

**Integral University, Lucknow**  
**Department of Computer Application**  
**STUDY & EVALUATION SCHEME**  
**Choice Based Credit System**

**Master of Computer Application (MCA)**  
**w.e.f. Session 2020-21**

**Year I, Semester I**

S. No.	Course Category	Subject Code	Name of the Subject	Periods				Evaluation Scheme				Subject Total
								Sessional (CA)			End Sem. Exam	
				L	T	P	C	UE	TA	Total	ESE	
1.	Core	CA451	Discrete Mathematics	3	1	0	4	40	20	60	40	100
2.	Core	CA452	Computer Organization and Architecture	3	1	0	4	40	20	60	40	100
3.	Core	CA453	Fundamentals of Computer and C Programming	3	1	0	4	40	20	60	40	100
4.	Core	CA454	UNIX and Shell Programming	3	1	0	4	40	20	60	40	100
5.	Core	CA455	Software Engineering	3	1	0	4	40	20	60	40	100
6.	Core	CA456	Operating System	3	1	0	4	40	20	60	40	100
7.	Core	CA457	Computer Organization and Architecture Lab	0	0	3	1	40	20	60	40	100
8.	Core	CA458	C Programming Lab	0	0	3	1	40	20	60	40	100
9.	Core	CA459	UNIX / LINUX Lab	0	0	2	1	40	20	60	40	100
<b>Total</b>				<b>18</b>	<b>6</b>	<b>8</b>	<b>27</b>					<b>900</b>

**L** - Lecture      **T** – Tutorial      **P** – Practical      **C** – Credit      **UE**– Unit Exams      **TA** – Teacher Assessment

**Sessional Total (CA)** = Class Test + Teacher Assessment

**Subject Total** = Sessional Total (CA) + End Semester Examination (ESE)

**\*Foundation course in Mathematics (for non-mathematics background students)**

# CA451 DISCRETE MATHEMATICS

w.e.f. Session 2020-21

**PREREQUISITE: NONE**

**COREQUISITE: NONE**

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**3 1 0**

## UNIT-I

**Set Theory:** Introduction, Basic concepts, Terminology and notation, Sub Set, Operation on Sets, Algebra of Sets, Combination of Sets, Multi-Sets, Ordered pairs and Cartesian product.

**Relations:** Definition, Relation on Sets, Operations on Relations, Properties of Relations, Composite Relations, Equality of Relations, Closure of Relations.

**Functions:** Definition, Classification of Functions, Operations on Functions, Recursively defined Functions.

**Mathematical Induction:** Mathematical Induction. [8]

## UNIT-II

**Algebraic Structures:** Monoid, Semigroup and Groups, Subgroups, Cyclic Groups, Cosets, Normal Subgroups, Permutation and Symmetric Groups, Group Homeomorphisms, Type of Homeomorphisms, Rings and Fields. [8]

## UNIT-III

**Propositional Logic:** Proposition, Truth Tables, Converse, Contrapositive and Inverse, Tautology, Contradiction, Well Formed Formula (WFF), Algebra of Proposition, Normal forms-Disjunctive normal form and Conjunctive normal form.

**Predicate Logic:** First order Predicate, Well Formed Formula of Predicate, Quantifiers, Inference theory of Predicate. [8]

## UNIT-IV

**Lattices:** Definition, Posets, Hasse diagram, Properties of Lattices, Sub-Lattices, Special Lattices –Bounded, Complemented, Distributed, Modular and Complete Lattice.

**Boolean Algebra:** Introduction, Theorems of Boolean Algebra, Boolean Expressions, Simplification of Boolean Functions, Karnaugh Maps, Logic Gates, Digital Circuits and Boolean Algebra. [8]

## UNIT-V

**Graphs:** Definition and terminology, Representation of Graphs, Multi-Graphs, Bipartite Graphs, Planar Graphs, Isomorphism and Homeomorphism of Graphs, Euler and Hamiltonian paths, Graph coloring.

