



**JECRC**<sup>TM</sup>  
**UNIVERSITY**  
BUILD YOUR WORLD

**School of Engineering**

**Syllabi and Course Structure**

**B. Tech. (Computer Science & Engineering)  
Cloud Computing (AWS)**

**(2025-2029)  
Academic Programmes**

**JULY 2025**

The curriculum and syllabus for B.Tech. Program conforms to outcome based teaching learning process. In general, several outcomes have been identified and the curriculum and syllabus have been planned in such a way that each of the courses meets one or more of these outcomes. Student outcomes illustrate the students are expected to know and be able to do by the time of graduation. These relate to the skills, understanding, and behaviour that students acquire as they progress through the program. Further each course in the program brings out clear instructional objectives which are mapped to the student outcomes.

**B.Tech. (CSE) Program Educational Objective (PEO's):**

A graduate of the Computer Science and Engineering Program should:

**PEO- I**

Students will develop themselves as effective professionals by solving real problems through the use of computer science knowledge and with attention to team work, effective communication, critical thinking and problem solving skills.

**PEO- II**

Students will develop professional skills that prepare them for immediate employment and for life-long learning in advanced areas of computer science and related fields.

**PEO- III**

Students will demonstrate their ability to adapt to a rapidly changing environment by having learned and applied new skills and new technologies.

**PEO- IV**

Students will be provided with an educational foundation that prepares them for excellence, leadership roles along diverse career paths with encouragement to professional ethics and active participation needed for a successful career.

## **Program Outcome(PO's)**

### **A graduate of the Computer Science and Engineering Program will demonstrate:**

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.<sup>[L]</sup><sub>[SEP]</sub>

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.<sup>[L]</sup><sub>[SEP]</sub>

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Culture, Values and Ethics: Understand the importance of culture and Values along with the implications it has on learning, teaching, engineering practice, identity, and enculturation as an engineer. Apply ethical principles being committed to professional ethics, responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**Program Specific Outcome:**

PSO1: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, cyber security, machine learning and networking for efficient design and automation of computer-based systems of varying complexity. (Professional Skills)

PSO2: The ability to apply standard and modern practices like Python, R language, automation and strategies in software project development using open-ended programming environments to deliver a quality product for business success. (Problem-Solving Skills)

PSO3: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths in the field of AI and Machine learning, Cloud Computing, Robotic automation, cyber security to be an entrepreneur, and a zest for higher studies.( Successful Career and Entrepreneurship)

<b>BCO481A</b>	<b>AWS Cloud Computing Fundamentals</b>	<b>3-0-0(3 Credits)</b>
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**Course Objectives:**

**CO1** This course helps students to build an understanding of the fundamental concepts of cloud computing.

**CO2** Students will be able to understand theoretical and practical concepts of traditional cloud and AWS cloud services.

<b>Unit 1</b>	<b>Cloud Concepts Overview:</b> Introduction to cloud computing, advantages of cloud, Introduction to AWS, moving to AWS Cloud. <b>AWS Global Infrastructure:</b> AWS Global Infrastructure, AWS services and AWS categories. AWS management console.
<b>Unit 2</b>	<b>Networking in AWS:</b> Introduction, networking basics, Amazon VPC, VPC networking.
<b>Unit 3</b>	<b>AWS Compute Services:</b> Introduction, Computer Services Overview, Amazon EC2, Amazon Lambda and Amazon Beanstalk.
<b>Unit 4</b>	<b>AWS EBS:</b> Introduction, Amazon Elastic Block Store Console, Working with EBS.
<b>Unit 5</b>	<b>AWS Cloud Architecture:</b> Introduction, AWS Well-Architected Framework Design Principles <b>Automatic Scaling and Monitoring:</b> Introduction, Amazon Elastic Load Balancing, Amazon CloudWatch, Amazon EC2 Auto Scaling

**Course Outcomes (CO)**

1. Students are able to understand basic cloud concepts and AWS Global Infrastructure.
2. Students are able to understand the basic concepts of networking in AWS.
3. Students are able to understand the basic concepts of Computing Services in AWS.
4. Students are able to understand the basic concepts of AWS EBS.
5. Students are able to understand the basic concepts of AWS Cloud Architecture and Automatic Scaling and Monitoring.

BCO482A	Introduction to Cloud Architecture	3-0-0 [3]
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***Module 1. Cloud Concepts Overview:***

Introduction to cloud computing, Advantages of the cloud, Introduction to AWS, Moving to the AWS Cloud.

