

# **Bachelor with Computer Applications as Major**

## **Third Semester**

**Course Code: CAP322J**

**Course Title: Data Communication & Computer Networks**

**Credits: Theory (4) Practical (2)**

**Max. Marks: 100 Min. Marks: 36**

### **Course Learning Outcomes:**

1. To Understand the Rudiments of How computers communicate
2. To understand the operation on the components in a data communication systems and functional relationship of these components
3. To introduce the fundamental concepts of computer Network, topologies, protocols and functioning & significance of networking standards.
4. To provide knowledge of protocols, IP addressing and error detection & correction mechanisms.

### **Unit 1:**

Data communication: Characteristics, Model, Data flow, Data representation, Analog and Digital Data, Analog and Digital Signals, Bit rate, Band width, Nyquist Bit rate, Shannon capacity, Data transmission modes, Parallel transmission, Serial transmission, Transmission impairments, Guided and Unguided transmission media.

### **Unit 2:**

Digital-to-Digital conversion (NRZ, Manchester), Analog-to-Digital conversion (Sampling, PCM, Quantization), Digital to Analog conversion (ASK, FSK, PSK), Multiplexing, Frequency Division Multiplexing, Time Division Multiplexing, De-Multiplexing, Introduction to Modulation and Demodulation.

### **Unit 3:**

Components of Network, Topologies, Categories of Networking: LAN, WAN, MAN. OSI reference model and TCP/IP model, Switching, Circuit switched networks, Datagram Networks, Virtual Circuit Networks, Introduction to Routing.

### **Unit 4:**

Network addressing: Physical & Logical, Subnetting, UDP and TCP, IPV4, Classful addressing, Network Protocols: HTTP, FTP, SMTP, SNMP, DNS, Error Detection & Correction, Hamming Distance, Parity check, Cyclic Redundancy check, Checksum.

### **Text Book:**

1. Data Communications and Networking Book by Behrouz A. Forouzan

### **Reference Book**

1. Computer networks / Andrew S. Tanenbaum, David J. Wetherall.
2. Data and Computer Communications by W Stallings

### **Unit Wise List of Practicals for Data Communication and Networking.**

#### **Unit 1: Data Communication and Transmission Media**

1. **Analog vs. Digital Signals:** Demonstrate the differences between analog and digital signals using waveform visualization.
2. **Calculating Bit Rate and Bandwidth:** Calculate the bit rate and bandwidth using the Nyquist formula and Shannon capacity.
3. **Transmission Media Testing:** Crimp a network cable (Cat 5/6) and test its continuity using a cable tester.
4. **Transmission Impairments Simulation:** Use Packet Tracer to simulate different transmission impairments (attenuation, distortion) and observe their effects.
5. **Comparing Guided and Unguided Media:** Compare guided media (coaxial, fiber-optic) and unguided media (wireless) through practical examples.

**Unit 2: Data and Signal Conversion, Multiplexing** 6. **Digital-to-Analog Conversion:** Use Packet Tracer to demonstrate digital-to-analog conversion using ASK, FSK, and PSK modulation techniques.

7. **Analog-to-Digital Conversion:** Simulate the process of analog-to-digital conversion using PCM and quantization techniques in Packet Tracer.
8. **Frequency Division Multiplexing (FDM):** Set up a simple FDM scenario using Packet Tracer to multiplex multiple signals onto a common medium.
9. **Time Division Multiplexing (TDM):** Create a TDM scenario in Packet Tracer to show how multiple signals are time-shared over a single channel.
10. **Introduction to Modulation and Demodulation:** Demonstrate the process of modulation and demodulation using simple audio signals and software tools.

**Unit 3: Networking Components, Models, and Topologies** 11. **Building a LAN:** Using Packet Tracer, set up a basic local area network (LAN) with computers, switches, and cables to illustrate a star topology.