**Trees:** Definition, Binary Tree, Binary Tree Traversal, Binary Search Tree.

**Recurrence Relation and Generating Function:** Recurrence Relation, Method of Characteristic Roots, Generating Function, and Solution of Linear Recurrence Relations using Generating Functions. [8]

## REFERENCES:

1. S. K. Sarkar, "A Text Book of Discrete Mathematics", S. Chand Publication, 2014, India, New Delhi.
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 6th edition, TMH, 2006, India, New Delhi.
3. B. Colman, R.C. Busby and S.C. Ross, "Discrete Mathematical Structures", 5th edition, Prentice Hall, 2004, India, New Delhi.

4. J. P. Tremblay, J.P and R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", TMH,2006, India, New Delhi.
5. Deo Narsingh, "Graph Theory with application to Engineering and Computer. Science", PHI Private Limited,2012,India, New Delhi.
6. Seymour Lipschutz, "Schaum's Outline of Discrete Mathematics", 3rd edition, TMH,2010,India, New Delhi.
7. C.L.Liu, "Elements of Discrete Mathematics", 2nd edition, TMHComputer Science Series,1985,India, New Delhi.

# CA452 COMPUTER ORGANIZATION AND ARCHITECTURE

w.e.f. Session 2020-21

**PREREQUISITE: NONE**

**COREQUISITE: CA457**

**L T P**  
**3 1 0**

## UNIT-I

### **Digital Logic Circuits:**

**Number System:** Binary, Decimal, Octal and Hexadecimal. Logic Gates, K-Map Simplification, Combinational Logic and Sequential Logic circuits.

**Basic Processing:** Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Instruction Code, Instruction Set, Micro Instruction. [8]

## UNIT-II

**Basic Organization:** Instruction Cycle, Organization of Central Processing Unit, Hardwired and Micro Programmed Control Unit, General Register Organization, Stack Organization, Addressing Modes, Instruction Formats.

**Memory Organization:** Memory Hierarchy, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory. [8]

## UNIT-III

**I/O Organization:** Peripheral Devices, I/O Interface, Asynchronous Data Transfer, Strobe Control, Handshaking, Modes of Data Transfer: Programmed I/O, Interrupt Driven I/O, Priority Interrupt.

**Programming:** Assembly Language Programming Based on Intel 8085/8086, Instructions, Data Transfer Programming Techniques, Conditional Call and Return Instructions. [8]

## UNIT-IV

**Parallel Computing:** Introduction, Parallelism in Uniprocessor Systems, Parallel Computer Structures, Architectural Classification Schemes and Parallel Processing Applications.

**Pipelining Processing:** An Overlapped Parallelism, Instruction and Arithmetic Pipelines. [8]

## UNIT-V

**Principles of Designing Pipelined Processors:** Internal Forwarding and Register Tagging, Hazard Detection and Resolution, Job Sequencing and Collision Prevention, Characteristics of Vector Processing, SIMD Array Processors, Masking and Data Routing.

**SIMD Interconnection Network:** Cube Interconnection Network, Shuffle-Exchange and Omega Network. [8]

## REFERENCES:

1. Mano Morris, "Computer System Architecture", PHI, 3rd Edition, 2017, India, New Delhi.
2. Kai Hwang, FayéAlayéBriggs, "Computer Architecture and Parallel Processing", TMH, 2nd edition 2017, India, New Delhi.
3. William Stallings, "Computer Organization and Architecture", Pearson, 10th edition, 2016, India, New Delhi.
4. Kai Hwang, "Advanced Computer Architecture" TMH, 18th Reprint, 2008, India, New Delhi.