***Module 2. Cloud Economic and Billing:***

Introduction, Fundamentals of Pricing, Total cost of ownership, Delaware North Case study, AWS organization, AWS Billing and cost Management, Billing dashboard, Technical Support Model,

***Module 3. AWS Global Infrastructure Overview:***

Introduction, AWS Global Infrastructure, AWS Services and Service category, AWS management console click through.

***Module 4:***

Introduction, AWS shared responsibility model, AWS IAM, Securing a New AWS Account, Securing account and data, working to ensure compliance

***Module 5: Networking and Content Delivery:***

Introduction, Networking Basics, Amazon VPC, VPC Networking, VPC Security, Route 53, Cloud front,

***Module 6. Compute:*** Introduction, compute services overview, amazon EC2 part 1, amazon EC2 part 2, amazon EC2 part 3, amazon EC2 cost optimization, container service, Introduction to AWS Lambda, Introduction to AWS Elastic Beanstalk,

***Module 7. Storage:***

Introduction, AWS EBS( Elastic Block Store Console), AWS S3, AWS EFS, AWS S3 Glacier.

***Module 8. Databases:***

Introduction , Amazon RDS, Amazon DynamoDB, Amazon Redshift, Amazon Aurora.

***Module 9. Cloud Architecture:***

Introduction, AWS Well Architected framework design principles, operational excellence, security, reliability, performance efficiency, cost optimization, reliability and high availability, AWS trusted advisor,

***Module 10. Automatic Scaling Monitoring:***

Introduction, Elastic Load Balancing, Amazon Cloud watch, Amazon EC2 Auto Scaling,

**Course Outcome:** Upon completion of this course, students will be able to

CO 1 Define the AWS Cloud

CO 2 Explain the AWS pricing philosophy

CO3 Identify the global infrastructure components of AWS

CO 4 Describe the security and compliance measures of the AWS Cloud, including AWS Identity and Access Management (IAM)

CO 5 Create a virtual private cloud (VPC) by using Amazon Virtual Private Cloud (Amazon VPC)

BCO483A	AWS CLOUD SECURITY	3-0-0 [3]
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## Course Objective

- 1.The primary objective of this course is to provide students with an in-depth understanding of cloud computing fundamentals, cloud deployment models, and various service delivery models (SaaS, PaaS, IaaS).
- 2.The course emphasizes the design and implementation of secure cloud architectures, strategies for enforcing data protection and access control, and an understanding of cloud-specific security patterns and practices.
- 3.Students will gain knowledge of potential security threats and how to mitigate them using modern cloud security tools and principles.

### Unit 1:

**Fundamentals of Cloud Computing and Architectural Characteristics-** Understand what is Cloud computing ,Architectural and Technological Influences of Cloud Computing,Understand the Cloud deployment models a. Public, Private, Community and Hybrid models

Scope of Control a. Software as a Service (SaaS) b. Platform as a Service (PaaS) c. Infrastructure as a Service (IaaS) • Cloud Computing Roles •,Risks and Security Concern.

### Unit 2:

**Security Design and Architecture for Cloud Computing-** Guiding Security design principles for Cloud Computing ,Cloud Security ,Secure Isolation , Comprehensive data protection , End- to-end access control , Monitoring and auditing , Common attack vectors and threats.

**Unit 3: Data Protection for Cloud Infrastructure and Services-** Understand the Cloud based Information Life Cycle Data protection for Confidentiality and Integrity, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key, Management, Assuring data deletion, Data retention, deletion and archiving procedures for tenant data, Data Protection Strategies.

**Unit 4: Enforcing Access Control for Cloud Infrastructure based Services-** Understand the access control requirements for Cloud infrastructure Common attack vectors and threats, Enforcing Access Control Strategies, Compute, Network and Storage, Authentication and Authorization, Roles-based Access Control, Multi-factor authentication, Host, storage and network access control options, OS Hardening and

minimization, securing remote access, Verified and measured boot, Firewalls, IDS, IPS and honeypots.

**Unit 5:** Security Patterns for Cloud Computing – Network Security, Identity & Access Management & Trust Secure On-Premise Internet Access Secure External Cloud Connection Cloud Denial-of-Service Protection Cloud Traffic Hijacking Protection Automatically Defined Perimeter Cloud Authentication Gateway Federated Cloud Authentication Cloud Key Management Trust Attestation Service Collaborative Monitoring and Logging Independent Cloud Auditing.