12. **Comparing OSI and TCP/IP Models:** Explain the differences between the OSI model and the TCP/IP model through practical examples of layer functions.
13. **Configuring a Router:** Use a physical or virtual router to demonstrate basic router configurations, including IP address assignment.
14. **Virtual LAN (VLAN) Setup:** Configure VLANs on a network switch using Packet Tracer to create separate broadcast domains.
15. **Introduction to Routing:** Set up a small routed network using Packet Tracer to showcase the routing process between subnets.

**Unit 4: Network Addressing, Protocols, and Error Detection** 16. **Subnetting Practice:** Given an IP address range, guide students through subnetting to create multiple subnets with varying host ranges.

17. **Configuring IP Addresses:** In Packet Tracer, configure IP addresses for devices in a network, ensuring proper subnetting.
18. **Testing UDP and TCP:** Use Packet Tracer to demonstrate the differences between UDP and TCP by sending data between devices.

19. **Exploring Network Protocols:** Set up a variety of services (HTTP, FTP, SMTP, DNS) in Packet Tracer to showcase their functions within a network.
20. **Error Detection Techniques:** Implement error detection techniques like parity check and CRC in Packet Tracer to show data integrity maintenance.

**BACHELOR WITH APPLIED COMPUTING AS MINOR**  
**3<sup>rd</sup> SEMESTER**

(FOR STUDENTS WITH MAJOR IN COMPUTER APPLICATIONS / INFORMATION TECHNOLOGY)

**ACP323N: APPLIED COMPUTING \_ CRYPTOGRAPHY & NETWORK SECURITY**

**CREDITS: THEORY (4) PRACTICAL (2)**

**LEARNING OUTCOMES**

- *Understand the fundamentals of cryptography, including classical ciphers, symmetric key cryptography, and public key cryptography.*
- *Apply cryptographic techniques to ensure message authentication and integrity.*
- *Comprehend the principles and applications of digital signatures.*
- *Understand the fundamental principles of network security and implement network security mechanisms.*
- *Analyse and mitigate network security threats and employ network security tools and techniques.*
- *Use Cryptool 2 to implement, analyse and understand various cryptographic procedures.*

**THEORY (4 CREDITS, 60 HOURS)**

**MAX. MARKS: 100 MIN. MARKS: 36**

**UNIT-I (15 hours)**

**Introduction to Cryptography:** History of cryptography, Basics of cryptography, Types of cryptographic algorithms, Security implications of cryptography. Classical Ciphers: Caesar Cipher, Mono-alphabetic cipher, Hill cipher, Poly-alphabetic cipher (Vegnere Cipher), One time pad, Transposition Cipher (Rail-fence Cipher). Introduction to Number Theory: Prime Number Generation and Testing for Primality, Fermat's and Euler's Theorems. Symmetric Key Cryptography: Principles of symmetric key cryptography, Encryption and decryption algorithms, Claude Shannon's Theory of Diffusion and Confusion, Avalanche Effect, Feistel Cipher, Common symmetric key algorithms (e.g., DES, Triple DES, AES),

**UNIT-II (15 HOURS)**

**Public Key Cryptography:** Principles of public key cryptography, Key pair generation and Diffie-Hellman key exchange, Common public key algorithms (e.g., RSA)

**Authentication Schemes and Hash Functions:** Message Authentication, Introduction to digital signatures, Digital signature algorithms. (RSA). Introduction to hash functions, Properties of hash functions, Common hash algorithms (e.g., SHA1), Cryptographic Hash Applications: Password hashing and storage, Message Authentication Code (MAC)

**UNIT-III (15 HOURS)**

**Network Security Principles and Protocols:** Defining network security, understanding the CIA triad (Confidentiality, Integrity, Availability) in network security, identifying common network security threats and vulnerabilities. Introduction to network security protocols, including IPsec (Internet Protocol Security), SSL (Secure Sockets Layer). Exploring network security mechanisms such as firewalls, intrusion detection systems (IDS). Investigating the application of network security principles and protocols in various scenarios, including email security.

