

Semester VI
BCA 6011: Data Communication and Networking
Major/DS Course (Core)

Credit:03

45 hours

Course Objective

The objective of the course is to equip students with a comprehensive understanding of network fundamentals, protocols, technologies, and architectures, enabling them to design, implement, and manage computer networks.

Course Learning Outcomes

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

- Understand the concept of Signals, OSI & TCP/IP reference models and functionalities of each layer in these models.
- Apply flow control and error control mechanisms using data link layer protocols.
- Apply the concepts of various routing algorithms and IP addresses to fulfil network requirements of an organization.
- Determine the model of reliable/unreliable communication using various Transport Layer Protocols (UDP, TCP).

Syllabus

Introduction: Communication systems, Analogue data, digital data, Communication channels, Synchronous data, Asynchronous data. Twin wire, Coaxial cable, Radio, VHF and microwaves, satellite links, Optical fiber. Concepts of modulation, ASK, FSK, PSK, Quadrature PSK, Differential PSK.

Introduction to computer network: Structure of computer network, point-to-point multidrop circuits, Data flow and physical circuits, network topologies, topologies and design goals. Hierarchical topology, horizontal topology, star topology, ring topology, mess topology. Telephone network, switched and non-switched options, fundamentals of communication theory, channel speed and bit rate. Voice communication and analogue waveforms, bandwidth and frequency spectrum, connecting the analogue and digital world, digital signals, the modem, asynchronous and synchronous transmission.

Local area networks and wide area networks, connection oriented and connectionless networks, classifications of communication protocols, time division multiple access (TDMA), time division multiplexing (TDM), carrier sense system(collison), token passing, peer-to-peer priority systems, priority slot, carrier sense systems (collison free). Token passing (priority) systems. Layered Protocols and the OSI model Goals of layered protocols, network design problems, communication between layers, introduction to standard organizations and the OSI model, standards organizations, Layers of OSI, OSI status

Polling/Selection Protocols: Character and bit protocols, binary synchronous control (BSC), HDLC, HDLC options HDLC frame format, code transparency and synchronization, HDLC transmission process, HDLC subsets, SDLC, protocol conversion.

Local Area Networks: Primary attributes of a LAN, Broadband and baseband and base LANs, IEEE LAN standards, relationship of the 802 standards to the OSI/CCITT model, connection options with LANs, LLC and MAC protocol data units, LAN topologies and protocols, CSMA/CD and IEEE 802.3, token ring (priority), token bus and IEEE 802.4, Metropolitan Area Networks (MANs), ANSI fiber distributed data interface.

Switching and Routing in Networks: Message switching, packet switching, when and when not to use packet switching, packet routing, packet switching support to circuit switching networks.

TCP/IP: TCP/IP Reference Model and internetworking, example of TCP/IP operations, related protocols, Concept of ports and sockets.

Books:

1. Black , U., “ Computer Networks- protocols, standards and Interfaces” , P.H.I.
2. Stallings, W ., “ Computer Communication Networks”,P.H.I.
3. Tannembaum , A.S., “ Computer Networks”, P.H.I.

BCA 6011: Data Communication and Networking (Practical)

Credit:01

30 hours

All programs should be developed in C/ C++ / Java / Python

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate Hamming-code based error detection & correction algorithm for noisy channel.
3. Simulate and implement stop and wait protocol for noisy channel.
4. Simulate and implement go back N sliding window protocol.
5. Simulate and implement selective repeat sliding window protocol.
6. Simulate and implement MST construction (Prim"s, Kruskal"s) for Ethernet
7. Simulate and implement the various routing algorithms (RIP, Distance-Vector routing, Dijkstra"s, Bellman-Ford, Floyd-Warshall, Flooding).

BCA 6012: Artificial Intelligence Major/DS Course (Core)

Credit:03

45 hours

Course Objective

The objective of the course is to equip students with the knowledge and skills to identify AI applications, apply basic AI techniques, and design intelligent systems that learn from experience, often focusing on machine learning and deep learning fundamentals.

Course Learning Outcomes

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

- Identify and apply suitable Intelligent agents for various AI applications
- Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem
- Apply the suitable algorithms to solve AI problems
- Implement ideas underlying modern logical inference systems

Syllabus

Scope of Artificial Intelligence, games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems, AI techniques in search and knowledge abstraction

Problem solving; state space search, search space control, heuristic search, hill climbing, branch and bound.

Knowledge representation; predicate logic, rule-based system, structured knowledge representation, semantic net.

Handling uncertainty, Fuzzy sets, probabilistic reasoning.

Learning, learning automation, learning by induction, Neural Networks, Genetic Algorithms
Emerging technologies and devices.

Books:

1. Artificial Intelligence, Rich & Knight, TMH
2. Introduction to AI & Expert Systems, Patterson, PHI
3. Neural Networks, Fuzzy Logic & Genetic Algorithms, Rajsekharan, PHI
4. Expert Systems, Giaranto, VIKAS

BCA 6012: Artificial Intelligence (Practical)

