction to AWS
- Moving to the AWS Cloud
- Activity: Sample Exam Question
- Knowledge check

Module 2: Cloud Economics and Billing

- Fundamentals of pricing
- Total cost of ownership
- Activity: Simple Monthly Calculator
- Delaware North case study
- AWS Organizations
- AWS billing and cost management
- Billing dashboards
- Technical support models
- Activity: Support Plan Scavenger Hunt
- Activity: Sample Exam Question
- Knowledge check

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Module 3: AWS Global Infrastructure Overview

- AWS global infrastructure
- Demo: AWS global infrastructure
- AWS services and service categories
- Activity: AWS Management Console Click through
- Activity: Sample Exam Question
- Knowledge check

Module 4: Cloud Security

- AWS shared responsibility model
- Activity: AWS Shared Responsibility Model
- AWS IAM
- Demo: AWS IAM Console
- Securing a new AWS account
- Lab: Introduction to AWS IAM
- Securing accounts
- Securing data
- Working to ensure compliance
- Activity: Sample Exam Question
- Knowledge check

Module 5: Networking and Content Delivery

- Networking basics
- Amazon VPC
- VPC networking
- Activity: Label This diagram
- Demo: Amazon VPC Console
- VPC security
- Activity: Design a VPC
- Lab: Build a VPC and Launch a Web Server
- Route 53
- CloudFront
- Activity: Sample Exam Question
- Knowledge check

Module 6: Compute

- Compute services overview
- Amazon EC2 part 1
- Amazon EC2 part 2
- Amazon EC2 part 3
- Demo: Amazon EC2
- Lab: Introduction to Amazon EC2
- Activity: Amazon EC2 Versus Managed Services
- Demo: Amazon EC2 Part Console
- Amazon EC2 cost optimization
- Container services
- Introduction to AWS Lambda
- Activity: AWS Lambda
- Introduction to AWS Elastic Beanstalk
- Activity: AWS Elastic Beanstalk
- Activity: Sample Exam Question
- Knowledge check

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Module 7: Storage

- AWS EBS
- Demo: Amazon Elastic Block Store Console
- Lab: Working with EBS
- AWS S3
- Demo: AWS S3 Console
- AWS EFS
- Demo: AWS EFS Console
- AWS S3 Glacier
- Demo: AWS S3 Glacier Console
- Activity: Storage Technology Selection
- Activity: Sample Exam Question
- Knowledge check

Module 8: Databases

- Amazon RDS
- Demo: Amazon RDS Console
- Lab: Build a Database Server
- Amazon DynamoDB
- Demo: Amazon DynamoDB
- Amazon Redshift
- Amazon Aurora
- Activity: Database case study
- Activity: Sample Exam Question
- Knowledge check

Module 9: Cloud Architecture

- AWS Well-Architected Framework design principles
- Activity: AWS Well-Architected Framework Design Principles
- Operational excellence
- Security
- Reliability
- Performance efficiency
- Cost optimization
- Reliability & high availability
- AWS Trusted Advisor
- Activity: Interpret AWS Trusted Advisor Recommendations
- Activity: Sample Exam Question
- Knowledge check

Module 10: Automatic Scaling and Monitoring

- Elastic Load Balancing
- Activity: Elastic Load Balancing
- Amazon CloudWatch
- Activity: Amazon CloudWatch
- Amazon EC2 auto scaling
- Lab: Scale & Load Balance your Architecture
- Activity: Sample Exam Question
- Knowledge check

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ADVANCED PYTHON

Add On Course for B.Tech (CS/IT)

SESSION 2022-23

Curriculum objectives

Upon completion of this course, students will be able to do the following:

1. Understanding of advanced Python programming concepts
2. Proficiency in object-oriented programming (OOP)
3. Expertise in data handling and manipulation
4. Mastery of web development with Python
5. Proficiency in machine learning and data science
6. Familiarity with other Python libraries and tools
7. Understanding of Python best practices and code optimization

Duration

Approximately 36 hours, when delivered synchronously by an educator. Detailed timings are providedbelow. Actual delivery times will vary from class to class and depending on the delivery format.

Delivery methods

This course can be delivered in person with synchronous lectures or with digital training models thatstudents can complete independently.

Learning resources

- Lecture materials
- Online multiple-choice knowledge checks
- Lab exercises
- Digital training (optional)
- Video introductions
- Video demos
- Example solutions

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Course timing

This table provides the suggested durations for all course activities. Note that the total classroom timefor all the modules in this course is 36 hours. Items that are not applicable are marked NA.

