



University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur



4th Semester Syllabus for BCA Admission Batch 2026
(Tentative)

Course structure										
SEMESTER 4										
SL NO	TYPES OF COURSE	SUB CODE	SUB NAME	L	T	P	S	TOTAL CONTACT HRS	CREDIT POINTS	
THEORY										
1	Computer Science & Application	BCACC401	Database Management System	3	1	0	0	4	4	
2	Computer Science & Application	BCACC402	Programming with Java	3	1	0	0	4	4	
3	Ability Enhancement	BCAAE401	Computer Networks	3	1	0	0	4	4	
4	Value Added Course	BCAGS401	General Studies & Current Affairs-IV	2	0	0	0	2	2	
PRACTICAL										
5	Computer Science & Application	BCACC491	Database Management System lab	0	0	4	0	4	2	
6	Computer Science & Application	BCACC492	Programming with Java lab	0	0	4	0	4	2	
SESSIONAL										
7	Skill Enhancement	BCAGS481	Competitive Aptitude Training-IV	0	0	0	2	2	2	
8	Skill Enhancement	BCASE481	Business Communication	0	0	0	2	2	2	
9	Minor	BCAMS481	Financial Management	0	0	0	2	4	2	
MOOCS/MAR/IFC										
10	Value Added Course	MOOCs	Massive Open Online Course	0	0	0	0	0	0	
11	Value Added Course	IFC	Industry and foreign certification	0	0	0	0	0	0	
12	Value Added Course	MAR	Mandatory Additional Requirements(MAR)	0	0	0	0	0	0	
								30	24	

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Syllabus and Lesson Plan

Subject Name: **Database Management Systems**

Credit: 4

Lecture Hours: 48

Subject Code: **BCACC401**

Maximum: 100 marks (Internal: 30 marks; External: 70 marks)

List of Faculty Members handling the Subject –

1. Prof. Manjima Saha,
2. Prof. Pritam Chakraborty
3. Prof. Manab Kumar Dutta

Pre-requisite: Fundamentals of computer, Basic Programming concept

Relevant Links:

[Study Material](#)

[Coursera](#)

[LinkedIn Learning](#)

[NPTEL](#)

COURSE OBJECTIVES:

1. Students will be familiarize with different concepts of DBMS, it's applications.
2. Students will able to draw and understand ER diagram Entity-Relationship diagrams for enterprise level databases
3. Students will be able to Formulate Queries using SQL.
4. Apply different normal forms to design the Database.
5. Student will get clear concepts about concurrency control protocols and recovery algorithms.
6. Identify suitable Indices and Hashing mechanisms for effective storage and retrieval of Data.

COURSE OUTCOMES:

- CO 1.** Familiarization with Database Management System and its applications.
- CO 2.** Comprehensive knowledge about relational models and various normal forms to design the Database.
- CO 3.** SQL commands to formulate various Queries and transactions.
- CO 4.** Explore the File organizations, indexing and hashing mechanisms.

Module No	Topic	Sub Topic	Chapter Name and Book	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
MODULE 1	Introduction	1.1 Database-System Applications 1.2 Purpose of Database Systems 1.3 View of Data 1.4 Database Languages 1.5 Relational Databases 1.6 Database Design 1.7 Object-Based and Semi structured Databases 1.8 Data Storage and Querying 1.9 Transaction Management 1.10 Database Architecture 1.11 Database Users and Administrators 1.12 History of Database Systems	Chapter 1: Introduction Book: Database Systems Concepts by A Silberschatz, Henry F Korth, and S. Sudarshan, 7 th Edition, Tata McGraw Hill	International Academia: https://ocw.mit.edu/courses/6-830-database-systems-fall-2010/resources/mit6830f10_lec01/ Industry Mapping: MyS QL, Google CLOUD	7	SQL Commands for- 1. Display the existing default employees or employee table. 2. Display all the existing tables of the database you are using. Display the structure of the above table. 3. Delete the details of all students from the table.
MODULE 2	Relational Model	2.1 Structure of Relational Databases 2.2 Fundamental Relational-Algebra Operations 2.3 Additional Relational-Algebra Operations 2.4 Extended Relational-Algebra Operations 2.5 Null Values 2.6 Modification of the Database	Chapter 2: Introduction to Relational Model Book: Database Systems Concepts by A Silberschatz, Henry F Korth, and S. Sudarshan, 7 th Edition, Tata McGraw Hill	International Academia: https://ocw.mit.edu/courses/6-830-database-systems-fall-2010/resources/mit6830f10_lec02/ Industry Mapping: MySQL, Google Cloud	6	SQL Command for: 1. Insertion 2. Updating 3. Deletion 4. Arithmetic Operations 5. Displaying Data in different ways 6. Set Operations 7. Aggregate Functions 8. Joining 9. Sub query

