

Fourth Semester

BTCS 401 Operating Systems

Objectives: This course should provide the students with good understanding of Operating System including its architecture and all its components. Good conceptions on all the subjects like processes, inter-process communication, semaphore, message passing, classical IPC problems, scheduling, memory management, file systems, security and protection mechanism, I/O hardware and software, deadlocks, etc. should be provided

1. Introduction to Operating system, Role of Operating System as resource manager, function of kernel and shell, operating system structures, views of an operating system. [5]
2. **Process management:** CPU scheduling, Scheduling Algorithms, PCB, Process synchronization, Deadlocks, Prevention, Detection and Recovery [5]
3. **Memory Management:** Overlays, Memory management policies, Fragmentation and its types, Partitioned memory managements, Paging, Segmentation, Need of Virtual memories, Page replacement Algorithms, Concept of Thrashing [8]
4. **Device Management:** I/O system and secondary storage structure, Device management policies, Role of I/O traffic controller, scheduler [5]
5. **File Management:** File System Architecture, Layered Architecture, Physical and Logical File Systems, Protection and Security: [5]
6. Brief study to multiprocessor and distributed operating systems. [4]
7. **Case Studies:** LINUX / UNIX Operating System and Windows based operating systems. Recent trends in operating system.

Suggested Readings/ Books:

1. A Silberschatz and Peter B. Galvin, “**Operating System Concepts**” Addison Wesley Publishing Company
2. Dhamdhare, **Systems Programming & Operating Systems**” Tata McGraw Hill
3. Gary Nutt, “**Operating Systems Concepts**”, Pearson Education Ltd. 3rd Edition
4. **Operating System** by Madnick Donovan
5. **Operating System** by Stallings
6. Ida M.Flynn **Understanding Operating Systems** -, Cengage Learning

BTCS402 Discrete Structures**Objective/s:**

The objective of this course is to provide the necessary back ground of discrete structures with particular reference to the relationships between discrete structures and their data structure counterparts including algorithm development.

1. **Sets, relations and functions:** Introduction, Combination of Sets, ordered pairs, proofs of general identities of sets, relations, operations on relations, properties of relations and functions, Hashing Functions, equivalence relations, compatibility relations, partial order relations. [7]
2. **Rings and Boolean algebra:** Rings, Subrings, morphism of rings ideals and quotient rings. Euclidean domains Integral domains and fields Boolean Algebra direct product morphisms Boolean sub-algebra Boolean Rings Application of Boolean algebra (Logic Implications, Logic Gates, Karnaugh-map) [8]
3. **Combinatorial Mathematics:** Basic counting principles Permutations and combinations Inclusion and Exclusion Principle Recurrence relations, Generating Function, Application. [7]
4. **Monoids and Groups:** Groups Semigroups and monoids Cyclic semigroups and submonoids, Subgroups and Cosets. Congruence relations on semigroups. Morphisms. Normal subgroups. Dihedral groups. [7]
5. **Graph Theory:** Graph- Directed and undirected, Eulerian chains and cycles, Hamiltonian chains and cycles Trees, Chromatic number Connectivity, Graph coloring, Plane and connected graphs, Isomorphism and Homomorphism. Applications. [7]

Suggested Readings/ Books:

1. Discrete Mathematics (Schaum series) by Lipschutz (McGraw Hill).
2. Applied Discrete Structures for Computer Science by Alan Doerr and Kenneth Levarseur.
3. Discrete Mathematics by N Ch SN Iyengar, VM Chandrasekaran.
4. Discrete Mathematics and Graph Theory(Cengage Learning) by Sartha
5. Discrete Mathematics and its Applications. Kenneth H Rosen.(McGraw Hill)
6. Elements of discrete mathematics. C L Liu (McGraw Hill)

BTCS403 Computer Networks–I

Objective/s and Expected Outcome: This course provides knowledge about computer network related hardware and software using a layered architecture.