# CA453 FUNDAMENTALS OF COMPUTER AND C PROGRAMMING

w.e.f. Session 2020-21

**PREREQUISITE:** NONE

**COREQUISITE:** CA458

**L T P**  
**3 1 0**

## UNIT-I

**Introduction to Computers:** History, Generation, Classification and Characteristics.

**Input/ Output Devices:** Keyboard, Mouse, Printer, Storage Units: Primary Memory and Secondary Memory.

**Basic Software Concepts:** Definition, Classification: System Software, Application Software and Utilities.

**Introduction to DOS:** Basics, Internal and External Commands.

**Basics of Networks:** Network Types and Topologies.

**Introduction to Internet:** Basic Terminologies, URL, Search Engine, Internet Service Provider (ISP) and TCP/IP [8]

## UNIT-II

**Overview of C Language:** History, Features of C Language, Structure of C Programs, Compilation and Execution of C Programs, Type of Errors, Debugging Techniques.

**C Language Fundamentals:** C Character Set, Identifiers and Keywords, Modifiers, Data Types and Sizes. Variables: Declaration and Initialization, Scope of Variables, Constants, Types of Constant, Typedef() and Type Conversion.

**Operators:** Types of Operators, Unary and Binary Operators, Assignment, Arithmetic, Relational and Logical Operators, Increment and Decrement Operators, Conditional Operators, sizeof() Operator, Comma Operator, Conditional Operator and Bitwise Operators.

**Expressions:** Type of Expression, Precedence and order of Evaluation. [8]

## UNIT-III

**Decision Control Statements:** if, if-else, Nested if-else, switch, break, continue and goto statement. Loops: for, while and do-while.

**Arrays:** Defining Array, Types of Array, Declaration and Initialization of Linear and Multidimensional Arrays.

**String:** Character Array, Arrays and Strings, String Manipulation. String Functions. [8]

## UNIT-IV

**Functions:** Built-in and User-defined, Function declaration, Definition And Function call, Nesting of Functions, Parameter Passing, Recursive Functions and Multifile Programs.

**Pointers:** Introduction, Pointer Operators (&,\*), Pointer Arithmetic, Call by Value and Call by Reference, Dynamic Memory Allocation, calloc() and malloc() Functions. [8]

## UNIT-V

**Structure and Union:** Definition and Concept, Declaration and Initialization of Structure and Union Variables, Difference between Structure And Union, Enumeration, Macros and C Preprocessors.

**File Handling in C:** Definition of Files, Creating a Data File, Opening Modes of Files. Standard Function: fopen(), fclose(), feof(), fseek(), frewind(). Using Text Files: fgetc(), fputc(), fscanf() etc. [8]

## REFERENCES:

1. V. Rajaraman, "Fundamentals of Computers", PHI, 2015, India, New Delhi.

2. Peter Norton's, "Introduction to Computer", TMH, 2008, India, New Delhi.
3. Hahn, "The Internet Complete Reference", TMH, 2001, India, New Delhi.
4. Peter Norton's, "DOS Guide", PHI, 1994, India, New Delhi.
5. Somashekara , "Problem Solving with C", PHI, 2009, India, New Delhi.
6. Kernigham, Ritchie, "The C Programming Language", PHI, 1977, India, New Delhi.

# CA454 UNIX AND SHELL PROGRAMMING

w.e.f. Session 2020-21

**PREREQUISITE: NONE**

**COREQUISITE: CA459**

**L T P  
3 1 0**

## **UNIT- I**

**Introduction:** Introduction to UNIX, UNIX System Organization (The Kernel and the Shell), Files and Directories, Library Functions and System Calls, Editors (vi and ed). [8]

## **UNIT-II**

**UNIX Shell Programming:** Types of Shells, Shell Meta Characters, Shell Variables, Shell Scripts, Shell Commands, UNIX Environment, Integer Arithmetic and String Manipulation, Special Command Line Characters, Decision Making and Loop Control, Controlling Terminal Input, Trapping Signals, Arrays. [8]

## **UNIT-III**

**Portability with C:** Command Line Argument, Background Processes, Process Synchronization, Sharing of Data, User-ID, Group-ID, Pipes, Fifos, Message Queues, Semaphores Shared Variables, Introduction to Socket Programming. [8]

