Syllabus for Bridge Course for MCA Programme

Mode of conduct: Self-Study via MOOCs

To be qualified for the MCA degree, candidates are required to pass the test in the individual theory and laboratory components of the Bridge course (40% marks to be obtained in theory and lab separately) which shall be conducted by Goa Business School. However, the marks obtained, although shown on the final year grade sheet, shall not be added to the CPI/SPI.

The content of the Bridge course(s) shall consist of the fundamentals in the following topics (percentages indicate weightage assigned to the topic for the purpose of evaluation)

Part A   (100 marks)
Programming and Simple Linear Data Structures: (70%)

Introduction to Algorithms, Flow charts, Assembly language and high-level language Programming in C: Tokens, Identifiers, Data Types, Sequence Control, Subprogram Control, Arrays, Structures, Union, String, Pointers, Functions, File Handling, Command Line Arguments, Pre-processor directives.

Data Structures: Abstract data types, Linear Data Structures: stacks, queues, and their applications. Linked Lists: singly linked list.

Basic sorting algorithms: bubble sort, selection sort, insertion sort

Computer Organization and Architecture & Fundamentals of Operating Systems: (30%)

Data Representation: Data Types, Number Systems and Conversion, Complements, Fixed Point Representation, Floating Point Representation,

Binary Arithmetic - Addition and Subtraction.

Computer System: Computer Components and Functions, interconnection structures, Bus Interconnections.

Processor Organization: Instruction Formats, addressing modes, Processor Organization, Register Organization, Instruction Cycle, Instruction Pipelining. Memory System Organization: Memory Hierarchy, Internal Memory, Cache Memory.

Input/output Organisation: Peripheral devices. I/O interface, Asynchronous Data Transfer, I/O Processor.

Introduction to Operating Systems, Structures and Basic functions of monolithic OS, System services.

Part B (100 marks)

Discrete Mathematics: **(50%)**

Set Theory: Concepts of sets – Union, Intersection, Cardinality. Elementary counting; permutations and combinations.

Fundamentals of logic: Propositional and Predicate Logic, Propositional equivalences, Predicates and Quantifiers, Rules of Inference.

Relations and Functions: Cartesian Product, Relations and their types, Properties of Relations

Functions, Types of Functions, Operations on Functions

Counting Techniques: Basics of Counting, Pigeonhole Principle, Recurrence relations.

Boolean Algebra, Boolean Expression, Boolean Functions.

Web Basics (HTML, CSS) **(50%)**

Web browsers

HTML Overview, DOCTYPE, HTML page structure, structural HTML tags, formatting text tags, semantic & generic HTML tags, HTML links, adding image and other page elements, Tables, frames, image mapping, HTML forms, attributes, form elements, type types, HTML entities, symbols, charset, comments, HTML audio, video

CSS overview, inline/internal/external css, @import, CSS selectors, combinators, pseudo-class & pseudo element, attribute selectors, colors, backgrounds, Border, padding, margin, box model, CSS width/height, min-/max- width/height, CSS text and font properties, CSS text and element alignment, CSS table & list, CSS units, CSS display, position, float, overflow, visibility, z-index, CSS 2D transform

Suggested links to MOOCs Courses

Course name	Organized by	Link
Computer Organization	Prof. S. Raman, Department of Computer Science and Engineering, IIT Madras.	http://www.nptelvideos.in/2012/11/computer-organization.html
Programming and data structure	Dr. P.P. Chakraborty, Department of Computer Science and Engineering, IIT Kharagpur.	http://www.nptelvideos.in/2012/11/programming- and-data-structure.html
Operating system	PROF.SANTANU CHATTOPADHYAY Department of Computer Science Engineering IIT Kharagpur	https://nptel.ac.in/courses/106/105/106105214/ First two weeks
Discrete Mathematical Structure	Prof. Kamala Krithivasan, Department of Computer Science and Engineering, IIT Madras	http://www.nptelvideos.in/2012/11/discrete-mathematical-structures.html
Web Basics		https://www.youtube.com/watch?v=mU6anWqZJcc
UNIX fundamentals		https://nptel.ac.in/courses/117/106/117106113/ first 4 Modules

Syllabus for Bridge Course for M.Sc. Data Science & M.Sc. Artificial Intelligence Programmes

To be qualified for the M.Sc. Data Science/M.Sc. Artificial Intelligence Degree, candidates are required to pass the Bridge course test which shall be conducted by Goa Business School. Candidates would be required to obtain a minimum of 40% marks separately in theory as well as in lab in paper 1 and 40% marks in paper 2 to be considered as "passed" in the Bridge course. However, the marks obtained, although shown on the final year grade sheet, shall not be added to the CPI/SPI.

Paper 1: Programming and Data Structures with Python (100 marks)

Introduction to Python Programming: Overview of Python language features, Basics of Python syntax and data types, Control flow statements (if, else, loops), Functions and modules in Python

Object-Oriented Design in Python: Understanding the principles of object-oriented programming (OOP), Defining and using classes and objects, Inheritance and Polymorphism in Python, Encapsulation and abstraction

Algorithmic Analysis and Big-O Notation: Introduction to Algorithm Analysis, Understanding efficiency with Big-O notation, Analyzing the time and space complexity of algorithms, Best, average, and worst-case scenarios.

Sorting Algorithms: Overview of common sorting algorithms (e.g., Bubble Sort, Selection Sort, Insertion Sort), Understanding merge sort and quicksort, Analyzing the time complexity of sorting algorithms

Search Algorithms: Overview of linear and binary search, Introduction to hash tables and hash functions, Understanding time complexity in searching algorithms.

Elementary Data Structures in Python: Introduction to basic data structures (lists, stacks, queues), Implementation and usage of heaps, Understanding binary trees and basic tree traversal algorithms

Reference:
1. Matthes, Eric. Python crash course: A hands-on, project-based introduction to programming. no starch press, 2023.
2. Python tutorial: https://docs.python.org/3/tutorial/index.html
3. SWAYAM course on Programming, Data Structures, and Algorithms Using Python by Prof. Madhavan Mukund. Link: https://onlinecourses.nptel.ac.in/noc22_cs26/preview

Paper 2: RDBMS and SQL (50 marks)

Introduction to RDBMS and SQL: Overview of Relational Database Management Systems, Introduction to Structured Query Language (SQL)
Data Definition Language(DDL) Statements: create table, constraints, Data types, Alter table, Drop table.

Query on Data Dictionary: To view the structure of the table created, To view user information, To view integrity constraints.

Data Manipulation Language(DML) Statements: INSERT, UPDATE, DELETE statements

Queries on Table: SELECT statement for basic querying, Filtering data using WHERE clause, Sorting and limiting results

Joins and Relationships: Understanding relationships between tables, Inner joins, outer joins, self joins, Handling multiple relations between tables

Set Operations and Aggregate Functions: UNION, INTERSECT, and EXCEPT operations, Introduction to aggregate functions (SUM, AVG, COUNT, MAX, MIN)

Reference:
1. Elmasri, Ramez, and Shamkant B. Navathe. Fundamentals of database systems. Addison-Wesley, 2011.
2. Online tutorial: https://www.youtube.com/watch?v=BPHAr4QGGVE