Following is the amended syllabus of B.Sc(General) course in Computer Science, University of Calcutta.

Effective From Session 2011

Computer Science General

SUMMARY OF PERIOD DISTRIBUTION : Total Marks : 400

Paper (F.M)	**Group (F.M)**	**Type**	**Minimum Number of Periods**	
			Theoretical(T)	**Practical(P)**
*****COURSE WORK FOR PART-I EXAMINATION				
I(100)	*****	T	120	
*****COURSE WORK FOR PART-II EXAMINATION				
II(100)	*****	T	120	
III(100)		P		120
*****COURSE WORK FOR PART-III EXAMINATION				
IV(100)	A(50) B(50)	T P	60	 72

* Shown within the syllabus; T-Theoretical, P-Practical
F.M: Full Marks
Note: Figures with in( ) below indicate number of periods allotted for that topic.

Part – I

PAPER I (THEORETICAL) : 100 Marks

Group A: General Concepts (20 Periods)

Information: Definition, Categories, Data: Storage, Retrieval and Processing.

Compute: Hardware – CPU, Primary & Secondary Storage, Cache Memory, I/O Devices.

Software: Classification System and application; Stored Program Concept and Von-Neumann Architecture; *Evolution:* types – supercomputers, mainframes, minis and workstations, PC's, Parallel Machines.

Generations of programming languages: low level language, assembly level language, High Level language, 4GL

Application Software: User specific application development; standard packages.

System Software: Classifications – Operating Systems(OS); Translators – Compilers and Interpreters, Preprocessors, Assemblers, Macro Assemblers, Loaders, Linkers, Line and Screen Editors, other utilities.

Virus: Concept, detection and protection.

Multimedia: Basic concept, associated hardware and software.

Object Oriented Paradigm: Basic characteristics, definition, brief comparison with other types of programming paradigms.

Group B: Digital logic Design (35 Periods)

Number System, Bits and Byte, Base conversion, (r-1)'s and r's complement, Fixed point, Floating point representation, ASCII, EBCDIC, Boolean Algebra;

Combinational Logic: AND, OR, NAND, NOR, XOR gates; adder, multiplexer, demultiplexer /decoder, encoder. (only conceptual study with block diagram and truth/state table)

Sequential Logic: flip-flops, registers, counters (synchronous & asynchronous) (only conceptual study with block diagram and truth/state table)

Group C: Computer Architecture and Organization (35 Periods)

Central Processing Unit (CPU)

ALU: Basic Structure of ALU, Addressing Mode, Instruction formats. Handling of interrupts and subroutines.

Control Unit: Instruction and Execution Cycle; Control of sequence, jump and branch instruction; shift instruction.

I/O: Controller, interrupt, DMA, Memory mapped I/O. Standard buses. (brief description of basic characteristics, principle of operation related parameters, and comparative study where applicable)

Memory: Memory devices (brief description of basic characteristics, principle of operation related parameters, and comparative study where applicable) static and dynamic RAM, ROM, cache; secondary memory (floppy disc, hard disc, tape, CD ROM, DVD).

Group D: Operating System (30 Periods)

Operating System: Definition, types of Operating System, functions of Operating System, SPOOLing, Buffering.

Process: Process concept, Process States, Process control block.

Process scheduling: Scheduling queues, Scheduler, Scheduling criteria, Long term scheduling, Short term scheduling (CPU scheduling - preemptive, non-preemptive), Medium term scheduling.

Context Switch.

Memory Management: Purpose, logical vs physical address space, overlays, swapping, contiguous memory location, memory protection, memory allocation, fragmentation, paging, associative register, segmentation, segmentation with paging, Virtual memory: Concept, demand paging and page fault (definitions only).

Distribution of Questions :

Q1. (Compulsory – 20 marks, any ten questions to be answered out of fifteen, each carrying 02 marks).

