

बंगाली विश्व विद्यापीठ

COMPUTER SCIENCE DEPARTMENT
UNIVERSITY OF KOLKATA

Syllabus

B.A. (Computer Science)
Effective from July 1994

SYLLABUS (W.E.F. JUNE, 1994)

T.Y.B.Sc. (Computer Science) Structure

	TERM-I	TERM-II
PAPER-I	SYSTEMS PROGRAMMING-I	SYSTEMS PROGRAMMING-II
PAPER-II	INTRODUCTION TO UNIX OPERATING SYSTEM.	FILES & DATABASES
PAPER-III	DATA COMMUNICATION-I	DATA COMMUNICATION-II
PAPER-IV	THEORETICAL COMPUTER SCIENCE	COMPUTER AIDED GRAPHICS
PAPER-V	ACCOUNTING & FINANCIAL MANAGEMENT - I	ACCOUNTING & FINANCIAL MANAGEMENT - II
PAPER-VI	MICROPROCESSORS	PERIPHERALS & INTERFACES

LAB-WORK

	TOPICS	NO.OF PRACTICALS
LAB-I		
	SYSTEMS PROGRAMMING-I	- 12
	SYSTEMS PROGRAMMING-II	- 12
LAB-II		
	UNIX OPERATING SYSTEM	- 12
	FILES & DATABASES	- 12
LAB-III		
	MICROPROCESSORS	- 12
	ACCOUNTING	- 03
	COMPUTER AIDED GRAPHICS	- 07
	INTERFACES	- 07
	FINANCIAL MANAGEMENT	- 03

P A P E R - I (A)
=====

SYSTEMS PROGRAMMING-I

1. INTRODUCTION

Components of system software
Evolution of system software.
The model of a computer system.

(2)
2. SOFTWARE PROCESSORS

INTRODUCTION TO SOFTWARE PROCESSORS

Translators & loaders.
Interpreters.

(2)
3. ASSEMBLERS

Elements of assembly language programming.
Overview of the assembly process.
Design of two pass assembler.
Case study of single pass assembler.
Macros & macro processors.

(12)
4. COMPILERS

Overview of the compilation process.
Programming language grammars.
Lexical Analyzer
Parser.
Storage allocation.
Compilation of expressions.
Compilation of control structures.
Code optimization.
Code generation

(12)
5. LOADERS & LINKAGE EDITORS.
Loading, linking & relocation.
Program relocatability.
Overview of linkage editing.
Linkage editor of IBM/360
Linking for program overlays.

(8)

6 SOFTWARE TOOLS

Text editors.
Interpreters & program generators.
Debug monitors.
Programming environments.

(6)

7 INTERRUPT ORGANIZATION

The program status register(PSR).
The interrupt Hardware.
Interrupt processing.
Interrupt with reference to 8086.

(8)

References

1. INTRODUCTION TO SYSTEM SOFTWARE
-by D. M. Dhamdhere.
2. SYSTEM PROGRAMMING
-by John Donovan

P A P E R - II (A)
=====

INTRODUCTION TO UNIX OPERATING SYSTEM.

1. SHELL PROGRAMMING

Types, simple commands, Use of meta characters, Shell script, Debugging, Shell variables, Control statements (FOR, WHILE, IF, CASE etc.), Keyword parameters, parameter substitution, Command substitution, Pipes, Redirection, Filters - concept of filters.

(8)

2. NROFF/TROFF

General information, Font & character size control, Text filling & centering, Vertical spacing, Macros, Strings. Diversions, Position traps, I/O conversions & character translation, The eqn/macro packages(mm).

(8)

3. AWK

General structure, Begin-end statements, Keywords, identifiers, Operators i/p records and fields, Numeric constant, String constants, Function direct command, Line usage, Command file control statements, report generators, Pattern matching, Associative arrays.

(12)

4. UTILITIES

BC, DC, MN, Cut, Paste, Sed, Grep, tr. lex & Yacc.