## **UNIT-IV**

**UNIX System Administration:** File System, Mounting and Unmounting File System, System Booting, Shutting Down, Handling User Account, Backup, Recovery, Security, Creating Files, Storage of Files, Disk Related Commands. [8]

## **UNIT-V**

**Different Tools and Debugger:** System Development Tools: Lint, Make, SCCS (Source Code Control system). Language Development Tools: YACC, LEX, M4. Text Formatting Tools: nroff, troff, tbl, eqn, pic. Debugger tools: Dbx, Adb, Sdb, Strip and Ctrace. [8]

## **REFERENCES:**

1. Parata, "Advanced UNIX Programming guide", BPB, 1985, India, New Delhi.
2. Yashwant Kanitkar, "UNIX Shell Programming", BPB, 2003, India, New Delhi.
3. Vijay Mukhi, "The 'C' Odyssey UNIX-the open boundless C", BPB, 2004, India, New Delhi.
4. Sumitabh Das, "UNIX Concepts and applications", TMH, 2017, USA, New York.
5. Mike Joy, Stephen Jarvis, Michael Luck, "Introducing UNIX and LINUX", Palgrave Macmillan, 2002, UK, London.
6. Rachel Morgan, Hanery McGilton, "Introducing UNIX System V", TMH, 1991, India, New Delhi.

# CA455 SOFTWARE ENGINEERING

w.e.f. Session 2020-21

**PREREQUISITE: NONE**

**COREQUISITE: NONE**

**L T P**  
**3 1 0**

## UNIT-I

**Fundamental Concept of Software Engineering:** Introduction to Software Engineering, Software Crisis, Software Problems, Software Engineering Problems, Characteristics of Software, Software Evaluation, Software Applications, Requirement Analysis and Requirement Specification Documents, Software Design, Coding, Testing, Maintenance, Validation and Verification, Monitoring and Control, Metrics and Measurement.

**Software Development Models:** Waterfall Model, Prototyping Model, Interactive Enhancement Model, Spiral Model, Iterative Models, Evolutionary Process Models, Role of Management in Software Development and Problem Analysis. [8]

## UNIT-II

**Software Design:** Design Process, Design Concepts, Design Model, Problem Partitioning and Hierarchy, Abstraction, Modularity, Top Down and Bottom Up Approach, Structure Design Methodology, Functional Approach, Object Oriented Approach, Coupling and Cohesion, Cyclomatic Complexity.

**Object Oriented Design:** OO Analysis and OO Design, Classes and Objects, Relationship among Objects, Inheritance and Polymorphism, Design Concepts, Design Notation and Specification, Design Methodology, Dynamic Modeling, Functional Modeling. [8]

## UNIT-III

**Software Coding:** Programming Practice, Top Down and Bottom Up Structured Programming, Information Hiding, Programming Style, Internal Documentation, Size measures, Complexity Metrics, Style Metrics.

**Software Testing:** Testing Fundamentals, Top Down and Bottom Up Approaches, Functional Testing, Structural Testing, Test Cases and Test Criteria, Software Testing Strategies, Testing Levels, Unit Testing, Integration Testing and System Testing, Alpha and Beta Testing, Test Plan, Test Case Specification, Test Case Execution and Analysis. [8]

## UNIT-IV

**Software Maintenance and Software Project Management:** Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering, Software Configuration Management Activities, Change Control Process, Software Version Control, Estimation of various Parameters, Project Scheduling Staffing and Personal Planning, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management. [8]

## UNIT-V

**Software Reliability and Quality Assurance:** Software Reliability, Reliability Issues, Musa's Model, Software Quality, Reliability Growth, ISO 9000 Certification, SEI Capability Maturity Model, Comparison between ISO and CMM Model.