No. of questions (Group) : 03(A), 04(B), 04(C), 04(D)

Q2 to Q9. Five questions to be answered taken at least one from each group. Each group contains two questions with 16 marks each.

All questions may have smaller subdivisions.

Text Books:

1. **Introduction to Computer Science by P.K.Sinha, P Sinha, BPB Publication.**
2. **Computer System Architecture by M. Morris Mano, PHI**
3. **Operating System Concepts, Peter B. Galvin, G. Gagne, 6th Ed., John Wiley & Sons, Inc.**
4. **Digital circuits by Sullivanan, Vikas Publication.**

Part - II

PAPER-II (THEORETICAL): 100 Marks

Group A : Algorithms & Data Structure (45 Periods)

Flowchart; *Algorithms and Problem Solving:* Algorithm definition and characteristics; algorithm representation technique – flowchart, in words (stepwise), pseudo code, structured constructs – simple structure, selection, repetition, indentation and comments, Recursive and non-recursive algorithms, Complexity, Asymptotic notation (definition, basic properties and use)

Data Structures: Data types and structures – definition. Concepts of sequential and linked allocation. *Linear Structures (concept and implementation):* Array, Stack, Queue.*Non-linear structures:* Graph, Binary Tree, Binary Search Tree (definition, illustration and basic properties).*Sorting and Searching:S*election sort, insertion sort, bubble sort, linear search, binary search.

Group B: Software Engineering: Models and Introduction to Analysis & Design (25 Periods)

Introduction, *Software life cycle models*: Waterfall model, Iterative waterfall model, Spiral model, Software Requirement Specifications (SRS), Data Flow Diagram (DFD).

Group C: Database Management System (50 Periods)

Overview: File management system and DBMS, DBMS architecture, Data Dictionary, DDL, DML, DBA (Definition and Role of DBA).

Data Models: Network, Hierarchical, Relational models and their comparison .*Relational Model:* Definition and properties, Keys of different types.*Relational Data Design:* ER diagram to relational schema, Normalization (upto 3NF)

Query Language: SQL – basic concepts.

Distribution of Questions :

Q1. (Compulsory – 20 marks, any ten questions to be answered out of fifteen, each carrying 02 marks).

No. of questions (Group) : 06(A), 03(B), 06(C)

Q2 to Q9. Five questions to be answered taken two from group A (out of 3 questions), one question from group B (out of 2 questions), and two questions from group C (out of 3 questions).

Each question carries 16 marks.All questions may have smaller subdivisions.

Paper-III (Practical) : 100 Marks

Group A: Word processing, Document Preparation & Presentation and Spreadsheet (24 Periods)

Group B: Programming in C (48 Periods)

Basic Structure: Character set, keywords, identifiers, constants, variables and type declaration, preprocessor.

Operators: Arithmetic, relational, logical, Assignment, Increment and Decrement, ternary, comma, casting; operator precedence and associativity; type conversion, character I/O, Escape sequence and formatted I/O.

Control Structure: if, if-else. switch case, break, continue.

Loop Structure: for, while, do-while.

Arrays: One-dimensional and two-dimensional, Different types of uses. String handling: concatenation, copy, comparison, string functions.

User defined functions: prototype, needs; argument passing; return value and types, recursion.

Structures: Initialization; arrays of a structure, arrays within structures, nested structure, size of structures.

Pointers: Declaration and initialization; operators; pointer arithmetic, accessing variables, pointer & arrays, strings, dynamic storage allocation.

Group C: Database Design and Applications (48 Periods)

The student should be familiar with at least one standard commercial RDBMS software under desktop or multiuser environment. Topic of works should include :

SQL: creation and modification of databases, insert, delete, update operations, creating view, queries, nested queries, aggregate function. Validation: Correctness, Integrity.

