Computer Science (Honours) CMSA -CBCS Syllabus

SEMESTER – II

Semester	*Courses*	*Topics*	*Credit*
II	**CMS-A-CC-2-3-TH (Core Course – 3) Theory**	**Computer Organization and Architecture**	**4**
	CMS-A-CC-2-3-P (Core Course – 3) Practical	**Computer Organization Lab.**	**2**
	CMS-A-CC-2-4-TH (Core Course – 4) Theory	**Basic Electronic Devices and Circuits**	**4**
	CMS-A-CC-2-4-P (Core Course – 4) Practical	**Basic Electronic Devices and Circuits Lab**	**2**

SEMESTER – II

CMS-A-CC-2-3-TH: Computer Organization and Architecture
Core Course-3: Theory: 04 Credits: 60 hours

Basic Structure of Computers (Qualitative Discussion) (05 hours)

Computer Types, Basic Functional Units, Basic Operational Concept, Bus Structure, Software, Performance, Multiprocessor and Multicomputer, IAS Computer, Historical perspectives.

Register Transfer and Micro-operation

Register Transfer Language, Register Transfer, Bus and Memory Transfers, Three State Bus Buffers, memory Transfer, Arithmetic and Logical micro-operations, Shift and Arithmetic shifts. (05 hours)

Basic Computer Organization and Design (05 hours)

Instruction Codes, Stored Program Organization, Indirect Address, Computer Registers, Common Bus System, Computer Instruction, Timing and Control, Instruction Cycle, fetch Decode, Register Reference Instructions, Memory Reference Instruction, Input-Output and Interrupt, Design of Basic Computer, Design of Accumulator Logic.

CPU Organization

Arithmetic and Logic Unit (ALU)- Combinational ALU, 2'S Complement Addition, Subtraction Unit, Booths Algorithm for Multiplication, Division Hardware using Restoration Division Algorithm. (06 hours)

General register organization, Control Word, Accumulator Based, Register Based, Stack Type CPU organization.

Control Unit

Hardwired Control Unit, Micro-programmed Control Unit: Control memory, Address Sequencing, conditional branching, mapping of instructions, subroutine, Design of Control Unit. (07 hours)

CPU Registers

Program Counter, Stack Pointer Register, Memory Address Register, Instruction Register, (06

Memory Buffer Register, Flag registers, Temporary Registers. hours)

Instructions.

Operational Code, Operands, Zero, One, Two and Three Address Instruction, Instruction Types, Addressing modes, Data Transfer and Manipulation instructions, Program control instructions. (03 hours)

CISC and RISC processors (03 hours)

Introduction, relative merits and De-merits.

Input / Output Organization

Polling, Interrupts, subroutines, Memory mapped IO, IO mapped IO, DMA, I/O Bus and Protocol, SCSI, PCI, USB, Bus Arbitration. (02 hours)

Computer Peripherals (08 hours)

VDU, Keyboard, Mouse, Printer, Scanner (Qualitative approach).

Memory

(Primary memory: ROM, PROM, EPROM, EEPROM, Flash memory, RAM: SRAM, DRAM, Asynchronous DRAMs, Synchronous DRAMs, Structure of Larger Memories, RAMBUS Memory, Cache Memory: Mapping Functions, Replacement Algorithms, interleaving, Hit and Rate penalty, Virtual memories, Address Translation, Memory Management requirements, Secondary Storage: Magnetic Hard Disks, Optical Disks, Magnetic Tape Systems. (10 hours)

CMS-A-CC-2-3-P: Computer Organization Lab.

Core Course-3: Practical: 02 Credits: 40 hours

(1). Construct an Arithmetic Unit capable of performing 4-bit subtraction and Addition using 2's complement method. Use Parallel Adders and other necessary logic gates.

(2). Construct a logical Unit using logic gates capable of performing 4-bit, Bitwise ORing, ANDing, XORing and inversion.