### **Course Outcomes**

Upon successful completion of this course, students will be able to:

1. **CO1:** Explain the fundamental concepts of cloud computing, deployment models, and service delivery frameworks.
2. **CO2:** Analyze and design secure cloud computing architectures using guiding security principles.
3. **CO3:** Evaluate various data protection mechanisms such as encryption, tokenization, and key management in cloud environments.
4. **CO4:** Implement effective access control strategies, including authentication and authorization, for cloud infrastructure.
5. **CO5:** Identify and apply cloud security patterns and techniques to mitigate common threats and vulnerabilities.

**AWS Track**  
**Department Elective 1**

<b>BCO 484A</b>	<b>Certified Cloud Practitioner</b> <b>Foundational</b>	<b>3:0:0(3)</b>
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Course Objective:

- To explain the basic principles of artificial intelligence
- To apply logic and structured concepts in knowledge representation and discuss the applications of artificial intelligence
- To implement and analyze Uninformed and Informed Search Strategies
- To implement and apply various game playing Algorithms to different problems
- Understand and represent various types of logics and their forms
- To Understand and various Learning techniques and analyze concept of ANN

**Unit-1**

Cloud Concepts Overview: Introduction to cloud computing, advantages of cloud, Introduction to AWS, moving to AWS Cloud.

AWS Global Infrastructure: AWS Global Infrastructure, AWS services and AWS categories. AWS management console.

**Unit-2**

Networking in AWS: Introduction, networking basics, Amazon VPC, VPC networking.

**Unit-3**

AWS Compute Services: Introduction, Computer Services Overview, Amazon EC2, Amazon Lambda and Amazon Beasnstalk.

**Unit-4**

AWS EBS: Introduction, Amazon Elastic Block Store Console, Working with EBS

**Unit-5**

AWS Cloud Architecture: Introduction, AWS Well-Architected Framework Design Principles  
Automatic Scaling and Monitoring: Introduction, Amazon Elastic Load Balancing, Amazon CloudWatch, Amazon EC2 Auto Scaling.

## Course Objectives

By the end of this course, students will:

1. Understand the foundational concepts of cloud computing and the AWS ecosystem.
2. Learn to navigate AWS Global Infrastructure and identify key services across various domains.
3. Develop the ability to configure virtual networks and manage cloud-based networking using Amazon VPC.
4. Gain practical experience in deploying and managing compute and storage resources using AWS services.
5. Explore architectural best practices and techniques for automatic scaling and real-time monitoring in AWS.

## Course Outcomes

After completing this course, students will be able to:

1. **CO1:** Describe the basic concepts of cloud computing and summarize the structure of AWS global infrastructure.
2. **CO2:** Use the AWS Management Console to access, configure, and manage key cloud services.
3. **CO3:** Design and implement secure and scalable networks using Amazon VPC.
4. **CO4:** Launch and manage compute instances (EC2, Lambda, Beanstalk) and attach appropriate storage solutions like EBS.
5. **CO5:** Apply the AWS Well-Architected Framework to develop scalable applications with automated load balancing and monitoring using CloudWatch and Auto Scaling.

**AWS Track**  
**Department Elective 2**

BCO 035B	<b>Programming in Java</b>	<b>3:0:0 [3]</b>
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**Objective**

- Cover issues related to the definition, creation and usage of classes, objects and methods.
- Discuss the principles of inheritance and polymorphism and demonstrate through problem analysis assignments how they relate to the design of methods, abstract classes and interfaces.
- Provide the foundation of good programming skills by discussing key issues to the design of object-oriented software, including programming design patterns, automatic documentation techniques and programming testing.
- Cover the basics of creating APIs as well as allow students to explore the Java Abstract Programming Interface (API) and Java Collection Framework through programming assignments.
- Discuss basic principles and tools of collaborating programming (versioning systems, code review) and study their usage through group programming projects.