Module Title	Lecture (Hrs)	Activity/Lab/ Demo (Hrs)	Total Module (Hrs)
Course Introduction	1	NA	2
Module 1: **Introduction to OOP**		1	
Module 2: Classes and Objects	1		2

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Module 3: Encapsulation	1	1	2
Module 4: Inheritance	1	1	2
Module 5: Polymorphism	1	1	2
Module 6: Advanced Topics in OOP	1	1	2
Module 7: Exception Handling	1	1	2
Module 8: File Input/Output	1	1	2
Module 9: Regular Expressions	1	1	2
Module 10: Debugging	1	1	2
Module 11: Unit Testing	1	1	2
Module 12: GUI Programming with Tkinter	1	1	2
Module 13: Database connectivity with SQLite	1	1	2
Module 14: Web Scrapping	1	1	2
Module 15: Working With JSON	1	1	2
Module 16: Multithreading	1	1	2
Module 17: Networking with Socket	1	1	2
Module 18: Minor Project	1	1	2
Total Course Time	18	18	36

Module sections

This section lists the module sections in this course.

Course Introduction

- Course objectives and overview

Module 1: Introduction to OOP

- Overview of OOP
- Benefits of OOP
- Terminology (classes, objects, attributes, methods, encapsulation, inheritance, polymorphism)
- Introduction to Python syntax for OOP

Module 2: Classes and Objects

- Creating classes in Python
- Instantiating objects
- Accessing attributes and methods of objects
- Class and instance variables

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Module 3: Encapsulation

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- Public, private, and protected access modifiers
- Encapsulation and information hiding
- Properties and getters/setters

Module 4: Inheritance

- Extending classes with inheritance
- Base and derived classes
- Overriding methods
- Super() function

Module 5: Polymorphism

- Polymorphism and dynamic binding
- Method overriding
- Abstract classes and interfaces
- Duck typing

Module 6: Advanced Topics in OOP

- Multiple inheritance
- Method resolution order
- Mixins and composition
- Diamond problem

Module 7: Exception Handling

- Types of exceptions
- Try-except statements
- Handling multiple exceptions
- Raising exceptions

Module 8: File Input/Output

- Reading and writing to files
- File modes
- Text files vs binary files
- Using 'with' statements

Module 9: Regular Expressions

- Regular expression syntax
- Match object
- Search and replace
- Regex in Python

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Module 10: Debugging

- Common debugging techniques
- Debugging tools in Python
- Using pdb module
- Logging

Module 11: Unit Testing

- Introduction to unit testing
- Writing test cases
- Running test cases
- Pytest framework

Module 12: GUI Programming with Tkinter

- Introduction to GUI programming
- Tkinter module
- Creating widgets
- Handling events

Module 13: Database Connectivity with SQLite

- Introduction to databases
- SQLite database
- Connecting to database
- Querying and modifying data

Module 14: Web Scraping with Beautiful Soup

- Introduction to web scraping
- Beautiful Soup module
- Parsing HTML/XML data
- Navigating the parsed data

Module 15: Working with JSON

- Introduction to JSON
- JSON syntax
- Encoding and decoding JSON data
- Using JSON in Python

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Module 16: Multithreading

- Introduction to multithreading
- Creating threads
- Synchronizing threads
- Thread pools

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Module 17: Networking with Sockets

- Introduction to networking
- Sockets in Python
- Creating server and client sockets
- Sending and receiving data

Module 18: Minor Project

Participants will work on a final project that applies the concepts learned throughout the course. The project should involve OOP principles and at least one other topic covered in the course (e.g. file I/O, web scraping, multithreading, etc.). Participants will present their projects and receive feedback from the instructor and other participants.

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ADVANCED JAVA

Add On Course for B.Tech (CSE/IT)

SESSION 2022-23

Curriculum objectives

1. Mastery of Java syntax and object-oriented programming (OOP)

Participants should be proficient in Java syntax and be able to design and implement complex class hierarchies, use inheritance and polymorphism effectively, and understand advanced topics such as abstract classes, interfaces, and lambda expressions.

2. Proficiency in concurrency and multithreading

Participants should be able to design and implement concurrent and multithreaded programs using Java's threading model. They should be able to use Java's synchronization constructs such as locks, semaphores, and monitors to ensure thread safety and avoid race conditions.

3. Expertise in Java web development

Participants should be able to develop web applications using Java frameworks such as Spring, Hibernate, and Struts. They should be able to create and deploy web applications, work with databases, and understand web security issues.

4. Mastery of Java collections and data structures

Participants should be able to work with Java collections and data structures such as lists, maps, and queues. They should be able to use Java's built-in collections framework and understand how to implement custom data structures.

5. Familiarity with Java I/O and networking

Participants should be able to work with Java I/O and networking APIs to read and write data from various sources and communicate over network protocols such as TCP/IP and HTTP.

6. Proficiency in software engineering principles and design patterns

Participants should be familiar with software engineering principles such as design patterns, SOLID principles, and code refactoring. They should be able to write maintainable, scalable, and reusable code using these principles.

7. Understanding of Java memory management and garbage collection

Participants should understand Java's memory management and garbage collection model. They should be able to optimize Java applications by reducing memory usage and managing object lifetimes.

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8. Familiarity with Java performance tuning and profiling

Participants should be able to profile and tune the performance of Java applications using tools such as JProfiler and VisualVM. They should be able to identify performance bottlenecks and optimize Java code for speed and efficiency.