MODULE 3	SQL	3.1 Background 3.2 Data Definition 3.3 Basic Structure of SQL Queries 3.4 Set Operations 3.5 Aggregate Functions 3.6 Null Values 3.7 Nested Subqueries 3.8 Complex Queries 3.9 Views 3.10 Modification of the Database 3.11 Joined Relations	Chapter 3: Introduction to SQL Book: Database Systems Concepts by A Silberschatz, Henry F Korth, and S. Sudarshan, 7 th Edition, Tata McGraw Hill	International Academia: https://ocw.mit.edu/courses/6-830-database-systems-fall-2010/resources/mit6830f10_lec05/	8	SQL Command for: 1. Arithmetic Operations 2. Displaying Data in different ways 3. Set Operations 4. Aggregate Functions 5. Various type of Joining 6. Sub query 7. Transactions
	Other Relational Languages	5.1 The Tuple Relational Calculus 5.2 The Domain Relational Calculus	Chapter 5: Advanced SQL Book: Database Systems Concepts by A Silberschatz, Henry F Korth, and S. Sudarshan, 7 th Edition, Tata McGraw Hill	International Academia: https://ocw.mit.edu/courses/6-830-database-systems-fall-2010/resources/mit6830f10_lec05/MITOpenCourseWare Industry Mapping: MySQL, Google CLOUD		

MODULE 4	Database Design and the E-R Model	6.1 Overview of the Design Process 6.2 The Entity-Relationship Model 6.3 Constraints 6.4 Entity-Relationship Diagrams 6.5 Entity-Relationship Design Issues 6.6 Weak Entity Sets 6.7 Extended E-R Features 6.8 Database Design for Banking Enterprise 6.9 Reduction to Relational Schemas	Chapter 6: Database Design using E-R Model Book: Database Systems Concepts by A Silberschatz, Henry F Korth, and S. Sudarshan, 7 th Edition, Tata McGraw Hill	International Academia: https://ocw.mit.edu/courses/6-830-database-systems-fall-2010/resources/mit6830f10_lec03/ Industry Mapping: MySQL, Google Cloud	6	1. Design an ER Diagram for the following case study: Students register for courses. Courses have allocated classrooms. Instructors guide students. Analyze the attributes and keys required to store data in such situation and ensure that the degree of the relationships are not more than 2. 2. Design an ER Diagram for the following case study: Design an ER Diagram for a Hospital showing the usage of all the different types of relationship, attributes and keys.
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	Relational Database Design	7.1 Features of Good Relational Designs 7.2 Atomic Domains and First Normal Form 7.3 Decomposition Using Functional Dependencies 7.4 Functional-Dependency Theory 7.5 Decomposition Using Functional Dependencies 7.6 Decomposition Using Multivalued Dependencies	Chapter 7: Relational Database Design Book: Database Systems Concepts by A Silberschatz, Henry F Korth, and S. Sudarshan, 7 th Edition, Tata McGraw Hill		4	1. Analyze the reason why the relations obtained from the ER Diagram are always in 1NF. 2. Analyze and prove that a relation in BCNF is always in 3NF but vice-versa is not true.
MODULE 5	Indexing of Files	8.1 Type of single level ordered indexes 8.2 Multilevel indexes 8.3 Dynamic multi-level indexes using B tree and B+ tree 8.4 Indexes on multiple keys 8.5 Other type of indexes	Chapter 14: Indexing Book: Database Systems Concepts by A Silberschatz, Henry F Korth, and S. Sudarshan, 7 th Edition, Tata McGraw Hill	International Academia: https://ocw.mit.edu/courses/6-830-database-systems-fall-2010/resources/mit-6-830f10-lec06/ Industry Mapping: MySQL, Google Cloud	3	1. SQL command for trigger and view 2. Analyze and construct a B+ tree for the following dataset: 20,10,34,45, 56,14,59, 46,12,5

MODULE 6	Introduction of Transaction processing Concepts and Theory	9.1 Introduction to Transaction Processing 9.2 Transaction and System concepts 9.3 Desirable properties of Transaction 9.4 Characterizing schedules based on Recoverability 9.5 Characterizing schedules based on Serializability 9.6 Transaction support in SQL	Chapter 17: Transaction Book: Database Systems Concepts by A Silberschatz, Henry F Korth, and S. Sudarshan, 7 th Edition, Tata McGraw Hill	International Academia: https://ocw.mit.edu/courses/6-830-database-systems-fall-2010/resources/mit6_830f10_lec10/ IndustryMapping: MySQL, Google Cloud	3	1. Analyze the property of DBMS where the DBMS informs the user that a transaction has been successfully completed.
	Concurrency Control Technique Concepts and Theory	10.1 Two Phase Locking Technique for Concurrency Control 10.2 Concurrency Control Based on Time Stamp Ordering 10.3 Multiversion Concurrency Control Techniques 10.4 Validation (Optimistic) Concurrency Control Techniques 10.5 Using locks for concurrency control. 10.5 Other concurrency control issues	Chapter 18: Concurrency Control Book: Database Systems Concepts by A Silberschatz, Henry F Korth, and S. Sudarshan, 7 th Edition, Tata McGraw Hill	International Academia: https://ocw.mit.edu/courses/6-830-database-systems-fall-2010/resources/mit6_830f10_lec11/ IndustryMapping: MySQL, Google Cloud	3	1. Use three database items with initial values: A = 100, B = 200, C = 300 Define five transactions (T1..T5): 2. Explain briefly how two-phase commit (2PC) interacts with locking when a distributed transaction holds locks across participants. What are the availability and blocking concerns?