(6)

5. MAKE

SCCS - Introduction, Terminology, creation and retriavation of the SCCS file, SCCS file commands, and connections

(8)

Libraries :- Curser, qsort/bsearch/hsearch/regxd

References

Uniplus - system v

- 1) Document processing volume (vol. 5)
- 2) Programming Tools (vol. 6)
- 3) User guide (vol. 4)

P A P E R - III (A)
=====

DATA COMMUNICATION-I

1. COMMUNICATIONS:

Concepts of data transmission, transmission characteristics asynchronous and synchronous transmission, basic terms, messages, headers and codes, sessions, line, characteristics, communication model - encoder, channel, decoder, signal processing.

2. Major components in a database system:

The transmission path: Path, wire pairs, cables, microwaves coaxial cables, comparison of wire-pair and coaxial cables, satellite communications, optic fibers submarine cable, waveguides, summary.

Modems: Modulation methods - Amplitude Modulation, Frequency Modulation, Pulse Code Modulation, Phase Modulation. Multilevel transmission, low-band modems, side channel modems, other modems, advances in modems, interface standards.

Switching: Circuit switching, message switching, packet switching, packet voice, private branch exchange.

Multiplexing, demultiplexing, Line Sharing and Compression: Multiplexed common carrier systems, multiplexing satellite signals, concentrators, data compression, cross bar switching.

3. Coding Techniques

Variable length coding - Huffman codes.

Fixed length coding - Error correcting & detecting codes- parity bits, Hamming codes

4. Computer Networks:

Introduction

Uses of computer networks

Network structure.

Network architecture.

The OSI reference model.

5. NETWORK TOPOLOGY

Introduction to topology design problems.

Connectivity analysis.

Graph theory, Max-flow, Disjoint paths, Delay analysis.

Local access network design.

References

1. Computer Networks and Distributed Processing- J.Martin.
2. Data Networks : Concepts, Theory & Practice - U.D. Black
3. Data Communication - S.P.Agrawal

P A P E R IV (A)

=====

THEORETICAL COMPUTER SCIENCES

1. PRELIMINARIES

Strings, Alphabets, language.
Graphs & trees.
Inductive proofs.
Set notations.
Relations.

(2)

2. FINITE AUTOMATA & REGULAR EXPRESSIONS

Finite state systems.
Basic definitions.
Nondeterministic finite automata.
Finite automata with E moves.
Regular expressions.
Applications of finite automata.
Lexical analysis.
Text editors.

(8)

3. PROPERTIES OF REGULAR SETS

The pumping lemma for regular sets.
Closure properties of regular sets.
Decision algorithms for regular sets.

(6)

4. CONTEXT FREE GRAMMARS

Motivation & introduction.
Context free grammars.
Derivation trees.
Simplification of context free grammars.
Chomsky normal form.
Greiback normal form.

(16)

5. PUSHDOWN AUTOMATA

Informal descriptions.
Definitions.
Pushdown automata & context free languages.

(6)

6. PROPERTIES OF CONTEXT FREE GRAMMARS

The pumping lemma for CFL's.
Closure properties of CFL's.
Decision algorithm for CFL's.

(4)

7. THE CHOMSKY HIERARCHY

Regular grammars.
Unrestricted grammars.

(2)

References

1. Introduction to automata theory, languages & computations
-by John E. Hopcroft & Jeffrey D. Ullman.
2. Introduction to computer theory.
-by Daniel I. A. Cohen.

P A P E R - V (A)
=====

ACCOUNTING AND FINANCIAL MANAGEMENT-I

1. Accounting - Meaning, objective and scope, Basic terms in the accounting, accounting principles, concepts and conventions, Double - entry system of book-keeping- Rules of Debit and credit.
2. Ledgers - Preparation of ledger accounts, Cash book : Simple, Double, Triple Column.
3. Various day book - Sales, Purchase, Journal, Bank book.
4. Final accounts with adjustments, Bank Reconciliation Statement
5. Manufacturing account, Profit & loss account, Trading account, Balance sheets,
6. Cost Accountancy - Scope, element of cost, classification of cost, behaviour of costs, Material, Labour, Direct Expenses & Overheads, Introduction to methods of costing; cost sheet, Tenders, Quotations. Evaluation of Incremental cost Analysis, Evaluation of Capital Investment proposals :- P.B., DCF, IRR, Social cost benefit ratio, H.R. Accounting, Inflation Accounting.
7. Introduction to computerized accounting system : Coding logic and codes required, master files, transaction files, introduction to documents used for data collection, processing of different files and outputs obtained.

