

AC – 29/06/2021

Item No: 6.38

UNIVERSITY OF MUMBAI



Syllabus

For the

Program: F.Y.B.Sc. Sem -I CBCS

Course: Computer Science

**(Choice Based and Credit System with effect from the
academic year 2021-22)**

Preamble

The rise of Information and Communication Technology (ICT) has profoundly affected modern society. Increasing applications of computers in almost all areas of human endeavor has led to vibrant industries with concurrent rapid change in technology.

As the computing field advances at a rapid pace, the students must possess a solid foundation that allows and encourages them to maintain relevant skills as the field evolves. Specific languages and technology platforms change over time. Thus students must continue to learn and adapt their skills throughout their careers. To develop this ability, students will be exposed to multiple programming languages, tools, paradigms and technologies as well as the fundamental underlying principles throughout this programme.

The programme offers required courses such as programming languages, data structures, computer architecture and organization, algorithms, database systems, operating systems, and software engineering; as well as specialized courses in artificial intelligence, computer-based communication networks, distributed computing, information security, graphics, human-computer interaction, multimedia, scientific computing, web technology, and other current topics in computer science.

The core philosophy of this programme is to –

- Form strong foundations of Computer Science
- Nurture programming, analytical & design skills for the real world problems.
- Introduce emerging trends to the students in gradual way.
- Groom the students for the challenges of ICT industry

The students these days not only aspire for a career in the industry but also look for research opportunities. The main aim of this programme is to deliver a modern curriculum that will equip graduates with strong theoretical and practical backgrounds to enable them to excel in the workplace and to be lifelong learners. Not only does it prepare the students for a career in Software industry, it also motivates them towards further studies and research opportunities. Graduating students, can thus take up postgraduate programmes in CS leading to research as well as R&D, can be employable at IT industries, or can adopt a business management career.

In the first year i.e. for semester I & II, basic foundation of important skills required for software development is laid. The syllabus proposes to have four core subjects of Computer science and two core courses of Mathematics-Statistics. All core subjects are proposed to have theory as well as practical tracks. While the Computer Science courses will form fundamental skills for solving computational problems, the Mathematics & Statistics course will inculcate research-oriented acumen. Ability Enhancement Courses on Soft Skill Development will ensure an overall and holistic development of the students. The syllabus design for further semesters encompasses more advanced and specialized courses of Computer Science.

We sincerely believe that any student taking this programme will get very strong foundation and exposure to basics, advanced and emerging trends of the subject. We hope that the students' community and teachers' fraternity will appreciate the treatment given to the courses in the syllabus.

We wholeheartedly thank all experts who shared their valuable feedbacks and suggestions in order to improvise the contents; we have sincerely attempted to incorporate each of them. We further thank Chairperson and members of Board of Studies for their confidence in us.

Special thanks to Department of Computer Science and colleagues from various colleges, who volunteered or have indirectly, helped designing certain specialized courses and the syllabus as a whole.

F.Y.B.Sc. Computer Science Syllabus

Choice Based Credit System (CBCS)

with effect from

Academic year 2021-2022

Semester – II				
Course Code	Course Type	Course Title	Credits	Lectures/Week
USCS201	Core Subject	Design & Analysis of Algorithms	2	3
USCSP201	Core Subject Practical	Design & Analysis of Algorithms – Practical	1	3
USCS202	Core Subject	Advanced Python Programming	2	3
USCSP202	Core Subject Practical	Advanced Python Programming – Practical	1	3
USCS203	Core Subject	Introduction to OOPs using C++	2	3
USCSP203	Core Subject Practical	Introduction to OOPs using C++ – Practical	1	3
USCS204	Core Subject	Database Systems	2	3
USCSP204	Core Subject Practical	Database Systems – Practical	1	3
USCS205	Core Subject	Calculus	2	3
USCSP205	Core Subject Practical	Calculus – Practical	1	3
USCS206	Core Subject	Statistical Methods	2	3
USCSP206	Core Subject Practical	Statistical Methods – Practical	1	3
USCS207	Ability Enhancement Course	E-Commerce & Digital Marketing	2	3