MODULE 1: Introduction

2nd Year, Sec A (Faculty Name – Manjima Saha, Pritam Chakraborty)

2nd Year, Sec B (Faculty Name – Manjima Saha, Manab Kumar Das)

2nd Year, Sec C (Faculty Name – Pritam Chakraborty, Manab Kumar Das)

Working Day	Lesson Plan Description
Day 1	Database-System Applications , Purpose of Database Systems
Day 2	View of Data , Database Languages
Day 3	Relational Databases , Database Design
Day 4	Data Storage and Querying
Day 5	Database Architecture , Database Users and Administrators
Day 6	History of Database Systems
Day 7	Object-Based and Semi structured Databases
Day 8	Transaction Management

MODULE 2: Relational Model

2nd Year, Sec A (Faculty Name – Manjima Saha, Pritam Chakraborty)

2nd Year, Sec B (Faculty Name – Manjima Saha, Manab Kumar Das)

2nd Year, Sec C (Faculty Name – Pritam Chakraborty, Manab Kumar Das)

Working Day	Lesson Plan Description
Day 9	Structure of Relational Databases
Day 10	Fundamental Relational-Algebra Operations
Day 11	Fundamental Relational-Algebra Operations
Day 12	Additional Relational-Algebra Operations
Day 13	Extended Relational-Algebra Operations
Day 14	Null Values
Day 15	Modification of the Database
Day 16	Modification of the Database

MODULE 3: SQL and other Relational Languages

2nd Year, Sec A (Faculty Name – Manjima Saha, Pritam Chakraborty)

2nd Year, Sec B (Faculty Name – Manjima Saha, Manab Kumar Das)

2nd Year, Sec C (Faculty Name – Pritam Chakraborty, Manab Kumar Das)

Working Day	Lesson Plan Description
Day 17	Background , Data Definition , Basic Structure of SQL Queries
Day 18	Set Operations, Aggregate Functions , Null Values
Day 19	Nested Sub queries , Complex Queries
Day 20	Views, Modification of the Database
Day 21	Modification of the Database, Joined Relations
Day 22	Joined Relations, The Tuple Relational Calculus
Day 23	The Tuple Relational Calculus
Day 24	The Domain Relational Calculus

MODULE 4: Database Design, E-R Model and Relational Database Design

2nd Year, Sec A (Faculty Name – Manjima Saha, Pritam Chakraborty)

2nd Year, Sec B (Faculty Name – Manjima Saha, Manab Kumar Das)

2nd Year, Sec C (Faculty Name – Pritam Chakraborty, Manab Kumar Das)

Working Day	Lesson Plan Description
Day 25	Overview of the Design Process, The Entity-Relationship Model
Day 26	Constraints , Entity-Relationship Diagrams , Entity-Relationship Design Issues
Day 27	Weak Entity Sets , Extended E-R Features
Day 28	Database Design for Banking Enterprise ,Reduction to Relational Schemas
Day 29	Features of Good Relational Designs ,Atomic Domains and First Normal Form
Day 30	Decomposition Using Functional Dependencies ,Functional-Dependency Theory
Day 31	Decomposition Using Functional Dependencies ,Decomposition Using Multivalued Dependencies
Day 32	Decomposition Using Functional Dependencies ,Decomposition Using Multivalued Dependencies

MODULE 5: Indexing of Files

2nd Year, Sec A (Faculty Name – Manjima Saha, Pritam Chakraborty)

2nd Year, Sec B (Faculty Name – Manjima Saha, Manab Kumar Das)

2nd Year, Sec C (Faculty Name – Pritam Chakraborty, Manab Kumar Das)

Working Day	Lesson Plan Description
Day 33	Type of single level ordered indexes
Day 34	Type of single level ordered indexes
Day 35	Multilevel indexes
Day 36	Multilevel indexes
Day 37	Dynamic multi-level indexes using B tree and B+ tree
Day 38	Indexes on multiple keys
Day 39	Other type of indexes
Day 40	Other type of indexes

MODULE 6: Introduction of Transaction processing Concepts and Theory & Concurrency Control Technique Concepts and Theory

2nd Year, Sec A (Faculty Name – Manjima Saha, Pritam Chakraborty)

2nd Year, Sec B (Faculty Name – Manjima Saha, Manab Kumar Das)

2nd Year, Sec C (Faculty Name – Pritam Chakraborty, Manab Kumar Das)

Working Day	Lesson Plan Description
Day 41	Introduction to Transaction Processing, Transaction and System concepts
Day 42	Desirable properties of Transaction, Characterizing schedules based on Recoverability
Day 43	Characterizing schedules based on Serializability, Transaction support in SQL
Day 44	Two Phase Locking Technique for Concurrency Control , Concurrency Control Based on Time Stamp Ordering
Day 45	Multi version Concurrency Control Techniques, Validation (Optimistic) Concurrency Control Techniques
Day 46	Using locks for concurrency control, Other concurrency control issues
Day 47	Doubt Clearing