(3). Construct an 4-bit ALU unit which can perform the following operation;

Selection		Function
S_1	S_0	
0	0	Addition
0	1	Subtraction
1	0	XOR-ing
1	1	Complement

(4). Construct a 2-bit Carry Look Ahead Adder using logic gates.

(5). Study and Construct a 1-digit BCD/Decimal adder using parallel adders and other necessary logic gates.

(6). Construct a Binary Multiplier using basic logic gates.

(7). Construct a Binary Divider using basic logic gates.
(8). Subtraction with 1's complement method using parallel adders and other necessary logic gates.
(9). Construction of BCD Subtractor with 9'S complement method using parallel adders and logic gates.
(10). Construction of BCD Subtractor with 10'S complement method using parallel adders and logic gates.
(11). Binary magnitude comparators (up to 4 bits) using parallel adder and logic gates.
(12). Construct a Binary 4-bit and 8-bit adder using logic gates.
(13). Construct a Serial in Serial out 4-Bit register.
(14). Construct a 4-Bit Universal Shift register.
(15). Construct a 4 bit ring counter.
(16). Construct a 4 - Bit Johnson Counter.
(17) Construct RAM (4-bit) and extend it
(18). Horizontal and Vertical Cascading of Memory modules.
(19). Code converters using memory modules.

Text/Reference Books

1. Computer System Architecture, Morries Mano, Pearson.
2. Computer Organization & Architecture, Williams Stallings, Pearson.
3. Computer Organization, Hamacher, Vranesic and Zaky, McGraw Hill.
4. Computer Architecture and Organization, Govindrajalu, Tata McGraw Hill.
5. Computer Architecture and Organization, J P Hayes, Tata McGRaw Hill.
6. Structured Computer Organization, Andrew S. Tanenbaum, Austin, 6th edition, Pearson.

CMS-A-CC-2-4-TH: Basic Electronic Devices and Circuits
Core Course-4: Theory: 04 Credits: 60 hours

Basics of Circuit Theory: (04 hours)
KVL, KCL, Thevenin's, Norton's, Superposition, Maximum Power Transfer Theorem. Application to simple problems.

Theory of Semiconductor devices: (03 hours)
Semiconductor materials and their properties, classification based on energy band diagram, Intrinsic and extrinsic semiconductors, P & N type.

Diode and its applications: (09 hours)
Working Principle, construction and characteristics of PN junction diode, biasing, depletion region, Single Phase Half, Full wave and bridge rectifier using PN Junction diode, Circuit, Working principle, Calculation of Average DC current and Voltage, RMS, Ripple Factor, efficiency, Peak Inverse Voltage (PIV).
Zener diode: Characteristics and its application as a voltage regulator

Bipolar Junction Transistor:
Principle of Junction Transistor (including current components, current gains), Types: CE, CB, CC), DC biasing in CE mode: Q-Point, load line analysis, Transistor as an amplifier. Inverter using transistors: Transfer characteristics and threshold voltages (08 hours)

Unipolar Junction Transistor: (08 hours)
Principle of JFET and MOSFET, Depletion and Enhancement mode operations, Concept of NMOS, PMOS and CMOS. CMOS circuits for basic logic gates (NOT, NAND, NOR)

PNPN Devices: (08 hours)
Working Principle of SCR, UJT, construction, characteristics and simple applications: SCR, DIAC, TRIAC, SCR regulated power supply, Switch Mode Power Supply (SMPS) qualitative study only. Concept and functions of Optoelectronic materials (LED, LCD, Photo Sensors and basics of Optical Fiber and Opto-couplers).

Operational Amplifiers (OPAMP): (12 hours)
Inverting Amplifier, Non-inverting Amplifier, Offset parameters, Inverting and Non-inverting Adder, Differentiator, Integrator, Scale changer and Schmitt Trigger. Concept of Virtual ground, CMRR, Signal Generation using OPAMP: Monostable, Astable (Square wave generator)

Timer: Construction and Functional description of 555, Mono-stable, Bistable and Astable Operation, VCO. (04 hours)

Data Acquisition: (04 hours)
R-2R ladder DAC, Weighted resistor type DAC, Flash Type ADC, Counter, Successive Approximation Register (SAR), Dual Slope ADC and Integrating Type.