Semester II

Course Code	Course Title	Credits	Lectures /Week
USCS204	Database Systems	2	3
<p>About the Course: The course introduces the core principles and techniques required in the design and implementation of database systems. It includes ER Model, Normalization, Relational Model, and Relational Algebra. It also provides students with theoretical knowledge and practical skills of creating and manipulating data with an interactive query language (MySQL). It also provide student knowledge and importance of data protection.</p>			
<p>Course Objectives:</p> <ul style="list-style-type: none"> <input type="checkbox"/> To make students aware fundamentals of database system. <input type="checkbox"/> To give idea how ERD components helpful in database design and implementation. <input type="checkbox"/> To experience the students working with database using MySQL. <input type="checkbox"/> To familiarize the student with normalization, database protection and different DCL Statements. <input type="checkbox"/> To make students aware about importance of protecting data from unauthorized users. <input type="checkbox"/> To make students aware of granting and revoking rights of data manipulation. 			
<p>Learning Outcomes: After successful completion of this course, students would be able to</p> <ul style="list-style-type: none"> <input type="checkbox"/> To appreciate the importance of database design. <input type="checkbox"/> Analyze database requirements and determine the entities involved in the system and their relationship to one another. <input type="checkbox"/> Write simple queries to MySQL related to String, Maths and Date Functions. <input type="checkbox"/> Create tables and insert/update/delete data, and query data in a relational DBMS using MySQL commands. <input type="checkbox"/> Understand the normalization and its role in the database design process. <input type="checkbox"/> Handle data permissions. <input type="checkbox"/> Create indexes and understands the role of Indexes in optimization search. 			
Unit	Topics	No of Lectures	
I	<p>Introduction to DBMS – Database, DBMS – Definition, Overview of DBMS, Advantages of DBMS, Levels of abstraction, Data independence, DBMS Architecture</p> <p>Data models - Client/Server Architecture, Object Based Logical Model, Record Based Logical Model (relational, hierarchical, network)</p> <p>Entity Relationship Model - Entities, attributes, entity sets, relations, relationship sets, Additional constraints (key constraints, participation constraints, weak entities, aggregation / generalization, Conceptual Design using ER (entities VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyond ER)</p>	15	

	<p>ER to Table- Entity to Table, Relationship to tables with and without key constraints.</p> <p>DDL Statements - Creating Databases, Using Databases, datatypes, Creating Tables (with integrity constraints – primary key, default, check, not null), Altering Tables, Renaming Tables, Dropping Tables, Truncating Tables</p> <p>DML Statements – Viewing the structure of a table insert, update, delete, Select all columns, specific columns, unique records, conditional select, in clause, between clause, limit, aggregate functions (count, min, max, avg, sum), group by clause, having clause</p>	
II	<p>Relational data model– Domains, attributes, Tuples and Relations, Relational Model Notation, Characteristics of Relations, Relational Constraints - primary key, referential integrity, unique constraint, Null constraint, Check constraint</p> <p>Relational Algebra operations (selection, projection, set operations union, intersection, difference, cross product, Joins –conditional, equi join and natural joins, division)</p> <p>Functions – String Functions (concat, instr, left, right, mid, length, lcase/lower, ucase/upper, replace, strcmp, trim, ltrim, rtrim), Math Functions (abs, ceil, floor, mod, pow, sqrt, round, truncate) Date Functions (adddate, datediff, day, month, year, hour, min, sec, now, reverse)</p> <p>Joining Tables – inner join, outer join (left outer, right outer, full outer)</p> <p>Subqueries – subqueries with IN, EXISTS, subqueries restrictions, Nested subqueries, ANY/ALL clause, correlated subqueries</p>	15
III	<p>Schema refinement and Normal forms: Functional dependencies, first, second, third, and BCNF normal forms based on primary keys, lossless join decomposition.</p> <p>Database Protection: Security Issues, Threats to Databases, Security Mechanisms, Role of DBA, Discretionary Access Control, Backing Up and Restoring databases</p> <p>Views (creating, altering dropping, renaming and manipulating views)</p> <p>DCL Statements (creating/dropping users, privileges introduction, granting/revoking privileges, viewing privileges), Transaction control commands – Commit, Rollback</p> <p>Index Structures of Files: Introduction, Primary index, Clustering Index, Multilevel indexes</p>	15

Textbooks:

1. “Fundamentals of Database System”, ElmasriRamez, NavatheShamkant, Pearson Education, Seventh edition, 2017
2. “Database Management Systems”, Raghu Ramakrishnan and Johannes Gehrke, 3rd Edition, 2014
3. “Murach's MySQL”, Joel Murach, 3rd Edition, 3rd Edition, 2019

Additional References:

1. “Database System Concepts”, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw Hill, 2017
2. “MySQL: The Complete Reference”, Vikram Vaswani, McGraw Hill, 2017
3. “Learn SQL with MySQL: Retrieve and Manipulate Data Using SQL Commands with Ease”, Ashwin Pajankar, BPB Publications, 2020

Course Code	Course Title	Credits	Lectures /Week
USCSP204	Database Systems – Practical	1	3
1.	Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.)		
2.	Perform the following: <ul style="list-style-type: none"> <input type="checkbox"/> Viewing all databases <input type="checkbox"/> Creating a Database <input type="checkbox"/> Viewing all Tables in a Database <input type="checkbox"/> Creating Tables (With and Without Constraints) <input type="checkbox"/> Inserting/Updating/Deleting Records in a Table 		
3.	Perform the following: <ul style="list-style-type: none"> <input type="checkbox"/> Altering a Table <input type="checkbox"/> Dropping/Truncating/Renaming Tables <input type="checkbox"/> Backing up / Restoring a Database 		
4.	Perform the following: <ul style="list-style-type: none"> <input type="checkbox"/> Simple Queries <input type="checkbox"/> Simple Queries with Aggregate functions 		
5.	Queries involving <ul style="list-style-type: none"> <input type="checkbox"/> Date Functions <input type="checkbox"/> String Functions <input type="checkbox"/> Math Functions 		
6.	Join Queries <ul style="list-style-type: none"> <input type="checkbox"/> Inner Join <input type="checkbox"/> Outer Join 		

7.	<p>Subqueries</p> <ul style="list-style-type: none"> <input type="checkbox"/> With IN clause <input type="checkbox"/> With EXISTS clause
8.	<p>Converting ER Model to Relational Model and apply Normalization on database. (Represent entities and relationships in Tabular form, Represent attributes as columns, identifying keys and normalization up to 3rd Normal Form).</p>
9.	<p>Views</p> <ul style="list-style-type: none"> <input type="checkbox"/> Creating Views (with and without check option) <input type="checkbox"/> Dropping views <input type="checkbox"/> Selecting from a view
10.	<p>DCL statements</p> <ul style="list-style-type: none"> <input type="checkbox"/> Granting and revoking permissions <input type="checkbox"/> Saving (Commit) and Undoing (rollback)
11.	<p>Creating Indexes on data tables.</p>

Evaluation Scheme

I. Internal Evaluation for Theory Courses – 25 Marks

(i) Mid-Term Class Test– 15Marks

- It should be conducted using any **learning management system** such as **Moodle** (Modular object-oriented dynamic learning environment)
- The test should have **15 MCQ's** which should be solved in a time duration of **30 minutes**.

(ii) Assignment/ Case study/ Presentations– 10 Marks

- Assignment / Case Study Report / Presentation can be uploaded on any **learning management system**.

II. External Examination for Theory Courses – 75 Marks

- Duration: **2.5 Hours**
- Theory question paper pattern:

All questions are compulsory.			
Question	Based on	Options	Marks
Q.1	Unit I	<i>Any 4 out of 6</i>	20
Q.2	Unit II	<i>Any 4 out of 6</i>	20
Q.3	Unit III	<i>Any 4 out of 6</i>	20
Q.4	Unit I,II and III	<i>Any 5 out of 6</i>	15

- All questions shall be compulsory with internal choice within the questions.
- Each Question maybe sub-divided into subquestions as a, b, c, d, etc. & the allocation of Marks depends on the weightage of the topic.

III. Practical Examination

- Each core subject carries 50 Marks
40 marks + 05 marks (journal) + 05 marks (viva)
- Duration: **2 Hours** for each practical course.
- Minimum **80% practical** from each core subjects are required to be completed.
- Certified Journal is compulsory for appearing at the time of Practical Exam**
- The final submission and evaluation of **journal in electronic form** using a Learning Management System / Platform can be promoted by college.