TEXT BOOK:

Database System Concepts – 7th Edition by A. Silberschatz, H. Korth and S. Sudarshan

Fundamentals of Database Systems – 5th Edition by R. Elmasri, S. Navathe

REFERENCE BOOKS:

C.J Date - An Introduction to Database Systems, 8e, Pearson Education

SQL,PL/SQL –The Programming language of Oracle, 4th Edition, BPB Publication

List of equipment/apparatus for laboratory experiments:

Sl. No.	Type	Requirements
1	Hardware	Computer with moderate configuration
2	Software	Oracle 10g / MySQL

CO- PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1:	3	2	1	1	2	3	3	1	1	2	2	2
CO2:	3	3	3	3	3	3	2	1	3	3	3	3
CO3:	3	2	2	3	3	3	3	3	3	2	2	3
CO4:	3	2	2	2	3	2	1	2	2	1	1	2

3: Strong correlation 2: Medium correlation 1: Weak correlation

PSO	PSO Description
PSO-1	Database Design and Modelling: Apply fundamental concepts of database design, including data models, ER diagrams, and normalization, to develop efficient and well-structured relational databases.
PSO-2	Query Processing and Optimization: Develop and optimize SQL queries and apply concepts of query processing, transaction management, and concurrency control to ensure data integrity and system performance.
PSO-3	Implementation and Application Development: Design and implement real-world database applications using modern DBMS tools and technologies, integrating front-end interfaces and back-end databases effectively.

QUESTION PAPER PATTERN AND DATES

EXAMINATION	Dates	PART – A	PART – B	PART – C	TOTAL MARKS
Mid Term 1		Attempt 5 out of 6 questions; Each question carries 2 marks (2×5)	Attempt 2 out of 3 questions; Each question carries 5 marks (5×2)	Attempt 1 out of 2 questions; Each question carries 10 marks (10×1)	30
Mid Term 2		Attempt 5 out of 6 questions; Each question carries 2 marks (2×5)	Attempt 2 out of 3 questions; Each question carries 5 marks (5×2)	Attempt 1 out of 2 questions; Each question carries 10 marks (10×1)	30
End Semester Examination		Attempt 10 out of 15 questions; Each question carries 2 marks (2×10)	Attempt 6 out of 9 questions; Each question carries 5 marks (5×6)	Attempt 5 out of 8 questions; Each question carries 10 marks (10×5)	100

Examination Rules & Regulations:

https://drive.google.com/file/d/1HTqwA_GXBodq_XaI_NC8nS9mMkXG-KJv/view?usp=sharing



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University of Engineering & Management, Jaipur



Subject Name: **Programming with Java**
Subject Code: **BCACC402**

Credit: 4

Lecture Hours: 40

Maximum: 100 marks (Internal: 30 marks; External: 70 marks)

List of Faculty Members handling the Subject –

1. Dr. Rupam Bhattacharya
2. Prof. Ankita Mandal
3. Prof. Sucheta Chandra

Pre-requisite: Basics of programming language and Logic building skills.

Relevant Links:

1. Link for Study Material:

<https://drive.google.com/file/d/12OSjengokF3Yk-phQrcP2I2dYoH4OkNL/view?usp=sharing>

2. Link for Coursera Course:

<https://www.coursera.org/specializations/object-oriented-programming/>

3. Link for LinkedIn Learning Course:

<https://www.linkedin.com/learning/paths/getting-started-as-a-java-developer?u=229219690>

COURSE OBJECTIVES:

1. To understand the Fundamentals of data types and operators
2. To understand concepts about conditional statements in Java
3. To understand and implement string, file, array, arraylist
4. To understanding about object oriented programming in Java.

COURSE OUTCOMES:

CO1: Write Java application programs using OOP principles and proper program structuring.

CO2: Develop Java program using packages, inheritance and interface. Create Multithreaded programs. Application of Strings.

CO3: Write Java programs to implement error handling techniques using exception handling and develop programs using class and inputs from keyboard.

CO4: Develop IO and graphical User Interface using AWT. Demonstrate event handling mechanism.

Module No	Topic	Sub Topic	Chapter Name and Book	Mapping with Industry and International Academia	Lecture Hours
1	Oops Concept	Object, Class, Data abstraction, Data encapsulation, Inheritance, Polymorphism, Dynamic binding	Programming with Java: A Primer, E Balagurusamy - Chapter 1	International Academia: Introduction to Programming in Java	8
	An overview of Java	Java features, JVM, Comparison between Java and C++, Idea of any Java Development Kit (JDK), learn to run java program through command line and with any JDK	Programming with Java: A Primer, E Balagurusamy - Chapter 2.2, 2.3 and 2.9		
	Data Concept	Data Types, variables, Arrays and constants Tokens in Java (Identifiers, Literals, Keywords, Operator)	Programming with Java: A Primer, E Balagurusamy - Chapter 3.6, 4 and 5	Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE, Visual Studio will be used.	
	Control Statements	Simple if statement, if...else statement, Nesting of if-else statement, switch statement	Programming with Java: A Primer, E Balagurusamy - Chapter 6		