**CASE (Computer Aided Software Engineering):** Various CASE Tools and their Usefulness, Role of Data Dictionary in CASE Tools, Architecture of CASE Environment, CASE Support in Software Life Cycle. [8]



## REFERENCES:

1. PankajJalote, "Software Engineering", Wiley Publications, 2010, USA, New Jersey.
2. Rajib Mall, "Fundamental of Software Engineering",PHI, 2014, India, New Delhi.
3. Roger S. Pressman, Bruce Maxim, "Software Engineering: A practitioner's Approach", 7th edition,TMH, 2014, India, New Delhi.
4. Sommerville, "Software Engineering", 7th edition, PearsonEducation, 2011, India, New Delhi.
5. K.K. Agarwal, Yogesh Singh, "Software Engineering", New Age InternationalPublishers, 2008, India, Rampur.
6. James F. Peters, WitoldPedrycz, "Software Engineering, An Engineering Approach", JohnWiley& Sons, 2000, USA, New Jersey.
7. ShelyCashman Rosenblatt, "Systems Analysis and Design", ThomsonPublications, 2006 USA, Stanford.
8. Waman S Jawadekar, "Software Engineering Principles and Practice",TMH, 2004, India, New Delhi.

# CA456 OPERATING SYSTEM

w.e.f. Session 2020-21

**PREREQUISITE: NONE**

**COREQUISITE: NONE**

**L T P**  
**3 1 0**

## UNIT-I

**Introduction:** Definition and Types of Operating Systems, Batch Systems, Multiprogramming, Time-Sharing, Parallel, Distributed and Real-Time Systems. Operating System Structure, Operating System Components and Services, System Calls, System Programs and Virtual Machines.

**Process Management:** Process Concept, Process Scheduling, Cooperating Processes, Threads and Interprocess Communication. [8]

## UNIT-II

**CPU Scheduling:** Criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real Time Scheduling and Algorithm Evaluation.

**Process Synchronization:** The Critical Section Problem, Synchronization, Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors. [8]

## UNIT-III

**Deadlocks:** Deadlocks System Model, Characterization, Deadlock Prevention, Avoidance and Detection, Recovery from Deadlock, Combined Approach to Deadlock Handling.

**Storage Management:** Memory Management, Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with Paging. [8]

## UNIT-IV

**Virtual Memory:** Demand Paging and its Performance, Page Replacement Algorithms, Allocation of Frames, Thrashing, Page Size and other Considerations, Demand Segmentation.

**File Management:** File Systems, Secondary Storage Structure, File Concept, Access Methods, Directory Implementation, Efficiency, Performance and Recovery. [8]

## UNIT-V

**Disk Management:** Disk Structure, Disk Scheduling, Disk Management, Recovery, Disk Structure, Swap Space Management, Disk Reliability.

**Case Study:** Windows NT-Design Principles, System Components, Environmental Subsystems, File System, Networking and Program Interface, Linux System Design Principles, Kernel Modules, Process Management, Scheduling Memory Management, File Systems, Input and Output, Interprocess Communication, Network Structure and Security.

**Android OS:** Overview, Features, Platform and Android SDKs. [8]

## REFERENCES:

1. Abraham Siberschatz and Peter Baer Galvin, "Operating System Concepts", TMH, 2018, India, New Delhi.
2. Milan Milankovic, "Operating Systems, Concept and Design", Wiley, 2001, India, New Delhi.
3. Harvey M Deital, "Operating System", Addison Wesley, 2003, USA, Boston.

**CA457COMPUTER ORGANIZATION AND ARCHITECTURE LAB**

**w.e.f. Session 2020-21**

**PREREQUISITE: NONE**

**COREQUISITE: CA452**

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**0 0 3**

1. Study of 8085 and 8086/8088.
2. Study and Bread Board Realization of Logic Gates, K-Map, Flip-Flop equation.
3. Implementation of Half Adder, Full Adder and Subtractor.
4. Implementation of Ripple Counters and Registers.
5. Implementation of Decoder and Encoder circuits.
6. Implementation of Multiplexer and De-Multiplexer circuits.
7. Assembly Language programs for 8086/8088:
  - i. Address and Data Transfer
  - ii. Addition, Subtraction
  - iii. Block transfer
  - iv. Find greatest numbers
  - v. Find r's and (r-1)'s complements of signed and unsigned number.
  - vi. Multiplication of two decimal/binary/hexadecimal/octal numbers.
  - vii. Division of two decimal/binary/hexadecimal/octal numbers.
  - viii. Conversion of Lower case to Upper case character.