CMS-A-CC-2-4-P: Basic Electronic Devices and Circuits Lab.
Core Course-4: Practical: 02 Credits: 40 hours

1. Study the forward characteristic of a p-n junction diode and calculate the static and dynamic resistance of the diode.
2. Construct a Half wave rectifier using power diodes and study its load regulation characteristics with or without capacitor filter.
3. Construct a Full wave rectifier using power diodes and study its load regulation characteristics with or without capacitor filter.
4. Construct a Bridge rectifier using power diodes and study its load regulation characteristics with or without capacitor filter.
5. Study the forward and reverse characteristic of a Zener diode and also determine the value of the current limiting resistance.
6. Construct a Zener Voltage regulator and study its load regulation characteristics.

7. Construct a positive and negative voltage regulator using Three terminal linear voltage regulator 78XX and 79XX. Study its load regulation characteristics.
8. Construct a variable positive voltage regulator using Three terminal linear voltage regulator LM317 and study its load regulation characteristics for different sets of output voltage.
9. Study the Output characteristics of a transistor in CE mode and calculate the gain from the graph.
10. Using Transistor to construct NOT or Invert Operation and draw the transfer characteristics and measure the threshold voltage.
11. Construct and study an Inverting Amplifier using OPAMP with different sets of input and feedback resistors and Calculate the gain from the graph.
12. Construct and study an Non-Inverting Amplifier using OPAMP with different sets of input and feedback resistors and Calculate the gain from the graph.
13. Construct and study an Inverting Adder using OPAMP.
14. Construct and study an Non-Inverting adder using OPAMP.
15. Construct and study a subtractor using OPAMP.
16. Construct and study the OPAMP as a differentiator.
17. Construct and study the OPAMP as a integrator.
18. Construct an Astable Multivibrator using Timer 555.
19. Construct an Astable Multivibrator using OPAMP.
20. Study and construct a R-2R ladder digital to analog converter.
21. Convert an analog signal into digital using ADC 0809.

Text/Reference Books:

1. Electronic Devices & Circuits Theory, Boylested & Nashelsky, PHI.
2. Electronics fundamental & Application, Chattopadhyay, Rakshit, New Age International Publishers.
3. Op-Amps And Linear Integrated Circuits, R. A. Gayakwad, Prentice Hall.
4. Solid State Electronic Devices, Streetman, PHI.
5. Elements of Electronics, Bagde Singh, S Chand Publication.
6. Microelectronic circuits, Sedra Smith, Oxford.
7. Operational Amplifier and Linear Integrated Circuits, Coughlin Driscol.
8. Electronic Devices and Circuits, Salivahanan, Suresh Kumar, McGrawHill education

UNIVERSITY OF CALCUTTA

SYLLABUS

Bachelor of Science (General)

In Computer Science (CMSG)

Choice Base Credit System (CBCS)

9.

2018

10. Semester-wise courses for B.Sc. (General)

	Sem-1	Sem-2	Sem-3	Sem-4	Sem-5	Sem-6
Core Course (CC)	**CC-1**	**CC-2**	**CC-3**	**CC-4**		
AECC	**AECC-1**	**AECC-2**				
Skill Enhancement course (SEC)			**SEC-A**	**SEC-B**	**SEC-A**	**SEC-B**
Total No. of Courses & marks	**4x100 =400**	**4x100 =400**	**4x100 =400**	**4x100 =400**	**4x100=400**	**4x100=400**
Total Credits	**20**	**20**	**20**	**20**	**20**	**20**