	Iteration Statement	For loop, While loop, Do-While loop	Programming with Java: A Primer, E Balagurusamy - Chapter 7		
	Classes and Objects	Creating main() in a separate class, Methods with parameters, Methods with a return type, Method overloading, Passing Objects as Parameters, Passing Values to methods and Constructor, Abstract classes	Programming with Java: A Primer, E Balagurusamy - Chapter 8		
2	Inheritance	Basic concepts, types of inheritance, use of super keyword, overriding methods.	Programming with Java: A Primer, E Balagurusamy - Chapter 8.11 and 8.12	International Academia: Introduction to Programming in Java Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE, Visual Studio will be used.	12
	String and String Buffer	Use of different functions	Programming with Java: A Primer, E Balagurusamy - Chapter 9.5		
	Packages, Interfaces	User defined package, import package, Class path, How to create interface, use and extend interface	Programming with Java: A Primer, E Balagurusamy - Chapter 10 and 11		
	Multithreaded Programming	Overview, Thread Life cycle, Advantages of multithreading over multi-tasking Thread Creation and simple programs, Synchronized threads, Synchronized Methods	Programming with Java: A Primer, E Balagurusamy - Chapter 12		
3	Exception Handling	Overview, What is Exceptions and handling exception?, Compile time errors Run time errors, try...catch, Using Multiple catch Blocks, finally Block, Throwing an Exception, Using the throw and throws Statement.	Programming with Java: A Primer, E Balagurusamy - Chapter 13.3	International Academia: Introduction to Programming in Java Industry Mapping: Hackerrank, TCS	10

				Codevita projects, GitHub platform. NetBeans and Eclipse IDE, Visual Studio will be used.	
4	Stream	Byte Streams, Input Stream, Output Stream Character Streams (Reader, Writer), How Files and Streams Work, Working with Reader classes (InputStreamReader, BufferedReader)	Programming with Java: A Primer, E Balagurusamy - Chapter 16	International Academia: Introduction to Programming in Java Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE, Visual Studio will be used.	10
	Applets	Applet vs. Application, Applet class, Advantages of Applet, Applet Lifecycle My First Applet, Applet tag, How to run applet	Programming with Java: A Primer, E Balagurusamy - Chapter 14		
	Abstract Window Toolkit	GUI Components, Interface and Classes of AWT Package, Labels, Buttons, Check Boxes, Radio button, Text Area, Text Field, Scrollbar, Panels, Layout managers, Simple event driven programming with Text Field and Button	Programming with Java: A Primer, E Balagurusamy - Chapter 14		

Lesson Plan

Module 1: Oops Concept,An overview of Java,Data Concept,Control Statement,Iteration Statement,Classes and Objects

2nd Year, Sec A (Faculty Name – Dr. Rupam Bhattacharya, Prof Ankita Mandal)

2nd Year, Sec B (Faculty Name – Dr. Rupam Bhattacharya,Prof Sucheta Chandra)

2nd Year, Sec C (Faculty Name – Prof Ankita Mandal, Prof Sucheta Chandra)

Working Day	Lesson Plan Description
Day 1	Understand what Java is and why it is widely used.
Day 2	Features of Java (Platform Independence, Robustness, Security, etc.).
Day 3	Java Virtual Machine (JVM), JRE, JDK. I
Day 4	Basics of Programming Paradigms
Day 5	Procedural vs. Object-Oriented Programming
Day 6	Core Concepts of OOP (Introduction)
Day 7	Class, Object, Encapsulation, Inheritance
Day 8	Control Statements, Iteration

Module 2: Inheritance,String ,String Buffer,Packages, Interfaces And multithreaded Programming:

2nd Year, Sec A (Faculty Name – Dr. Rupam Bhattacharya, Prof Ankita Mandal)

2nd Year, Sec B (Faculty Name – Dr. Rupam Bhattacharya,Prof Sucheta Chandra)

2nd Year, Sec C (Faculty Name – Prof Ankita Mandal, Prof Sucheta Chandra)

Working Day	Lesson Plan Description
Day 9	Inheritance in Java
Day 10	Method Overriding and super
Day 11	Strings and String Buffer
Day 12	Packages in Java
Day 13	Interfaces
Day 14	Abstract Class vs Interface
Day 15	Introduction to Multithreading
Day 16	Thread Synchronization & Wrap-Up
Day 17	Overview, Thread Life cycle,
Day 18	Simple programs, Synchronized threads, Synchronized
Day 19	Methods

Day 20	Advantages of multithreading over multi-tasking Thread Creation and
Day 21	Overview, Thread Life cycle,
Day 22	Simple programs, Synchronized threads, Synchronized
Day 23	Open book class test of Module 2

Module 3: Exception Handling

2nd Year, Sec A (Faculty Name – Dr. Rupam Bhattacharya, Prof Ankita Mandal)