References

1. Double Entry Bookkeeping - Batliboy.
2. Cost accounting - B.K. Bhat.
3. Principles of Management Accounting - Manmohan S.N., Goyal

P A P E R - VI (A)
=====

MICROPROCESSORS

1. Architecture of 8 bit microprocessor - addressing modes. Architecture & instruction set of 8085, Comparative study of z-80, 68000, 6502.
2. Instruction timing & state diagram of 8085, pin configuration.

3. Assembly language programming of 8085

Assembler directives, simple assembly language programs, arithmetic, code conversion, iterations, subroutines, & stacks.

4. 8986 Architecture

CPU Architecture
Internal Operation
Machine Language Instructions
 Addressing Modes
 Instruction Formats
Instruction Execution Timing
The 8088

5. Assembler Language Programming

Assembler Instruction Format
Data Transfer Instructions
Arithmetic Instructions
 Binary Arithmetic
 Packed BCD Arithmetic
 Unpacked BCD Arithmetic
Branch Instructions
 Conditional Branch Instructions
 Unconditional Branch Instructions
Loop Instructions
NOP and HLT Instructions
Flag Manipulation Instructions
Logical Instructions
Shift and Rotate Instructions
Directives and Operators
 Data Definition and Storage Allocation
 Structures
 Records
 Assigning Names to Expressions
 Segment Definition
 Program Termination
 Alignment Directives
 Value-Returning Attribute Operators
Assembly Process
Translation of Assembler Instructions

6. Modular Programming

Linking and Relocation
 Segment Combination
 Access to External Identifiers
Stacks
Procedures
 Calls, Returns, and Procedure Definitions
 Saving and Restoring Registers

Procedure Communication
Recursive Procedures
Interrupts and Interrupt Routines.
Macros
 ASM-86 Macro Facilities
 Local Labels
 Nested Macros
 Controlled Expansion and Other Functions
Program Design
Program Design Example.

References

1. MCS-85 users manual.
2. Microprocessors architecture, programming & applications -by Gaonkar John-Wiley publication.
3. Microcomputer Systems: The 8086/8088 Family- Architecture, Programming and Design - Yu-Cheng Liu & Glenn A. Gibson

P A P E R - I (B)
=====

SYSTEMS PROGRAMMING-II

1. Definitions, Simple monitors, Basic concepts buffering, Spooling, multiprogramming, Time sharing, & real time systems, protecting the system from users & users from each other- i/o, memory & CPU protection, hardware features for protection. (6)
2. Functions of operating system, services to user-program execution, file system, I/O operations, errors handling internal functions-resource allocation, accounting, protection. User interface-system calls & their implementation, utilities. Internal organization-actions required in different circumstances. Flow of control inside an operating system. (4)
3. File systems - the notion of a file, types of files, limitations of tape-based systems, structure of a disk, blocking-file operation-create, open, read/write, reset, close, delete. Access methods-Sequential, Direct, indexed, space allocation, & free space management. Directories-Flat, Free-structured & acyclic graph directories, problems with general graph directories, access control & protection. (8)
4. CPU-scheduling-requirements of a scheduling algorithm, Process state & process control block, scheduling queues, Scheduling algorithm, Performance measures for schedules-% utilization, Throughput, turnabout or response time. (8)
FIRST COME-first & shortest-job-first round-robin, multilevel queues. (8)
5. MEMORY management-relocation, swapping managing protection-fixed & variable partitions, paging, sharing of pages, segmentation, hardware support for this, the notion of virtual memory. (13)
6. SCHEDULING OF I/O-first-come-first, shortest-seek-time-first, the elevator algorithm, comparison of algorithms. (3)
7. DEAD LOCKS : The problem, representing situations where dead locks is possible, dead locks preventions, avoidance, detection, recovery from dead lock. (6)

Note-: All the above topics should be covered with the following issues of UNIX & MS-DOS as case study:

UNIX : file systems, device independence,
FILETYPES : (div/ord/device/fifo)security, process control.

er as an ordinary program, supporting minimal features in kernel.

control, system calls for devices, DOS calls BIOS-CALLS, command interpreter.