Credit:01

30 hours

All programs should be developed using Prolog or LISP

1. Write a prolog/lisp program to calculate the sum of two numbers.
2. Write a prolog/lisp program to find the maximum of two numbers.
3. Write a prolog/lisp program to calculate the factorial of a given number.
4. Write a prolog/lisp program to calculate the nth Fibonacci number.
5. Write a prolog/lisp program, insert_nth (item, n, into_list, result) that asserts that result is the list into_list with item inserted as the nth element into every list at all levels.
6. Write a Prolog/lisp program to remove the Nth item from a list.
7. Write a Prolog/lisp program, remove-nth (Before, After) that asserts the After list is the Before list with the removal of every nth item from every list at all levels.
8. Write a Prolog/lisp program to implement append for two lists.
9. Write a Prolog/lisp program to implement palindrome (List).
10. Write a Prolog/lisp program to implement max (X,Y, Max) so that Max is the greater of two numbers X and Y.
11. Write a Prolog/lisp program to implement maxlist (List, Max) so that Max is the greatest number in the list of numbers List.
12. Write a Prolog/lisp program to implement sumlist (List, Sum) so that Sum is the sum of a given list of numbers List.
13. Write a Prolog/lisp program to implement two predicates even length (List) and Odd length (List) so that they are true if their argument is a list of even or odd length respectively.
14. Write a Prolog/lisp program to implement reverse (List, Reversed List) that reverses lists.
15. Write a Prolog/lisp program to implement maxlist (List, Max) so that Max is the greatest number in the list of numbers List using cut predicate.
16. Write a Prolog/lisp program to implement GCD of two numbers.
17. Write a prolog/lisp program that implements Semantic Networks/Frame Structures.

BCA 6013: Microprocessor Major/DS Course (Core)

Credit:03

45 hours

Course Objective

The course objective is to introduce the basic concepts of microprocessor and to develop in students the assembly language programming skills and real time applications of Microprocessor as well as microcontroller.

Course Learning Outcomes

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

- Understand the basic architecture of 8085 and 8086.
- Impart the knowledge about the instruction set.
- Understand the basic idea about the data transfer schemes and its applications
- Develop skill in simple program writing for INTEL 8085 and INTEL 8086.

Syllabus

Microprocessors: 8-bit microprocessor architecture; 8085 pin description

Programmers model of 8085, addressing modes of 8085; Instruction set of 8085; Assembly language program for 8085

Memory interfacing; I/O interfacing; Peripheral ICs; I/O memory Interfacing Chips, Bus structure of microprocessor-based systems, bus arbitration, Interrupt handling and DMA operation. Basic idea about microprogramming.

Advanced Microprocessors: Functional description of 8086 microprocessor, software model of 8086/8088; Data addressing modes of 8086; 80x86 family of microprocessor

Comparison of different microprocessors; microprocessors of other families; Assembly language program of 8086 microprocessor.

Books:

1. Microprocessors: A.P.Mathur
2. Microcomputer systems -8086/8088 family: Liu and Gibson
3. Programming the 80286,80386 Computers: B.B. Brey 4. Microprocessors and Interfacing: Hall

BCA 6013: Microprocessor (Practical)

Credit:01

30 hours

All programs should be developed for the Intel 8085 Microprocessor.
ASSEMBLY LANGUAGE PROGRAMMING

1. Write a program for 32-bit binary division and multiplication
2. Write a program for 32-bit BCD addition and subtraction
3. Write a program for Linear search and binary search.
4. Write a program to add and subtract two arrays
5. Write a program for binary to BCD conversion
6. Write a program for BCD to binary conversion

BCA 6014: Internet & E-Commerce Major/DS Course (Core)

Credit:03

45 hours

Course Objective

The course objective is to learn the basic concepts of Internet and e-commerce technologies, and gain hands-on experience in setting up systems for Internet and e-commerce applications

Course Learning Outcomes

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

- The principles of Internet technologies and applications.
- Understand different file transfer protocols and search engines.
- Different payment methodology and security aspects.
- Develop a sense to use the Internet and e-commerce for enhancing daily life and work

Syllabus

Introduction to Internet: Evolution of Internet, concept of Intranet and Internet, Applications of Internet, Types of Connectivity such as dial – up, leased, VSAT. etc., Internet Server and Clients module in various Operating Systems, TCP/IP, Introduction to RFC, Addressing in Internet – IP and Domains, major features of IP, IP datagram, major IP services, IP source routing, value of the transport layer, TCP, major features of TCP, passive and active operation, Internet Service Providers.

E-mail and List-servers: E-mail Networks, E-mail protocols (X.400, SMTP, UUCP), Format of an E- mail message, Description of E-mail Headers, E- mail contents and encoding, E-mail routing, List servers, E-mail clients, POP-3, IMAP-4.

File Transfer Protocol: Introduction to FTP, public domain Software, Types of FTP Servers, FTP clients, Common Commands.

Telnet: Telnet protocol, Server daemon, Telnet clients, Terminal emulation

Usenet and Internet Relay Chart Introduction to World Wide Web: Evolution of WWW, Basics Features, WWW Browsers, WWW servers, HTTP & URL's

WWW Browsers: Basic features, Bookmarks, history. Progress indicators, Personalization of Browsers, Printing displayed pages and forms, Saving Web pages, Netscape Communicators, Internet Explorer, Search and Downloads.

Web Publishing: Technology Overview, Web site planning, where to host your Web site, Multiple sites on one server, Maintaining a Web site, Publishing tools.

HTML: Document overview, Header elements, Section Headings, Block- oriented elements, Lists, Inline elements, Visual Mark-up, Hypertext links, Uniform Resource Locators, (URL's), Images, Forms, Tables, Special characters

Search Engines: Technology overview, Popular Search Engines, how to register a Web site on search engines.

Internet Security: Overview of Internet Security threats, Firewalls, Introduction to AAA.

E-commerce: Introduction to E-commerce, Payment Methodology, Security aspects, Standard in electronic payment. E-commerce and Banking, E-commerce and Retailing.

Books:

1. Internetworking with TCP/IP – by D.E.Comer, PHI
2. E-Commerce-Paul A.Murphy, TMH