<b>UNIT 1</b>	<b>Java Fundamentals:</b> Features of Java ,OOPs concepts , Java virtual machine , Reflection byte codes ,Byte code interpretation , Data types, variable, arrays, expressions, operators, and control structures , Objects and classes
<b>UNIT 2</b>	<b>Java Classes:</b> Abstract classes ,Static classes ,Inner classes ,Packages, Wrapper classes Interfaces ,This ,Super ,Access control
<b>UNIT 3</b>	<b>Exception handling:</b> Exception as objects ,Exception hierarchy ,Try catch finally ,Throw, throws
<b>UNIT 4</b>	<b>IO package:</b> Input streams ,Output streams ,Object serialization ,De serialization ,Sample programs on IO files ,Filter and pipe streams
<b>UNIT 5</b>	<b>Multi threading:</b> Thread Life cycle ,Multi threading advantages and issues ,Simple thread program ,Thread synchronization .GUI: Introduction to AWT programming, Layout and component managers ,Event handling ,Applet class ,Applet life-cycle ,Passing parameters embedding in HTML ,Swing components – JApplet, JButton, JFrame, etc. Sample swing programs

**Course Outcome:**

At the end of this course student will:

- CO1: Understand how object-oriented concepts are incorporated into the Java programming language  
 CO2: Develop problem-solving and programming skills using OOP concept  
 CO3: Understand the benefits of a well structured program  
 CO4: Develop the ability to solve real-world problems through software development in high-level programming language like Java  
 CO5: Develop efficient Java applets, threading and applications using OOP concept

**MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:**

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1		M		M	H				M		H		M	H	
CO2	L		M		H		L	L		M		M		H	M
CO3		M		H	M	L		L		M	H		M	H	
CO4			H	M			L		M		H		M	H	
CO5			H	M		L						M	H	H	

H = Highly Related; M = Medium L = Low

**References:**

1. Programming with Java A Primer, E.Balaguruswamy Tata McGraw Hill Companies
2. Java Programming John P. Flynt Thomson 2nd
3. Java Programming Language Ken Arnold Pearson
4. The complete reference JAVA2, Herbert schildt. TMH

**AWS Track**  
**Department Elective 3**

<b>BCO 486A</b>	<b>AWS Academy Cloud Developing</b>	<b>Total Credits: 3</b>
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**Course Objectives**

CO1 Recall cloud computing services and models.CO2. Describe developing on AWS.

CO3. Configure AWS Identity and Access Management for programmatic accessCO4. Configure storage with Amazon S3 programmatically.

CO5. Develop with DynamoDB and explain caching.

*Module 1 – Welcome to Academy Cloud Developing (ACD)*

Cloud prerequisites objectives and overview, AWS training portal, AWS free tier, AWS educate, AWS documentation scavenger hunt.

*Module 2 – Introduction to Developing on AWS*

System development lifecycle, steps to get started developing on AWS, working with AWS SDKs, errors and exceptions, introduction to AWS X-rays, introduction to amazon cloudwatch and AWS cloudtrail.

*Module 3 – Introduction to AWS Identity and Access Management (IAM)*

Shared responsibility model , overview of IAM, authentication with IAM , authorization with IAM.

*Module 4 – Developing Storage Solutions with Amazon S3*

Introduction to Amazon S3, Creating amazon S3 buckets, working with amazon S3 objects, protecting data and managing access to amazon S3 resources.

*Module 5 – Developing NoSQL Solutions with Amazon DynamoDB*

Introduction to amazon dynamoDB, amazon dynamo DB Key concepts, partition and data distribution, secondary indexes, read/write throughput, streams and global tables, backup and restore, basic operations for amazon dynamoDB tables.

*Module 6 - Caching Information for Scalability*

Caching overview, caching with amazon cloudfront, caching with amazon elasticache, caching strategies.

*Module 7 - Introduction to Containers*

Introduction to containers, Container VS Hardware virtualization, Microservices-use case for containers, Amazon container services.

#### *Module 8 - Developing Solutions with Amazon SQS and Amazon SNS*

Introduction to message queues, introduction to amazon SQS, amazon SQS developer concepts, introduction to amazon SNS, amazon SNS developer concepts, introduction to amazon MQ.

#### *Module 9 - Developing Event-Driven Solutions with AWS Lambda*

Introduction to server less computing with AWS lambda, overview of AWS lambda, Execution model for invoking lambda functions, AWS lambda permissions, overview of authoring and configuring lambda functions, overview of deploying lambda functions.

#### *Module 10 - Developing Solutions with Amazon API Gateway*

Application Programming Interfaces, Amazon API Gateway, Creating a RESTful API, Controlling Access to a RESTful API, Testing a RESTful API, Deploying a RESTful API, Invoking a RESTful API, Monitoring a RESTful API.