1. Introduction to Computer Networks:

Data Communication System and its components, Data Flow, Computer network and its goals, Types of computer networks: LAN, MAN, WAN, Wireless and wired networks, broadcast and point to point networks, Network topologies, Network software: concept of layers, protocols, interfaces and services, ISO-OSI reference model, TCP/IP reference model. [7]

2. Physical Layer:

Concept of Analog & Digital Signal, Bandwidth, Transmission Impairments: Attenuation, Distortion, Noise, Data rate limits : Nyquist formula, Shannon Formula, Multiplexing : Frequency Division, Time Division, Wavelength Division, Introduction to Transmission Media : Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (radio, microwave, infrared), Switching: Circuit Switching, Message Switching ,Packet Switching & their comparisons. [6]

3. Data Link Layer:

Design issues, Framing, Error detection and correction codes: checksum, CRC, hamming code, Data link protocols for noisy and noiseless channels, Sliding Window Protocols: Stop & Wait ARQ, Go-back-N ARQ, Selective repeat ARQ, Data link protocols: HDLC and PPP. [6]

4. Medium Access Sub-Layer:

Static and dynamic channel allocation, Random Access: ALOHA, CSMA protocols, Controlled Access: Polling, Token Passing, IEEE 802.3 frame format, Ethernet cabling, Manchester encoding, collision detection in 802.3, Binary exponential back off algorithm. [6]

5. Network Layer:

Design issues, IPv4 classful and classless addressing, subnetting, Routing algorithms: distance vector and link state routing, Congestion control: Principles of Congestion Control, Congestion prevention policies, Leaky bucket and token bucket algorithms [6]

6. Transport Layer:

Elements of transport protocols: addressing, connection establishment and release, flow control and buffering, multiplexing and de-multiplexing, crash recovery, introduction to TCP/UDP protocols and their comparison. [3]

7. Application Layer:

World Wide Web (WWW), Domain Name System (DNS), E-mail, File Transfer Protocol (FTP), Introduction to Network security [2]

Suggested Readings/ Books:

1. Computer Networks, 4th Edition, Pearson Education by Andrew S. Tanenbaum
2. Data Communication & Networking, 4th Edition, Tata McGraw Hill. By Behrouz A. Forouzan.
3. Computer Networking, 3rd Edition, Pearson Education by James F. Kurose and Keith W. Ross
4. Internetworking with TCP/IP, Volume-I, Prentice Hall, India by Douglas E. Comer.
5. Guide to Networking Essentials, 5th Edition, Cengage Learning by Greg Tomsho,
6. Handbook of Networking, Cengage Learning by Michael W. Graves.

BTCS404 Microprocessors and Assembly Language Programming

Objective/s: The course is intended to give students good understanding of internal architectural details and functioning of microprocessors.

- 1. Introduction:** Introduction to Microprocessors, history, classification, recent microprocessors.[5]
- 2. Microprocessor Architecture:** 8085 microprocessor Architecture. Bus structure, I/O, Memory & Instruction execution sequence & Data Flow, Instruction cycle. System buses, concept of address Bus, Data Bus & Control Bus, Synchronous & Asynchronous buses. [5]
- 3. I/O memory interface:** Data transfer modes: Programmable, interrupt initiated and DMA. Serial & parallel interface, Detail study of 8251 I/O Processor & 8255 programmable peripheral interfaces.[6]
- 4. Instruction set & Assembly Languages Programming:** Introduction, instruction & data formats, addressing modes, status flags, 8085 instructions, Data transfer operations, Arithmetic operations, Logical operations, Branch operations. [7]
- 5. Case structure & Microprocessor application:** Interfacing of keyboards and seven segment LED display, Microprocessor controlled temperature system (MCTS), Study of traffic light system, stepper motor controller, Microprocessor based micro computers. [8]
- 6. Basic architecture of higher order microprocessors:** Basic introduction to 8086 family, Motorola 68000, Pentium processors. [5]

Suggested Readings/ Books:

1. Ramesh Gaonkar, “8085 Microprocessor “,PHI Publications.
2. Daniel Tabak, “Advanced Microprocessors”, McGraw- Hill, Inc., Second Edition 1995.
3. Douglas V. Hall, “Microprocessors and Interfacing: Programming and Hardware”, Tata McGraw Hill Edition,1986.
4. Charles M.Gilmore,” Microprocessors: Principles and Applications”, McGraw Hill.
5. Ayala Kenneth, “The 8086 Microprocessor Programming and Interfacing”, Cengage Learning

BTCS 405 System Programming

Objective/s and Expected Outcome: This course provides knowledge to design various system programs.