References

1. Operating Systems - Peterson, Silbershatz.
2. Structured Systems Programming - Welsh, Mc Keag.
3. An Introduction to Operating Systems - A. Haberman.
4. Operating Systems - John Donovan

P A P E R - II (B)

=====

FILES & DATABASES

1. General concept of file system
Physical organization and trade offs (space and access)
Factors affecting physical organization
Space saving
Redundancy
Random or sequential access.
File activity ratio
Frequency of reference
Response time
Throughput
Data validity
Data Recovery
Data independence
Clustering
2. Organization Techniques (4)
Indexed sequential organization
I.S.A.M
Blocking
Multiple indexing
Insertion and deletion
B-Tree
Hashing
Key to address conversion algorithm
Mid-square
Dividing
Shifting
Folding

Over flow handling

Chaining
Prime area spill method

(4)

3. Concept of the data base

Purpose of database system
Data redundancy and inconsistency
Data independence
Security and integrity problem
Multiple user

Models of data
Physical
Logical

Concept of Entity and attributes
Flat file
Tuples
Entity identifiers
Primary/secondary/Multiple key

(4)

4. Hierarchical Model

Tree structure diagrams
Data retrieval facility
Insertion, Updation, Deletion
Virtual records
Mapping hierarchical to files

(8)

5. Network model

DBTG Codasy1 model
Data retrieval facility
Insertion, deletion, modification
Mapping networks to files

(8)

6. Relational Model

Relational Algebra
Join
Projection
Selection
Cross-product.
Union.
Set difference.
Data retrieval facility (SQL)
Insertion, Deletion, Updation+View
Normal Forms - First, Second, Third and Boyce code
normal forms
Lossless Join Decomposition to Boyce - code normal
form

Dependency preserving decompositions into third normal form.

UNIFY DBMS

Dbase III v/s UNIFY

Mapping relations to files

(18)

7. Data dictionary, crash recovery, security and integrity. (shadow paging, incremental log with deferred update and immediate updating)

(4)

8. Discussion of existing DBMS Packages :

IMS, System 2000

Total, IDMs.

Oracle, System R.

dBASE-III.

(2)

References

1. Database Organization - James Martin
2. Files & Databases - Henry Korth.

PAPER - III (B)

=====

DATA COMMUNICATION - II

1. PHYSICAL LAYER

Theoretical basis of data communication.
Telephone system
Transmission & multiplexing
Terminal handling.
Errors.

2. DATA LINK LAYER

Elementary data link protocols.
Sliding window protocols.
Examples of data link layer
Protocol Performance.

3. THE NETWORK LAYER

Network layer design issues.
Rooting algorithms.
Congestion control algorithms.
Internetworking.

4. NETWORK SHARING TECHNIQUES

Introduction.

Multiplexing techniques : time division multiplexing
statistical time division multiplexing frequency division
multiplexing, polling.

Broadcast bus sharing techniques: ALOHA, Reservation,
Contention techniques.

Ring access techniques: Fixed slot, pre-allocated empty
slot, register or buffer instruction, token passing.

Conclusion.

5. CHOOSING THE LOCAL AREA NETWORK

Introduction.

Option for local network.

User expressions.

Performance.

Installing the network: Customer requirements, network
features, choosing the network.

Reference

1. Computer network - Tanenbaum.
2. Local area network - K C E GEE (NCC Publication).

P A P E R - I V (B)

=====

COMPUTER AIDED GRAPHICS

1. INTRODUCTION

Overview of interactive computer graphics, Advantages
of man machine interaction through pictures, Some major
applications of computer graphics, Brief history of computer
graphics, Graphics systems available on PC's.

2. GRAPHICS HARDWARE

OUTPUT DEVICES: Line drawing & pointing devices,
Storage tube, & refresh displays, random scan & raster scan
devices, Plotters & printers.

INPUT DEVICES : Tablet, Mouse, Joystick, Light pen,
Keyboards, Buttons etc.

3. CLIPPING & WINDOWING

Cohen-Sutherland algorithm for line clipping, World &
screen coordinate systems, Window to view port transformation.

4. 2D-VIEWING TRANSFORMATIONS

Translation, Scaling & rotation transformations, Concatenation of transformations, matrix representation of transformation using homogeneous coordinates.