#### *Module 11 - Developing Solutions with AWS Step Functions*

Workflow Coordination in Distributed Applications, Introduction to AWS Step Functions, StateTypes, AWS Step Functions Use Case, AWS Step Functions API.

#### *Module 12 - Developing Secure Applications on AWS*

Secure Network Connections. Manage Application Secrets, Authenticate with AWS Security Token Service, Authenticate with Amazon Cognito.

#### *Module 13 - Deploying Applications on AWS.*

Introducing DevOps, Using AWS Code Services for CI/CD, Introducing Deployment and Testing Strategies, Deploying Applications with AWS Elastic Beanstalk, Deploying Applications with AWS CloudFormation, Deploying Serverless Applications with AWS SAM

**AWS Track**  
**Department Elective 4**

<b>BCO 037 B</b>	<b>ADVANCE PROGRAMMING IN JAVA</b>	<b>3-0-0 [3]</b>
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**OBJECTIVES:** - Students will be able to know the following

- To learn the Java programming language: its syntax, idioms, patterns, and styles.
- To become comfortable with object oriented programming: Learn to think in objects
- To learn the essentials of the Java class library, and learn how to learn about other parts of the library when you need them.
- To introduce event driven Graphical User Interface (GUI) programming

<b>UNIT 1</b>	Revisited of GUI, Database Programming using JDBC Introduction to JDBC ,JDBC Drivers & Architecture CURD operation Using JDBC Connecting to non-conventional Databases. Connectivity with SQL server, Oracle and MS access.
<b>UNIT 2</b>	Networking , Networking Basics ,The Networking Classes and Interfaces InetAddress ,Factory Methods ,Instance Methods ,Inet4Address and Inet6Address, TCP/IP Client Sockets ,URL,URLConnection,Http URL Connection, The URI Class,Cookies, TCP/IP Server Sockets,Datagram, DatagramSocket ,DatagramPacket,
<b>UNIT 3</b>	RMI (Remote Method Invocation) RMI overview RMI architecture, Designing RMI application, Executing RMI application. Example demonstrating RMI
<b>UNIT 4</b>	Servlet: Web Application Basics. Architecture and challenges of Web Application.Introduction to servlet life cycle Developing and Deploying Servlets Exploring Deployment Descriptor (web.xml). Handling Request and Response Initializing a Servlet Accessing Database Servlet Chaining Session Tracking & Management Dealing with cookies Transferring Request Accessing Web Context Passing INIT and CONTEXT Parameter Sharing information using scope object Controlling concurrent access User Authentication Filtering Request and Response Programming Filter Filter Mapping Servlet Listeners .
<b>UNIT 5</b>	Basic JSP Architecture Life Cycle of JSP (Translation, compilation) JSP Tags and Expressions Role of JSP in MVC-2 JSP with Database JSP Implicit Objects Tag Libraries JSP Expression Language (EL) Using Custom Tag JSP Capabilities: Exception Handling Session Management Directives JSP with Java Bean.

**OUTCOMES:-**

Upon end of this course, students will be able to:

- About the Java programming language: its syntax, idioms, patterns, and styles.
- Become comfortable with object oriented programming: Learn to think in objects
- Learn the essentials of the Java class library, and learn how to learn about other parts of the library when you need them.
- Introduce event driven Graphical User Interface (GUI) programming
- Able to Understand the JSP Implementation

**MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF  
PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:**

Course Outcomes	Program Outcomes												Program specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			H	L	H		L			M	H			H	
CO2		L	H		H	L		L					M	H	
CO3			H	M					L	L		M		H	
CO4				M	H			M			L			H	M
CO5		L			H	M			M					H	

**Text Books:**

1. J2EE: The complete Reference by James Keogh
2. Java 6 And J2Ee 1.5, Black Book by kogent
3. Java Server Programming Java EE6 (J2EE 1.6), Black Book by kogent

**Reference books:-**

1. Programming with Java A Primer, E.Balaguruswamy Tata McGraw Hill Companies
2. Java Programming John P. Flynt Thomson 2<sup>nd</sup>
3. Java Programming Language Ken Arnold Pearson

BCO 069A	Advance Programming in Java Lab	0-0-2
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**Exp. Name of the Experiment**

**No.**

1 Design a registration page using HTML.

**2 Implementing JDBC**

Program 2(A) Write a program by using JDBC to execute insert, select and update query by using PreparedStatement and display the results.