- 1. Introduction:** Introduction to system programming and different types of system programs – editors, assemblers, macro-processors, compilers, linkers, loader, debuggers. [2]
- 2. Assemblers:** Description of single pass and two pass assemblers, use of data structures like

OPTAB and SYMTAB, etc. [9]

3. **Macroprocessors:** Description of macros, macro expansion, conditional and recursive macro expansion. [5]
4. **Compilers:** Various phases of compiler – lexical, syntax and semantic analysis, intermediate code generation, code optimization techniques, code generation, Case study : LEX and YACC. [9]
5. **Linkers and Loaders:** Concept of linking, different linking schemes, concept of loading and various loading schemes. [5]
6. **Editors:** Line editor, full screen editor and multi window editor, Case study MS-Word, DOS Editor and vi editor. [4]
7. **Debuggers:** Description of various debugging techniques. [2]

Suggested Readings/ Books:

1. Donovan J.J., “**Systems Programming**”, New York, Mc-Graw Hill, 1972.
2. Dhamdhare, D.M., “**Introduction to Systems Software**”, Tata Mc-Graw Hill, 1996.
3. Aho A.V. and J.D. Ullman ,”**Principles of compiler Design**” Addison Wesley/ Narosa 1985.
4. Kenneth C. Loudon,” **Compiler Construction**”, Cengage Learning.

BTCS 406 Operating System Lab

1. Installation Process of various operating systems
 2. Virtualization, Installation of Virtual Machine Software and installation of Operating System on Virtual Machine
 3. Commands for files & directories: cd, ls, cp, md, rm, mkdir, rmdir. Creating and viewing files using cat. File comparisons. Disk related commands: checking disk free spaces. Processes in linux, connecting processes with pipes, background processing, managing multiple processes. Manual help. Background process: changing process priority, scheduling of processes at command, batch commands, kill, ps, who, sleep. Printing commands, grep, fgrep, find, sort, cal, banner, touch, file. File related commands ws, sat, cut, grep.
 4. Shell Programming: Basic of shell programming, various types of shell, Shell Programming in bash, conditional & looping statement, case statements, parameter passing and arguments, shell variables, shell keywords, creating shell programs for automate system tasks, report printing.
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BTCS 407 Computer Networks-I Lab

1. Write specifications of latest desktops and laptops.
 2. Familiarization with Networking Components and devices: LAN Adapters, Hubs, Switches, Routers etc.
 3. Familiarization with Transmission media and Tools: Co-axial cable, UTP Cable, Crimping Tool, Connectors etc.
 4. Preparing straight and cross cables.
 5. Study of various LAN topologies and their creation using network devices, cables and computers.
 6. Configuration of TCP/IP Protocols in Windows and Linux.
 7. Implementation of file and printer sharing.
 8. Designing and implementing Class A, B, C Networks
 9. Subnet planning and its implementation
 10. Installation of ftp server and client
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BTCS408 Microprocessor and Assembly Language Programming Lab

1. Introduction to 8085 kit.
 2. Addition of two 8 bit numbers, sum 8 bit.
 3. Subtraction of two 8 bit numbers.
 4. Find 1's complement of 8 bit number.
 5. Find 2's complement of 8 bit number.
 6. Shift an 8 bit no. by one bit.
 7. Find Largest of two 8 bit numbers.
 8. Find Largest among an array of ten numbers (8 bit).
 9. Sum of series of 8 bit numbers.
 10. Introduction to 8086 kit.
 11. Addition of two 16 bit numbers, sum 16 bit.
 12. Subtraction of two 16 bit numbers.
 13. Find 1's complement of 16 bit number.
 14. Find 2's complement of 16 bit number.
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BTCS 409 System Programming Lab

1. Create a menu driven interface for
 - a) Displaying contents of a file page wise
 - b) Counting vowels, characters, and lines in a file.
 - c) Copying a file
2. Write a program to check balance parenthesis of a given program. Also generate the error report.
3. Write a program to create symbol table for a given assembly language program.
4. Write a program to create symbol table for a given high-level language program.
5. Implementation of single pass assembler on a limited set of instructions.
6. Exploring various features of debug command.
7. Use of LAX and YACC tools.