5. GRAPHICAL INPUT TECHNIQUES

Positioning techniques, pointing & selection, inking & painting.

6. RASTER GRAPHICS

Bresenham's algorithm for line drawing, algorithm for scan converting polygons, raster graphics display architecture.

7. THREE DIMENSIONAL GRAPHICS

3D modeling & viewing transformations including perspective transformation, three dimensional clipping, hidden surface elimination, algorithm, depth buffer algorithm & Warnock's algorithm.

8. DISPLAY OF CURVES & SURFACES

Parametric representation of curves & surfaces, Bezier & B-spline methods, Interactive creation & modification of curves & surfaces.

References

1. Principles of Interactive Computer Graphics - Newman and Sproul.
2. Fundamentals of Interactive Computer Graphics - Foley and Van Dam.
3. Procedural Interactive Computer Graphics - Rogers.

P A P E R - V (B)
=====

ACCOUNTING & FINANCIAL MANAGEMENT-II

1. Introduction - Meaning and Role of financial management
2. Ratio Analysis - Profitability, Turnover, Solvency & Leverage Ratios; Limitations of Ratio Analysis, Funds flow & Cash flow statement.

3. Materials - Purchase Procedure, Inventory valuation, EOQ, Material levels, Stores organization.
Labour - various methods of wage payment and incentives to workers, time keeping, time booking.
Overheads - Classification, allocation, Apportionment reapportionment and Absorption of overheads, overhead absorption rates, treatment of under the over - absorption of overheads, blanket and departmental rates.
4. Budget and Budgetary Control: Nature and scope, Importance, Method of finalization of Master Budget and Financial Budget.
5. Marginal Costing - Nature, scope and Importance, Break - even analysis, Its uses and limitation, construction of break even chart, practical applications of marginal costing.
6. Standard Costing - Nature and scope, Computation and analysis of variances with reference to material cost, labour cost and overhead cost, interpretation of the variances.

P A P E R - VI (B)
=====

PERIPHERALS AND INTERFACES

1. I/O Programming
 - Fundamental I/O Considerations
 - Programmed I/O
 - Interrupt I/O
 - Block Transfers and DMA
 - I/O Design Example
2. Introduction to Multiprogramming
 - Process Management and IRMX
 - Semaphore Operations
 - Common Procedure Sharing
 - Memory Management
 - Virtual Memory and the 80286
3. System Bus Structure
 - Basic 8086/8088 Configurations
 - Minimum Mode
 - Maximum Mode
 - System Bus Timing
 - Interrupt Priority Management
 - Interrupt System Based on a Single 8259A
 - Interrupt System Based on a Single 8259As
 - Bus Standards

4. I/O Interfaces

- Serial Communication Interfaces
 - Asynchronous Communication
 - Synchronous Communication
 - Physical Communication Standards
 - 8251A Programmable Communication Interface
- Parallel Communication
 - 8255A Programmable Peripheral Interface
 - A/D and D/A Example
- Programmable Timers and Event Counters
 - Intel's 8254 Programmable Interval Timer
 - Interval Timer Application to A/D
- Keyboard and Display
 - Keyboard Design
 - Display Design
 - Keyboard/Display Controller
- DMA Controllers
- Diskette Controllers
- Maximum Mode and 16-Bit Bus Interface Design.

References

1. Microprocessors & interfacing -by D. Hall.
2. Microprocessor systems : 8086/8088 family.
-by Yu-cheng liu, G.A.Gibson.

COMPUTER LABORATORY FOR T.Y.B.Sc. (COMPUTER SCIENCE)

LAB-I

Term I : Systems Programming I

1. Programs like gcd, lcm, factorial, squares in SMACO using opcodes or mnemonics.
(3 Practicals)
2. Simulate CPU for SMACO using atleast 9 commands.
(2 Practicals)
3. To create save and print file, to delete, move and insert line/lines in a line editor.
or screen commands should not be used. The editor should be similar to edlin or ed.)
(3 Practicals)
4. Assembler for SMACO.
(File containing labels, opcodes and operands, directives like blo, dat and org. should take care of forward references. Make use of symbol tables.)
(4 Practicals)