Program 2(B) Write a program by using JDBC to execute an update query by using PreparedStatement and display the results.

Program 2(C) Write a program and execute ResultSetMetaData Interface by using JDBC.

**3 Implementing Servlet**

Program 3(A) Write a program and execute a simple servlet demonstrating servlet lifecycle.

Program 3(B) Write a program and execute a servlet program that receives input from html page.

Program 3(C) Write a program and execute ServletRequest and ServletResponse Interfaces with methods.

Program 3(D) Write a program and execute HttpServlet Class doGet() and doPost() Methods.

Program 3(E) Write a program to store the user information into Cookies. Write another program to display the above stored information by retrieving from Cookies.

**4 Implementing JSP, JSP Custom Tags and Directives**

Program 4(A) Write a program to connect HTML page, JSP page and mysql database. Program 4(B) Write a program and implement custom tags in JSP

Program 4(C) Write a program and implement JSP directives.

**5 Implementing JavaBean**

Program 5 Write a program and implement Javabeans using JSP page.

**6 Implementing JSP Standard ActionElements**

Program 6 Write a program and implement JSP StandardActionElements.

**7 Implementing JSP Scripting Elements**

Program 7: Write a program and execute JSP Scriptlets, Declarations and Expressions.

**8 Learning session management**

Program 8(A): Write program and execute session management using URL rewriting

Program 8(B) :Write program and execute session management using Hidden Fields.

Program 8(C) : Write program and execute session management using Cookie

Program 8(D): Write a program and execute session management using Session Objects.

9 **Remote Method Invocation (RMI)**

Program 9(A):Write a program and execute Remote Method Invocation

10 **Configure web.xml**

Program 10:Write a code to deploy web.xml file

11 **Performing Client-Server Communication and Networking**

Program 11(A): WAP to implement Client-Server Program

Program 11(B): WAP to implement InetAddress.

Program 11(C): WAP for Sending Email in java

12. **Implementing Multithreading**

Program 12: WAP to implement multithreading(three threads using single run method).

**MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:**

Course Outcomes	Program Outcomes												Program specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1			H	L	H		L			M	H			H	
CO2		L	H		H	L		L					M	H	
CO3			H	M				L	L			M		H	
CO4				M	H			M			L			H	M
CO5		L			H	M			M					H	

**AWS Track**  
**Department Elective 5**

<i>BCO615A</i>	<b>QUANTUM COMPUTING</b>	<b>Total Credits: 3</b>
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**Course Objectives:**

1. To introduce the basic principles of quantum mechanics, linear algebra, and Dirac notation relevant to quantum computing.
2. To explain quantum entanglement, quantum algorithms, and quantum channels with foundational understanding.
3. To provide exposure to quantum cryptography and quantum communication protocols.
4. To familiarize students with practical quantum computing using IBM Quantum and associated simulators for basic quantum programming and analysis.

<b>UNIT 1</b>	<b>Fundamentals of Quantum Mechanics:</b> Introduction to quantum mechanics and linear algebra concepts for quantum computing, including quantum states in Hilbert space, Dirac notation, Bloch sphere, density operators, superposition and measurement postulates. Covers uncertainty principle, no-cloning theorem, and basics of quantum dynamics with unitary transformations and Schrödinger equation applications.
<b>UNIT 2</b>	<b>Quantum Correlations:</b> Study of quantum correlations and entanglement, Bell’s theorem and Bell inequalities, and Schmidt decomposition. Includes applications like superdense coding, quantum teleportation, and entanglement swapping, emphasizing their role in quantum networks and information processing.
<b>UNIT 3</b>	<b>Quantum Cryptography:</b> Introduction to quantum cryptography and its distinction from classical methods, focusing on QKD protocols such as BB84 and E91. Covers security analysis, eavesdropping, no-cloning implications, and applications of QKD in secure communications and cryptographic infrastructures.
<b>UNIT 4</b>	<b>Quantum Gates and Algorithms:</b> Overview of quantum gates such as Pauli, Hadamard, phase, T-gate, CNOT, and Toffoli, along with universal gate sets and quantum circuits. Introduces key algorithms like Deutsch–Jozsa, Grover’s search, and Shor’s factoring, highlighting quantum speedup and computational complexity.
<b>UNIT 5</b>	<b>Quantum Programming:</b> Hands-on quantum programming using IBM Quantum (IBMQ) and Qiskit simulators, constructing and analyzing quantum circuits, performing quantum measurements, and visualizing states. Includes implementing basic algorithms, error mitigation concepts, and executing circuits on real IBM quantum hardware.