**UNIT-IV (15 HOURS)**

**Network Security Threats and Mitigation Strategies:** Understanding various types of network attacks, including denial-of-service (DoS) attacks, distributed denial-of-service (DDoS) attacks, man-in-the-middle (MitM) attacks, spoofing attacks, and malware attacks. Implementing network security mitigation strategies, including network hardening, vulnerability scanning and patching. Exploring network security tools and techniques, such as network sniffers for network traffic analysis.

**REFERENCES:**

- William Stallings, "Cryptography and Network Security: Principles and Practice," Pearson. Eighth edition. 2023.
- Sarhan M. Musa, "Network Security and Cryptography," Mercury Learning and Information, 2<sup>nd</sup> edition. 2022.
- Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies" O'reilly, Second Edition.
- Jan L. Harrington, "Network Security: A practical Approach," Morgan Kaufmann Publishers.
- Roberta Bragg, Mark Phodes-Ousley, Keith Strassberg, "Network Security The Complete Reference," McGraw Hill Publications.

## **PRACTICAL (2 CREDIT)**

1. Overview of Cryptool 2 and its features, Hashing (SHA1), (SHA2), (MD5)
2. Installation, and setup of Cryptool 2 environment. Download link <https://www.cryptool.org/en/ct2/downloads>.
3. Use Cryptool 2 to demonstrate the principles of classical ciphers such as Caesar Cipher,
4. Use Cryptool 2 to demonstrate the principles of classical ciphers such as Hill cipher
5. Use Cryptool 2 to demonstrate the principles of classical ciphers such as Vigenere Cipher.
6. Use Cryptool 2 to encrypt and decrypt messages using Feistel Cipher (FEAL).
7. Explore the processes of encryption and decryption in DES using Cryptool 2.
8. Explore the processes of encryption and decryption in AES using Cryptool 2.
9. Engage in experiments with public key algorithms (RSA) using Cryptool 2.
10. Use the “check password strength” tool in Cryptool 2 to assess and analyse the strength of a password.
11. Conduct experiments on hashing techniques (SHA-1) and the verification of hash values using Cryptool 2.
12. Conduct experiments on hashing techniques (SHA-2) and the verification of hash values using Cryptool 2
13. Setup and configure Windows Firewall for filtering. Explain its role in network security management on Windows-based systems.
14. Overview of wireshark tool,
15. Installation, and setup of Wireshark
16. Use Wireshark to capture and analyse network traffic. Identify patterns and anomalies, and discuss the role of network forensics in incident response.
17. Use Wireshark to capture and analyse network traffic on a test network. Identify different protocols, analyse packet headers, and discuss the significance of each.

# BACHELOR WITH COMPUTER APPLICATIONS AS MINOR

## 3rd SEMESTER

### CAP322N: DATA COMMUNICATION & COMPUTER NETWORKS

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**3rd SEMESTER**  
**SKILL ENHANCEMENT COURSE (SEC)**

**CAP322S: ANDROID PROGRAMMING**

**CREDITS: THEORY: 2; PRACTICAL: 2**

**THEORY (2 CREDITS)**

**UNIT 1: INTRODUCTION TO ANDROID**

Basics of OOPS,

Overview History Of Android ,Features of Android , Architecture of Android , Overview of Stack , Linux Kernel ,Native Libraries , Android Runtime ,Application Framework , Applications , SDK Overview ,Platforms ,Tools – (JDK, SDK, Android Studio, ADT, AVD, Android Emulator) ,Android Versions, Creating your first Android Application .

**UNIT II: ACTIVITIES, FRAGMENTS & INTENTS**

Introduction to Activities , Activity Lifecycle , Introduction to Intents , Linking Activities using Intents , Calling built-in applications using Intents , Introduction to Fragments , Adding Fragments Dynamically , Lifecycle of Fragment , Interaction between Fragments, Understanding the Components of a Screen , Views and ViewGroups , LinearLayout ,TableLayout ,RelativeLayout , Application Icon. TextView, Button, ImageButton, EditText, CheckBox, RadioButton, RadioGroup Views, ProgressBar View Using RecyclerView, Display long lists and handle clicks.