Term II : Systems Programming II

1. File reading after finding the starting cluster in C.
(Make use of directory sector, FAT, cluster and sector information).
(2 Practicals)
2. Interrupt handler in C.
(Keyboard interrupt should be disabled and alt-c should be used to toggle shift lock).
(2 Practicals)
3. MS-DOS patching:
(Implementing, ls - l, ls-a and ls commands using findfirst and findnext. Conversion of date, time and size should be done properly).
(4 Practicals)
4. TOY-Shell on MS-DOS having following features:
 - display shell prompt.
 - execute program for example ws.
 - implement command cd (with all options like Unix).
 - declare variables single character minimum 10.
 - implement echo command.
 - to execute commands stored in variables.
 - implement set command on Unix without arguments.
(it should display values of all variables.).
 - implement redirection.
(4 Practicals)

LAB-II

Term I : UNIX

1. Shell Practical 1 : Creating a file f4 using files f1,f2,f3 using cut and Paste.
(1 Practical)
2. Shell Practical 2 : Write a shell script which will take user name as a parameter & program will run in background.
(2 Practicals)
3. Nroff Practical 1 : Use of basic commands.
(1 Practical)
4. Nroff Practical 2 : Use of macro facilities.
(2 Practicals)
5. Awk Practical 1 : Print a file with even and odd pages separately.
(2 Practical)
6. Awk Practical 2 : Use of Sprintf.
(2 Practicals)
7. Use of lex yacc and libraries.
(1 Practical)
8. Use of libraries curses.h and S.C.C.S.
(1 Practical)

Term - II : FILES AND DATABASES

1. Write a program to create an index sequential file using C.
(1 Practical)
2. Designing and creating a database and adding data.
(1 Practical)
3. Modifying database and data entry screen forms.
(1 Practical)
4. Using SQL:
 - i. Nested queries.
 - ii. Aggregate functions.
 - iii. Group by clause.
 - iv. Having clause.
(3 Practicals)
5. Using DML.
 - i. Insert clause.
 - ii. Update Clause.
 - iii. Delete Clause.
(3 Practicals)

6. Using RPT:
 - i. Sorting feature.
 - ii. Control break feature.
 - iii. Header commands.

(3 Practicals)

LAB-III

Term - I : MICROPROCESSORS AND ACCOUNTING

MICROPROCESSORS

1. Study of Microprocessor kits
2. Simple assembly language programs(following programs should be written in 8085 as well as 8086 assembly language)

Arithmetic programs

- i. Largest of given numbers
- ii. Smallest of given numbers
- iii. Arrange the given numbers in ascending order
- iv. Arrange the given numbers in descending order
- v. Multiplication of given numbers
- vi. Division of given numbers
- vii. Move the string
- viii. Reversing the given string using stacks

Code conversion.

- i. Decimal to Hex., Octal.
- ii. Hex. to BCD using procedure.
- iii. ASCII to Binary

ACCOUNTING

(Following practicals should be performed on computers)

1. Preparation of ledger accounts.
2. Preparation of cash book.
3. Preparation of balance sheet, profit and loss account.

Term-II: INTERFACES, FINANCIAL MANAGEMENT & COMPUTER AIDED GRAPHICS

COMPUTER AIDED GRAPHICS

1. Implement rubber-band technique using line-drawing algorithm.
(Second end-point should be chosen interactively).

2. Interactivity drawing/erasing of polygons/lines/circle.
3. Implementing rotation about an point on polygons.
4. Implementing scaling & translation transformation on polygons.
5. Clipping a polygon using any clipping algorithm.
6. Saving a drawn pattern & redrawing it.
7. Curve drawing by giving control points. Using Bezier or B-spline method.

(Above practicals should be done using C without using standard functions for line, circle, polygon etc.)

INTERFACES

1. Microprocessor based function generator using DAC.
2. Assembly language program for converting analog signal to digital.(DAC)
3. To find out the on time of reed relay.
4. Reading a thumb wheel switch using 8255 or 8253 chip.
5. Music generation using 8255.
6. Study of 8253 and 8254 chip.
7. Interfacing stepper motor.

FINANCIAL MANAGEMENT

1. Based on Ratio Analysis.
2. Based on EOQ.
3. Draw break even chart and findout break even point. (take appropriate example).

=x=x=x=

BBJ/WS/SYLL/TYSYLL/03/05/94