**Course Outcomes**

Upon successful completion of this course, the student will be able to:

**CO1:** Understand fundamental quantum mechanical principles and their application to quantum information processing.

**CO2:** Analyze quantum entanglement, correlations and their role in quantum communication protocols.

**CO3:** Apply quantum cryptography techniques for secure key distribution and evaluate their

security properties.

**CO4:** Design and interpret basic quantum circuits and algorithms demonstrating quantum speedup.

**CO5:** Implement and test quantum programs using IBM Quantum tools and analyze the effect of noise and errors on computation.

### Textbooks

1. Phillip Kaye, Raymond Laflamme, et al., *An Introduction to Quantum Computing*, Oxford University Press, 2007.
2. Chris Bernhardt, *Quantum Computing for Everyone*, MIT Press, 2020.
3. David McMahon, *Quantum Computing Explained*, Wiley-Interscience, IEEE Computer Society, 2008.

### References

1. Michael A. Nielsen & Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press, 2013.
2. Eleanor G. Rieffel & Wolfgang H. Polak, *Quantum Computing: A Gentle Introduction*, MIT Press, 2014.

### MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	H	M	L	L	L	L	L	L	L	M	L	M	H	M	H
CO2	M	H	M	L	L	L	L	L	L	M	L	M	H	M	M
CO3	M	M	H	M	L	L	L	L	L	M	L	M	M	H	M
CO4	M	H	H	M	M	L	L	L	L	H	L	M	H	H	M
CO5	L	M	H	H	H	L	L	L	L	H	L	M	H	H	L

H = Highly Related; M = Medium L = Low

**AWS Track**  
**Department Elective 6**

<b>BCO 029B</b>	<b>DATA MINING &amp; WAREHOUSING</b>	<b>3:0:0 [3]</b>
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**OBJECTIVE:**

- To compare and contrast different conceptions of data mining.
- To explain the role of finding associations in commercial market basket data.
- To characterize the kinds of patterns that can be discovered by association rule mining.
- To describe how to extend a relational system to find patterns using association rules.
- To evaluate methodological issues underlying the effective application of data mining.

<b>UNIT 1</b>	Introduction: Basic concepts of data mining, including motivation and definition; different types of data repositories; data mining functionalities; concept of interesting patterns; data mining tasks; current trends, major issues, and ethics in data mining
<b>UNIT 2</b>	Data: Types of data and data quality; Data Preprocessing: data cleaning, data integration and transformation, data reduction, discretization, and concept hierarchy generation; Exploring Data: summary statistics, visualization, multidimensional data analysis
<b>UNIT 3</b>	Association and Correlation Analysis: Basic concepts: frequent patterns, association rules - support and confidence; Frequent itemset generation - Apriori algorithm, FP-Growth algorithm; Rule generation, Applications of Association rules; Correlation analysis
<b>UNIT 4</b>	Clustering Algorithms and Cluster Analysis: Concept of clustering, measures of similarity, Clustering algorithms: Partitioning methods - k-means and k-medoids, CLARANS, Hierarchical methods - agglomerative and divisive clustering, BIRCH, Density-based methods - Subspace clustering, DBSCAN; Graph-based clustering - MST clustering; Cluster evaluation; Outlier detection and analysis.
<b>UNIT 5</b>	Data Mining Algorithms: Partitioned Algorithms, Hierarchical Algorithms, Density-Based Algorithms, Grid-Based Algorithms, Web Content Mining, Web Structure Mining, Web Usage Mining, Spatial Mining, Multimedia Data Mining, Text Mining. Case Study.

**OUTCOMES:** At the end of the course, the student should be able to:

- Compare and contrast different conceptions of data mining.
- Explain the role of finding associations in commercial market basket data.
- Characterize the kinds of patterns that can be discovered by association rule mining.
- Describe how to extend a relational system to find patterns using association rules.
- Evaluate methodological issues underlying the effective application of data mining.