2nd Year, Sec B (Faculty Name – Dr. Rupam Bhattacharya, Prof Sucheta Chandra)

2nd Year, Sec C (Faculty Name – Prof Ankita Mandal, Prof Sucheta Chandra)

Working Day	Lesson Plan Description
Day 24	Introduction to Exception Handling
Day 25	Basics of Exception Handling
Day 26	Using Multiple Catch Blocks
Day 27	The finally Block
Day 28	Throwing Exceptions
Day 29	Using throws Statement
Day 30	Exception Propagation and Nested try-catch Blocks
Day 31	Write a program that uses the throws keyword to handle IO Exception.
Day 32	Write a program to demonstrate exception propagation with method calls.
Day 33	Solve real-world problems like file handling or invalid inputs using
Day 34	Open book test on Module 3

Module 4: : Stream Applets Abstract Window Toolkit

2nd Year, Sec A (Faculty Name – Dr. Rupam Bhattacharya, Prof Ankita Mandal)

2nd Year, Sec B (Faculty Name – Dr. Rupam Bhattacharya, Prof Sucheta Chandra)

2nd Year, Sec C (Faculty Name – Prof Ankita Mandal, Prof Sucheta Chandra)

Working Day	Lesson Plan Description
Day 35	Introduction to Streams
Day 36	Byte Streams
Day 37	Character Streams
Day 38	Buffered Streams
Day 39	Introduction to Applets
Day 40	Applet Methods and HTML Integration
Day 41	Graphics in Applets
Day 42	Introduction to Abstract Window Toolkit (AWT)
Day 43	Event Handling in AWT
Day 44	AWT Layout Managers and Wrap-Up
Day 45	Open book test on Module 4
Day 46	Doubt clearing classes
Day 47	Doubt clearing classes
Day 48	Doubt clearing classes

TEXT BOOK:

- 1. Programming with Java: A Primer (3rd Edition) , E.Balagurusamy. (Module – 1, 2, 3, and 4)**

REFERENCE BOOKS:

1. Java: The Complete Reference. [e-Book link](#)
2. Core Java An Integrated Approach (Black Book). [E-Book link](#)

List of equipment/apparatus for laboratory experiments:

Sl. NO	Requirements
1.	Computer with moderate configuration
2.	Java 8 or higher

CO- PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1:	3	2	2	0	0	2	0	0	0	0	0	0
CO2:	3	3	3	0	2	2	2	0	0	0	0	1
CO3:	3	2	3	3	2	2	1	1	1	0	0	1
CO4:	3	2	2	2	3	1	1	0	0	1	1	1

3: Strong correlation 2: Medium correlation 1: Weak correlation

PSO	PSO Description
PSO1	Technical Knowledge and Problem-Solving: Apply fundamental concepts of computer applications, programming languages, data structures, algorithms, and database management to analyse and solve computational problems effectively.
PSO2	Software Design and Development: Demonstrate the ability to design, develop, test, and deploy software solutions by utilizing modern tools, technologies, and logical programming skills for real-world applications across domains such as web, mobile, and enterprise systems.
PSO3	Professional Skills and Ethics: Exhibit effective communication, teamwork, leadership, and ethical practices while adapting to emerging IT trends, thereby contributing responsibly to societal and organizational development.

QUESTION PAPER PATTERN AND DATES

EXAMINATION	Dates	PART – A	PART – B	PART – C	TOTAL MARKS
Mid Term 1		Attempt 5 out of 6 questions; Each question carries 2 marks (2×5)	Attempt 2 out of 3 questions; Each question carries 5 marks (5×2)	Attempt 1 out of 2 questions; Each question carries 10 marks (10×1)	30
Mid Term 2		Attempt 5 out of 6 questions; Each question carries 2 marks (2×5)	Attempt 2 out of 3 questions; Each question carries 5 marks (5×2)	Attempt 1 out of 2 questions; Each question carries 10 marks (10×1)	30
End Semester Examination		Attempt 10 out of 15 questions; Each question carries 2 marks (2×10)	Attempt 6 out of 9 questions; Each question carries 5 marks (5×6)	Attempt 5 out of 8 questions; Each question carries 10 marks (10×5)	100

Examination Rules & Regulations:

<https://iemcollege->

[my.sharepoint.com/:b:/g/personal/iemcoe_office_iem_edu_in/EXrcoe3d6oxIogHKO074XeUBC9qm3XNaf_qUeSiVTNh5OQ?e=MMQn40](https://iemcollege-my.sharepoint.com/:b:/g/personal/iemcoe_office_iem_edu_in/EXrcoe3d6oxIogHKO074XeUBC9qm3XNaf_qUeSiVTNh5OQ?e=MMQn40)



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University of Engineering & Management, Jaipur



Syllabus and Lesson Plan

Subject Name: **Computer Networking**
Subject Code: **BCAAE401**

Credit: 4

Lecture Hours: 40

Maximum: 100 marks (Internal: 30 marks; External: 70 marks)

List of Faculty Members handling the Subject –

1. Prof..Dr.Goldina Ghosh
2. Prof.Ankan Bhowmik
3. Prof.Manjima Saha

Pre-requisite: Knowledge of basic data communication & networks.