Overall, an advanced Java training course should provide participants with a deep understanding of Java programming and enable them to apply their knowledge to solve complex programming problems in various domains.

Duration

Approximately 36 hours, when delivered synchronously by an educator. Detailed timings are providedbelow. Actual delivery times will vary from class to class and depending on the delivery format.

Delivery methods

This course can be delivered in person with synchronous lectures or with digital training models thatstudents can complete independently.

Learning resources

- Lecture materials
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- Lab exercises
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- Video introductions
- Video demos
- Example solutions

Course timing

This table provides the suggested durations for all course activities. Note that the total classroom timefor all the modules in this course is 36 hours. Items that are not applicable are marked NA.

Module Title	Lecture (Hrs)	Activity/Lab/ Demo (Hrs)	Total Module (Hrs)
Course Introduction	1	NA	2
Module 1: **Introduction to Advanced java**		1	
Module 2: Multithreading	1	1	2
Module 3: Exception Handling	1	1	2
Module 4: JAVA IO	1	1	2
Module 5: Netyworking	1	1	2
Module 6: Java Database Connectivity(JDBC)	1	1	2
Module 7: Advanced JDBC	1	1	2
Module 8: Servlets	1	1	2
Module 9: Java Server Pages (JSP)	1	1	2

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Module 10: Java Beans	1	1	2
Module 11: Enterprise Java Beans (EJB)	1	1	2
Module 12: Java Persistence API (JPA)	1	1	2
Module 13: Spring Framework	1	1	2
Module 14: Hibernate	1	1	2
Module 15: Web Services	1	1	2
Module 16: Security	1	1	2
Module 17: Design Patterns	1	1	2
Module 18: Minor project	1	1	2
Total Course Time	18	18	36

Module sections

This section lists the module sections in this course.

Course Introduction

- Course objectives and overview

Module 1: Introduction to Advanced Java

- Overview of Advanced Java
- Benefits of Advanced Java
- Features of Advanced Java
- Terminology (JVM, JRE, JDK, bytecode, etc.)
- Introduction to Eclipse IDE for Java development

Module 2: Multithreading

- Introduction to multithreading
- Creating threads
- Thread synchronization
- Thread pools
- Thread safety and atomicity
- Deadlocks and solutions

Module 3: Exception Handling

- Types of exceptions
- Try-catch statements
- Throwing exceptions
- Checked and unchecked exceptions
- Custom exception handling

Module 4: Java IO

- Introduction to IO operations
- File IO

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- Byte streams vs character streams
- Buffered streams
- Object IO

Module 5: Networking

- Introduction to networking
- Socket programming in Java
- Client-server communication
- Multithreaded servers
- Remote Method Invocation (RMI)

Module 6: Java Database Connectivity (JDBC)

- Introduction to JDBC
- Connecting to databases
- Executing SQL queries
- Working with result sets
- Batch processing

Module 7: Advanced JDBC

- PreparedStatement vs Statement
- Stored procedures
- Transactions
- Connection pooling
- Data source objects

Module 8: Servlets

- Introduction to servlets
- Servlet lifecycle
- Handling HTTP requests and responses
- Session management
- Filters

Module 9: JavaServer Pages (JSP)

- Introduction to JSP
- JSP lifecycle
- JSP directives and actions
- Implicit objects
- Scriptlets and expressions

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Module 10: JavaBeans

- Introduction to JavaBeans
- Properties and methods
- Event handling
- Bound and constrained properties
- Design patterns

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Module 11: Enterprise JavaBeans (EJB)

- Introduction to EJB
- Session beans
- Entity beans
- Message-driven beans
- EJB lifecycle

Module 12: Java Persistence API (JPA)

- Introduction to JPA
- Object-relational mapping (ORM)
- Annotations
- Persistence units
- CRUD operations

Module 13: Spring Framework

- Introduction to Spring Framework
- Inversion of Control (IoC)
- Dependency Injection (DI)
- Spring MVC
- Spring Data JPA

Module 14: Hibernate

- Introduction to Hibernate
- Object-relational mapping (ORM)
- Annotations and mapping files
- HQL and criteria queries
- Caching and lazy loading

Module 15: Web Services

- Introduction to web services
- SOAP vs REST
- Creating SOAP web services in Java
- Creating RESTful web services in Java
- JAX-RS

Module 16: Security

- Introduction to security
- Authentication and authorization
- Basic authentication
- Digest authentication
- Form-based authentication

Module 17: Design Patterns

- Introduction to design patterns

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- Creational patterns
- Structural patterns
- Behavioral patterns
- Singleton, Factory, Adapter, Observer, Command, and Template Method patterns

Module 18: Minor Project

Participants will work on a final project that applies the concepts learned throughout the course. The project should involve Advanced Java principles and at least one other topic covered in the course (e.g. web services, Spring Framework, etc.). Participants will present their projects and receive feedback from the instructor and other participants.

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