Distribution of Questions :

Group A: One question to be answered out of three 10 marks
Group B: One question to be answered out of five 30 Marks
Group C: One question to be answered out of four 30 marks
Viva: 20 marks Sessional: 10 marks

Duration of Examination – 6 hours

Note : Problems to be assigned to a student by drawing lots in a manner similar to that followed in other practical examinations. The sessional work must be submitted in a word processed version with computer printout of problems, algorithms, listings, output, discussions, graphs, charts, figures, Handwritten output will not be accepted under any circumstances.

Questions will not be package/product specific.

Part III

Paper IV : 100 Marks (Theoretical 50, Practical 50)

Group A (Theoretical) Full Marks : 50

Communication and Computer Networks (60 Periods)

Communication Concepts: Analog and Digital communication – basic concept and comparison. Signal types frequency spectrum, strength, bandwidth, data rate, channel capacity. S/N ratio, modulation and demodulation FSK, ASK.

Transmission media (brief idea, characteristics, comparison) : Guided (twisted pair, co-axial, optical fiber) and unguided (microwave, satellite-geo synchronous and low-orbit, VSAT).
Audio and Video communication systems : Analog and digital telephone, AM & FM radio, cable TV network, ISDN, paging, cordless and cellular phones, ATM.
Computer Networks : Distributed processing and resource sharing concepts. Classes – LAN, MAN, WAN
Architecture – OSI , TCP/IP and http protocol – brief study. Basic idea of protocols, routing, congestion control.
LAN : Ethernet and Token Ring topology (principle of operation, characteristics, comparison). High speed LANs
Internetworking Modems, bridges and routers, connectivity concepts. Network security.
The Internet : basic idea, DNS and URL, IP address, browsers
E-mail : Architecture and services.

Distribution of questions :
Q1. (Compulsory – 10 marks, any five questions to be answered out of eight, each carrying 02 marks)
Q2 to Q9. Any five questions to be answered out of eight, each carrying 08 marks.
Questions may have smaller subdivisions.

Text Books :
1. Data Communications and Networking by Behrour A. Forouzan, 2nd or 4th Edition, TMH
2. Data and Computer communication by William Stallings, 6th Edition, Pearson Education
3. Computer Networks by Tanenbaum, Pearson Education

Group B (Practical) Full Marks – 50

Group B1 & B2 together constitute Group B.

Group B1: Unix / Linux and Shell Programming (36 periods)

Files & Directories : Copy, delete, rename, compare files, create, navigate, remove directories, access vi editor, status of users, background jobs; Pipes & filters; cut, past and sort , pattern searching in a string, Other internal and external commands.
Shell Programming : Concept and simple programming problems.

Group B2 : Programming in Visual Basic (36 periods)

Students should learn about programming on the following topics using one of the two languages, primarily through practical sessions, along with theoretical classes in between.

Basic Features; building objects with classes, operations with objects, class libraries. Multitasking and multithreading applications; software design involving forms, objects, events, functions, procedure and methods (32 bit programming). ODBC driver; Front and development for database. MFC based multimedia applications.

Distribution of questions:

Group B1: One question to be answered out of four	20 marks
Group B2: One question to be answered out of four	10 marks

Sessional Work – 10 marks, Viva-voce – 10 marks

Duration of Examination – 4 hours

Note : Problems to be assigned to a student by drawing lots in a manner similar to that followed in other practical examinations. The sessional work must be submitted in a word processed version with computer printout of problems, algorithms, listings, output, discussions, graphs, charts, figures, Handwritten output will not be accepted under any circumstances.

Question will not be package/product specific.

Text Books :

1. Your Unix The Ultimate guide by Sumitabha Das, McGraw Hill
2. Unix Shell Programming by Y Kanetkar
3. Microsoft Visual Basic 2008 Step by Step, Michael Halvorson, Microsoft Press
4. Simply Visual Basic 2008, Paul Deitel, H.M Deitel, and G. J. Ayer, Prentice Hall
5. Mastering Microsoft Visual Basic 2008, Evangelos Petroutsos, Sybex Publisher
6. Visual Basic 6 by Prasenjit Sinha, S Chand Publication