Relevant Links:

1. Link for Study Material:

<https://drive.google.com/file/d/1kahlHAzA9pd-zVMtGmHeWPf-vRd4el-/view?usp=sharing>

2. Link for Coursera Course:

<https://www.coursera.org/browse/information-technology/networking>

3. Link for LinkedIn Learning Course:

<https://www.linkedin.com/learning/cisco-ccna-200-301-cert-prep-1-network-fundamentals-and-access>

COURSE OBJECTIVES:

1. To deliver comprehensive view of Computer Network.
2. To enable the students to understand the Network Architecture, Network type and topologies
3. To understand the design issues and working of each layer of OSI model.
4. To familiarize with the benefits and issues regarding Network Security.

COURSE OUTCOMES:

CO1: Identify the different components in a Communication System and their respective roles.

CO2 Describe the technical issues related to the Networks.

CO3: Defining the standard model and protocols of networking

CO4: Understand the basics of data communication, networking, internet and their importance.

Module number	Topic	Sub-topics	Chapter Name and Book	Mapping with Industry and International Academia	Lecture Hours
1	Introduction	Introduction to communication systems, Data, signal and Transmission: Analog and Digital, Transmission modes, components, Transmission Impairments, Performance criteria of a communication system. Goals of computer Network, Networks: Classification, Components and Topology, categories of network [LAN, MAN, WAN]; Internet: brief history, internet today; Protocols and standards; OSI and TCP/IP model.	Data Communications and Networking, B. A. Forouzan, TMH (Chapter 1, Chapter 2, Chapter 3)	International Academia: https://ocw.mit.edu/courses/6-033-computer-system-engineering-spring-2018/pages/week-5/ Industry Mapping: Wireshark, Network Simulator 3	10

2	Physical Layer & Data link layer	Physical Layer: Overview of data[analog & digital], signal[analog & digital], transmission [analog & digital] & transmission media [guided & unguided]; Circuit switching: time division & space division switch, TDM bus; Telephone Network Data link layer: Types of errors, framing [character and bit stuffing], error detection & correction methods; Flow control; Protocols: Stop & wait ARQ Medium access sub layer: Point to point protocol, FDDI, token bus, token ring; Reservation, polling, concentration; Multiple access protocols: ALOHA, CSMA,FDMA, TDMA, CDMA; Ethernet	Data Communications and Networking, B. A. Forouzan,TMH(Chapter 4, Chapter 5,Chapter 6) Data Communications and Networking, B. A. Forouzan,TMH(Chapter 10,Chapter 11, Chapter 12)	International Standards: (https://ocw.mit.edu/courses/6-033-computer-system-engineering-spring-2018/pages/week-5/) Industry Mapping: Wireshark, Network Simulator 3	10
3	Network layer & Transport layer:	Network layer: Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing : Internet address, Classful address, Routing: techniques, static vs. dynamic routing , Protocols: IP, IPV6. Transport layer: Process to process delivery; UDP; TCP; Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm, Quality of services [Qos]	Data Communications and Networking, B. A. Forouzan,TMH (Chapter 17,Chapter 18,Chapter 22,Chapter24)	International Standards: (https://ocw.mit.edu/courses/6-033-computer-system-engineering-spring-2018/pages/week-6/) Industry Mapping : Wireshark, Network Simulator 3	10

4	Application Layer	Application Layer DNS, SMTP, FTP, HTTP & WWW	Data Communications and Networking, B. A. Forouzan, TMH (Chapter 26)	International Standards: (https://ocw.mit.edu/courses/6-033-computer-system-engineering-spring-2018/pages/week-11/)	10
	Network Security	Security: Cryptography [Public, Private Key based], Digital Signature, Firewalls [technology & applications]	Data Communications and Networking, B. A. Forouzan, TMH (Chapter 32)	Industry Mapping: Industry Mapping: Wireshark, Network Simulator 3	

Module 1: Introduction

2nd Year, Sec A (Dr. Goldina Ghosh, Prof. Ankan Bhowmik)

2nd Year, Sec B (Prof. Ankan Bhowmik, Prof. Manjima Saha)

2nd Year, Sec C (Dr. Goldina Ghosh, Prof. Ankan Bhowmik)

Working Days	Lesson Plan Description
Day 1	Introduction to communication systems
Day 2	Signal and Transmission: Analog and Digital, Transmission modes,
Day 3	Components, Transmission Impairments, Performance criteria of a communication system.
Day 4	Goals of computer Network, Networks: Classification, categories of network
Day 5	Goals of computer Network, Networks: Classification, categories of network
Day 6	Components and Topology
Day 7	[LAN, MAN, WAN
Day 8	Protocols and standards; OSI and TCP/IP model.
Day 9	Protocols and standards; OSI and TCP/IP model.
Day 10	Assignments and Solutions

Module 2: Physical Layer & Data link layer

2ndYear, Sec A (Dr.Goldina Ghosh,Prof.Ankan Bhowmik)