# CA458 C PROGRAMMING LAB

w.e.f. Session 2020-21

PREREQUISITE: NONE

COREQUISITE: CA453

L T P  
0 0 3

## 1. Implementing Concept of Operators and Expressions

- i. Program to demonstrate the working of Arithmetic operators.
- ii. Program to demonstrate the working of Increment and Decrement operators.
- iii. Program to demonstrate the working of Assignment, Relational, Logical and Conditional operators.

## 2. Implementing Concept of Various Decision Control statements and loops.

- i. Program to find Largest of three integers.
- ii. Program to check whether the given number is Palindrome or Not
- iii. Program to find whether the given integer is
  - A PrimeNumber.
  - An ArmstrongNumber.
- iv. Program for Pascal triangle.
- v. Program to find Sum of n Terms of Series

$$n - n * 2/2! + n * 3/3! - n * 4/4! + \dots$$

## 3. Implementing Concept of Arrays (Single and Double dimension)

- i. Program to find Sum and Average of n integers using Linear Array.
- ii. Program to perform Addition, Multiplication, Transpose on Matrices.

## 4. Implementing Concept of String operations

- i. Program to perform following operations by using user defined functions
  - Concatenation.
  - Reverse.
  - StringMatching.

## 5. Implementing Concept of Function and Recursive Function

- i. Program to swap two values using
  - Call byvalue.
  - Call byreference.
- ii. Program to calculate the Factorial of a given number.

## 6. Implementing Concept of Pointers.

- i. Program to Sort the list of integers using Dynamic Memory Allocation.

## 7. Implementing Concept of Structures.

- i. Program to display the marksheet of a Student Using Structure.

## 8. Implementing Concept of Enumeration and Unions.

- i. Program to store the information of Student using Union.
- ii. Program to display weekdays using Enumeration.

## 9. Implementing Concept of File Handling

- i. Program to perform following operations on data files
  - Read from datafile.
  - Write to datafile.
- ii. Program to copy the content of One File to Another File using Command Line Argument.

## CA459 UNIX / LINUX LAB

w.e.f. Session 2020-21

**PREREQUISITE: NONE**

**COREQUISITE: CA454**

**L T P  
0 0 2**

### UNIX COMMANDS

1. Miscellaneous Commands
2. File and Directory Related Commands.
3. Communication and Disk Related Commands.
4. Basic Filters

### SHELL PROGRAMMING

1. Shell Script to accept two numbers and perform all arithmetic operations on it.
2. Menu Based Shell Script.
3. Shell Script to calculate the Gross Salary as under following constraints:-  
In a company an employee is paid as under
  - i. If his basic pay less than 1500 then HRA is 10%, DA is 90% of basic pay.
  - ii. If his basic pay equal or above 1500 then HRA is 500 and DA is 98% of basic pay.If the employee salary is input through keyboard, find its gross salary.
4. Shell Script through case statement.
5. Shell Script to illustrate While ,Until and For Loop.
6. Shell Script to find the
  - i. Sum of digit
  - ii. Reverse of a digit
7. Shell Script to perform String operations.
8. Shell Script to find the largest among numbers using positional parameters.
9. Write a Shell Script which will greet you “Good Morning”, ”Good Afternoon”, “Good Evening” and “Good Night” according to current time.
10. Shell Script to delete all files whose size is zero bytes from current directory.

### SYSTEM PROGRAMMING

1. Use the fork() to create the Process.
2. Use the fork() to create the Child Process.
3. Implementation of exec System Call.
4. Implementation of Pipe.
5. Implementation of Semaphore and message queue.
6. Implement of Socket Programming