**PRACTICALS (2 CREDITS)**

**UNIT 1**

1. Install Android Studio, Hello World, Logging Install Android Studio.
2. Create a virtual device. Create and Run Hello World on emulator and device. Explore manifest file.
3. Create an app that takes a number input from the user and displays the factorial of that number.
4. Create an app that takes a URL from the user and opens the *url* inside the chrome browser.
5. Create an app that takes two numbers from the user and displays Multiplication, Addition, Subtraction of the two numbers.
6. Create an app that generates two random numbers, displays them to the user, asks the user to guess the Multiplication of the numbers and checks if the value entered by the user is correct or incorrect.
7. Create an app that takes First Name, Last Name, Phone number and address from the user and displays that inside the same activity.

**UNIT 2**

8. Create and Start Activities Create a new activity and layout Start the new activity from an existing activity with an explicit intent Pass user-entered information from one activity to the other Pass information back to the main activity.
9. Using Android, Create a login Activity. It asks “username” and “password” from user. If username and password are valid, It displays a Welcome message using a new activity.
10. Create an app that takes Date of birth from the user and displays his/her age.

**BOOKS RECOMMENDED**

1. Head First Android Development, O’reilly Media. Griffiths, D., & Griffiths,
2. Professional Android™ 4 Application Development. John Wiley & Sons, Inc.
3. Android Programming: The Big Nerd Ranch Guide

**ADDITIONAL RESOURCES:**

1. <https://developer.android.com>
2. Android Development for Beginners - Full Course on YouTube <https://www.youtube.com/watch?v=fis26HvvDII>

**3<sup>rd</sup> SEMESTER**  
**COMPUTER APPLICATIONS**  
**(WEB DEVELOPER)**  
**SKILL ENHANCEMENT COURSE (SEC)**

**WDP322S: INTRODUCTION TO PHP AND MYSQL**

**CREDITS: THEORY: 2, PRACTICAL: 2**

**THEORY (2 CREDITS)**

***UNIT 1 – INTRODUCTION TO PHP (20 LECTURES)***

Essential PHP. Creating a simple PHP program. PHP Building Blocks- Variables, Data Types, Operators and Expressions. Switching Flow, Loops , Functions- Calling, Defining Returning Values, Variable Scope Static Functions , Arrays, Array related Functions. Working with Objects- String, Date and Time

Working with Forms. Working with Cookies and User Sessions. Working with Files and Directories

***UNIT 2 – PHP AND MYSQL (10 LECTURES)***

Basic SQL Commands, Transactions and Stored Procedures.

Interacting with MYSQL using PHP- Creating Databases and Tables with PHP

**REFERENCE BOOKS:**

1. Steven Holzner, "PHP: The Complete Reference Paperback", McGraw Hill Education (India), 2007.
2. Timothy Boronczyk, Martin E. Psinas, "PHP and MYSQL (Create-Modify-Reuse)", Wiley India Private Limited, 2008.
3. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5", 3rd Edition Paperback, O'Reilly, 2014.

**PRACTICAL (2 CREDITS)**

**LAB SHEET- INTRODUCTION TO PHP AND MYSQL**

1. Create a PHP page using functions for comparing three integers and print the largest number.
2. Write a function to calculate the factorial of a number (non-negative integer). The function should accept the number as an argument.
3. Write a program to check whether the given number is prime or not.
4. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.
5. Write a PHP function that checks if a string is all lower case.
6. WAP to sort an array.
7. WAP in PHP to create Login and Logout using sessions.
8. WAP in PHP to parse a sentence and calculate no. of words and punctuation marks.
9. Program to set, retrieve and delete a cookie
10. WAP in PHP to open a new connection to the MySQL server.
11. WAP to create, open, read, write, append, delete and close files.
12. Develop a PHP MySQL Login System.