2ndYear, Sec B (Prof.Ankan Bhowmik,Prof.Manjima Saha)

2ndYear, Sec C (Dr.Goldina Ghosh,Prof.Ankan Bhowmik)

Working Days	Lesson Plan Description
Day 11	Physical Layer: Overview of data[analog & digital], signal[analog & digital],
Day 12	Transmission [analog & digital]
Day 13	Transmission media [guided & unguided]
Day 14	Circuit switching: time division & space division switch
Day 15	TDM bus; Telephone Network
Day 16	Data link layer: Types of errors, framing [character and bit stuffing],
Day 17	Error detection & correction methods
Day 18	Flow control; Protocols: Stop & wait ARQ
Day 19	Medium access sub layer: Point to point protocol, FDDI, token bus, token ring; Reservation, polling, concentration;
Day 20	Multiple access protocols: ALOHA, CSMA,FDMA, TDMA, CDMA; Ethernet

Module 3: Network layer & Transport layer

2ndYear, Sec A (Dr.Goldina Ghosh,Prof.Ankan Bhowmik)

2ndYear, Sec B (Prof.Ankan Bhowmik,Prof.Manjima Saha)

2ndYear, Sec C (Dr.Goldina Ghosh,Prof.Ankan Bhowmik)

Working Days	Lesson Plan Description
Day 21	Network layer: Internetworking & devices
Day 22	Repeaters, Hubs, Bridges, Switches, Router, Gateway
Day 23	Addressing : Internet address, Classful address,
Day 24	Addressing : Internet address, Classful address,
Day 25	Routing: techniques, static vs. dynamic routing ,
Day 26	Protocols: IP, IPV6.
Day 27	Protocols: IP, IPV6.
Day 28	Transport layer: Process to process delivery; UDP; TCP;
Day 29	Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm
Day 30	Quality of services [Qos]

Module 4: Application Layer & Network Security

2ndYear, Sec A (Dr.Goldina Ghosh,Prof.Ankan Bhowmik)

2ndYear, Sec B (Prof.Ankan Bhowmik,Prof.Manjima Saha)

2ndYear, Sec C (Dr.Goldina Ghosh,Prof.Ankan Bhowmik)

Working Days	Lesson Plan Description
Day 31	Introduction to Application Layer
Day 32	DNS, SMTP,
Day 33	FTP, HTTP & WWW
Day 34	Security: Cryptography
Day 35	Public, Private Key based
Day 36	Public, Private Key based
Day 37	Digital Signature, Firewalls
Day 38	Revision & Exercise Solving
Day 39	Revision & Exercise Solving
Day 40	Revision & Exercise Solving

TEXTBOOK:

1. Data Communications and Networking, B. A. Forouzan,TMH
2. Computer Networks, A. S.Tanenbaum, Pearson Education/PHI

REFERENCEBOOKS:

1. Data and Computer Communications, W. Stallings, PHI/Pearson Education

CO- PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1:	3	2	2	0	0	2	0	0	0	0	0	0
CO2:	3	3	3	0	2	2	2	0	0	0	0	1
CO3:	3	2	3	3	2	2	1	1	1	0	0	1
CO4:	3	2	2	2	3	1	1	0	0	1	1	1

3: Strong correlation 2: Medium correlation 1: Weak correlation

PSO	PSO Description
PSO1	Technical Knowledge and Problem-Solving: Apply fundamental concepts of computer applications, programming languages, data structures, algorithms, and database management to analyse and solve computational problems effectively.
PSO2	Software Design and Development: Demonstrate the ability to design, develop, test, and deploy software solutions by utilizing modern tools, technologies, and logical programming skills for real-world applications across domains such as web, mobile, and enterprise systems.
PSO3	Professional Skills and Ethics: Exhibit effective communication, teamwork, leadership, and ethical practices while adapting to emerging IT trends, thereby contributing responsibly to societal and organizational development.

QUESTION PAPER PATTERN AND DATES

EXAMINATION	Dates	PART – A	PART – B	PART – C	TOTAL MARKS
Mid Term 1		Attempt 5 out of 6 questions; Each question carries 2 marks (2 × 5)	Attempt 2 out of 3 questions; Each question carries 5 marks (5 × 2)	Attempt 1 out of 2 questions; Each question carries 10 marks (10 × 1)	30
Mid Term 2		Attempt 5 out of 6 questions; Each question carries 2 marks (2 × 5)	Attempt 2 out of 3 questions; Each question carries 5 marks (5 × 2)	Attempt 1 out of 2 questions; Each question carries 10 marks (10 × 1)	30
End Semester Examination		Attempt 10 out of 15 questions; Each question carries 2 marks (2 × 10)	Attempt 6 out of 9 questions; Each question carries 5 marks (5 × 6)	Attempt 5 out of 8 questions; Each question carries 10 marks (10 × 5)	100

Examination Rules & Regulations:

https://iemcollege-my.sharepoint.com/:b:/g/personal/iemcoe_office_iem_edu_in/EXrcoe3d6oxIogHKO074XeUBC9qm3XNaf_qUeSiVTNh5OQ?e=MMQn40