Computer Science General (CMSG) Syllabus

Courses	Topics	Credit
CMS-G-CC-1-1-TH Sem-1-Core Course-1 Theory	Computer Fundamentals and Digital Logic Design	04
CMS-G-CC-1-1-P Sem-1-Core Course-1 Practical	Word Processing, Spreadsheet, Presentation and Web design by HTML/ PHP	02
CMS-G-CC-2-2-TH Sem-2- Core Course-2Theory	Algorithm and Data Structure	04
CMS-G-CC-2-2-P Sem-2-Core Course-2 Practical	Programming with C	02
CMS-G-CC-3-3-TH Sem-3- Core Course-3 Theory	Computer Organization	04
CMS-G-CC-3-3-P Sem-3-Core Course-3 Practical	Programming using PYTHON	02
CMS-G-CC-4-4-TH Sem-4- Core Course-4 Theory	Operating System	04
CMS-G-CC-4-4-P Sem-4-Core Course-4 Practical	Shell Programming (Unix/Linux)	02
Skill Enhancement Courses (SEC-A & B): Choices : Semesters-3 to 6		
CMS-G-SEC-A-X-1-TH	Communication, Computer Network andInternet	02
CMS-G-SEC-A-X-2-TH	Software Engineering	02
CMS-G-SEC-B-X-1-TH	Multimedia and its Applications	02
CMS-G-SEC-B-X-2-TH	Information Security	02
Discipline Specific Elective- A (DSE- A): Candidate has to opt any oneof the following topics		
CMS-G-DSE-A-5-1-TH	Data base Management System (DBMS)	04
CMS-G-DSE-A-5-1-P	Database Design and Applications	02
CMS-G-DSE-A-5-2-TH	Object Oriented Programming	04
CMS-G-DSE-A-5-2-P	Object Oriented Programming by C++/ Java	02
CMS-G-DSE-A-5-3-TH	Sensor Network and IoT	04
CMS-G-DSE-A-5-3-P	Sensor Network and IoT Lab.	02
Discipline Specific Elective- B (DSE- B): Candidate has to opt any one of the following topics		
CMS-G-DSE-B-6-1-TH	Embedded Systems	04
CMS-G-DSE-B-6-1-P	Embedded Systems Lab.	02
CMS-G-DSE-A-6-2-TH	Operation Research	04
CMS-G-DSE-A-6-2-P	Operation Research Lab.	02

CMS-G-DSE-A-6-3-TH	Computational Mathematics	04
CMS-G-DSE-A-6-3-P	Computational Mathematics Lab.	02

CMS-G-CC-2-2-TH: Algorithms& Data Structure
Core Course- 2: Theory: 60 hours

Introduction: Algorithms, ADT. (04 hours)

Arrays: (10 hours) AD
One dimensional and Two Dimensional Arrays, Row Major and Column MajorForms.

Linked List: (16 hours) AB
Singly and Doubly Linked List; Operations Like Insertion, Deletion. Searching.

Stacks and Queues: (16 hours) AB+AD
Concepts of Stack and Queue; Insertion and Deletion of Elements;Array and Linked Representation: Prefix, Infix and Postfix Notation; Postfix Expression Evaluation, Infix to Postfix.

Searching: (04 hours) AD
Algorithm of Sequential, Binary Search Techniques.

Sorting: (10 hours) AB
Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort.

CMS-G-CC-2-2-P: Programming with C AB+AD
Core Course- 2: Practical: 40 hours

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

Operators: Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional, comma; operator precedence and associativity; arithmetic expression-evaluation and type conversion. Character I/O, Escape sequence and formatted I/O.

Branching and Looping:if, if-else, while, do-while, for.
Arrays: One-dimensional and 2-dimensional. Different types of uses. String handling with arrays – read and write, concatenation, comparison, string functions.

User defined functions: Need; Call by Reference and Call by value; return values and types; nesting of functions; recursion.

Structures: Initialization; arrays of a structure, arrays within structures, structure within structure, size of structures, Dynamic Storage Allocation.

Pointers: Declaration and initialization; operators; pointer arithmetics; accessing variables, pointer & arrays, strings, functions, Linked lists, concepts and use in C with different examples.

File handling: Opening & Closing, I/O.

Other Features: Bit level operations, macro definitions, union, command line arguments