● **MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:**

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	H		M										M		M
CO2	M		M		M								H		
CO3	H	M		L			1						H	M	
CO4	M		H	M		M								H	
CO5	M	H											M		

- H = Highly Related; M = Medium L = Low

**Text Books:**

1. Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, Introduction to Data Mining. Pearson (2005), India. ISBN 978-8131714720
2. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, 3rd edition (July 2011), 744 pages. ISBN 978-0123814791

**Reference Books:**

1. T. Hastie, R. Tibshirani, and J. H. Friedman, The Elements of Statistical Learning, Data Mining, Inference, and Prediction. Springer, 2nd Edition, 2009. 768 pages. ISBN 978-0387848570

2. C. M. Bishop, Pattern Recognition and Machine Learning. Springer, 1st edition, 2006. 738 pages. ISBN 978-0387310732

3. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann, 3rd edition (January 2011). 664 pages. ISBN 978-0123748560.

**AWS Track**  
**Department Elective 7**

<b>BCO215B</b>	<b>Web development using WordPress</b>	<b>3-0-1 [3]</b>
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**Web development using WordPress**

**Course objective:-**Student will be able to design and develop websites using WordPress tool.

<b>UNIT 1</b>	<b>Introduction to CMS:</b> Introduction to Content Management Systems, Main Features of CMS, Web Content Management System, Component Content Management System, Enterprise Content Management System, Introduction of Blogs. Installing WordPress with a Web Host's "1-Click Install", Manually Installing WordPress
<b>UNIT 2</b>	<b>Introduction to WordPress:</b> Introduction to WordPress, Setting up WordPress, Setting Up Database, Overview of Working of WordPress, Dashboard, Exporting and Importing of Site Content, Backup of Site data and files, Upgrading WordPress, Settings: General, Writing, Reading, Discussion, Media, Privacy, Permalinks, Configuring and Managing Accounts, Adding Content: Post, Pages, Setup and use of Categories, Tags, Internal Linking
<b>UNIT 3</b>	<b>Advance Features for WordPress:</b> Working with media: using Media Library, Audio and Video Files, Managing Comments, Fighting Spam with Akismet, Syndication: Setup and Display of RSS Feed, Setup of Subscriptions, use of Google FeedBurner with WordPress, Widgets and Plug-ins: Use of Widgets and Plug-ins, Differences, Upgrade of Plug-ins. Adding an Image Gallery, Editing an Existing Image Gallery, Adding Video Embedding Responsive Videos, Uploading a Video File,
<b>UNIT 4</b>	<b>Customization with WordPress</b> Introduction to WordPress Themes, Customized WordPress Theme: Default Theme, New Theme, Theme Editor, Set up of Menus, Post Thumbnails, Customization of Themes: Custom CSS, addition of Frames, Getting Fancy with Themes: Customization of Themes with CSS, addition of Favicon, Editing Function files, Advanced Theme Development: Anatomy of WordPress theme, Building new Theme, Template Files, Template Tags, Use of Loop, Custom Post Types and Custom Taxonomies, One Installation and Multiple blogs: Setup and Administration of Blog Network, Customization of WordPress: Integration of Third Party Services, Third Party Comment System, AD Integration, Web Fonts, Tools and Tricks
<b>UNIT 5</b>	<b>WordPress Security, Performance &amp; Deployment</b> Website Security (SSL, Backups, Anti-malware Plugins), Performance Optimization (Caching, Image Optimization, CDN), SEO for WordPress (Yoast SEO, RankMath), Migrating Websites (Local to Live Server), Career Pathways: Freelancing, Agencies, and Personal Branding.

## Course Outcomes

CO1:- To be able to understand concepts of content management system, its benefits.

CO2:- Understand installation and configuring word press for web development

CO3:- To be able to work with video and audio files with their plug-ins in websites

CO4:- To be able to create websites more attractive by using themes and CSS, increasing usability by adding hyperlinks.

CO5:Able to create interactive web sites

### MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L	M	L	M							L	L		
CO2	L		M		M									L	M
CO3		L		M	H				M		M		M	M	M
CO4		M	L	M	H				M		M	M	M	H	H
CO5	H	H	L	M	M			L	M		M	M	H	M	L

H = Highly Related; M = Medium L = Low

### References:

1. Building Web Apps with WordPress: WordPress as an Application Framework 2nd Edition by Brian Messenlehner, Jason Coleman
2. WordPress for Beginners 2020: A Visual Step-by-Step Guide to Mastering WordPress (Webmaster Series) by Dr. Andy Williams
3. WordPress 5 Complete - Seventh Edition by Karol Krol