Name of the Course: Computer Science Practical 1

Sr. No.	Heading	Particulars
1	**Description the course:**	**Introduction:** The Major Computer Science Practical Course, encompassing Digital Systems and Architecture as well as Database Systems, is a comprehensive and hands-on exploration into the foundational aspects of both hardware and software that underpin modern computing. This practical course is designed to provide students with a holistic understanding of digital systems, computer architecture, and the effective management of data within databases. **Relevance:** In an era where seamless integration of hardware and software is pivotal, the combination of Digital Systems and Architecture with Database Systems is highly relevant. This practical course addresses the symbiotic relationship between the two, offering students a holistic perspective on building robust computing solutions. **Usefulness:** This course is immensely useful for students aiming to bridge the gap between hardware and software. By integrating digital systems with database concepts, students gain a unique skill set that enables them to design, implement, and optimize computing systems comprehensively. **Application:** The skills acquired in this practical course find direct application in the development of efficient and integrated computing solutions. Students learn to design digital systems, optimize hardware performance, and seamlessly integrate these systems with databases to handle and manipulate data effectively. **Interest:** The Major Computer Science Practical Course is designed to spark interest by offering a hands-on approach to both hardware and software components. Students engage in practical exercises that involve designing digital circuits, implementing database solutions, and integrating these components, fostering a deeper understanding and appreciation for the intricacies of computing systems.

		Connection with Other Courses: This practical course serves as a nexus, connecting various other courses in the computer science curriculum. It lays a foundation for advanced courses in computer organization, embedded systems, software engineering, and database management. The integrated approach ensures students comprehend the synergies between different aspects of computer science. **Demand in the Industry:** Professionals who can seamlessly navigate both digital systems and database management are in high demand. Industries ranging from electronics and telecommunications to software development and data analytics actively seek individuals proficient in both hardware and software aspects, recognizing the practical value of this dual expertise. **Job Prospects:** Graduates from this practical course enjoy promising job prospects in roles that require a holistic understanding of computing systems. Potential job titles include systems architect, database administrator, embedded systems developer, and hardware-software integration specialist. These professionals are well-positioned to contribute to diverse industries seeking comprehensive computing solutions.
2	**Vertical:**	Major
3	**Type:**	Practical
4	**Credits:**	2 credits (1 credit = 30 Hours of Practical work in a semester)
5	**Hours Allotted:**	60 hours
6	**Marks Allotted:**	50 Marks
7	**Course Objectives(CO):** **CO 1.** To verify the truth tables of various logic gates **CO 2.** Develop proficiency in designing and implementing digital circuits. **CO 3.** Explore various components of digital systems, including processors, memory units, and input/output interfaces. **CO 4.** Develop skills in designing and creating relational databases. **CO 5.** Explore the principles of database querying using SQL. **CO 6.** Gain practical knowledge of transaction management and data control in database systems.	

8	**Course Outcomes (OC):** After successful completion of this course, students would be able to - **OC 1.** Verify truth tables of various logic gates **OC 2.** Simplify given Boolean expressions and implement them using Logisim. **OC 3.** Design and validate the operation of various combinational circuits using Logisim. **OC 4.** Understand the behavior and applications of flip-flops in digital systems. **OC 5.** Design and implement expressions using multiplexers/demultiplexers in Logisim. **OC 6.** Create and maintain relational databases, applying normalization principles. **OC 7.** Write simple queries to MySQL related to String, Maths and Date Functions. **OC 8.** Create tables and insert/update/delete data, and query data in a relational DBMS using MySQL commands. **OC 9.** Handle data permissions.
9	**Modules:-** **Module 1 (30 hours):**
	Digital Systems & Architecture – Practical **Logic Gates Truth Table Verification:** Study and verify the truth table of various logic gates (NOT, AND, OR, NAND, NOR, EX-OR, EX-NOR) using Logisim. **Boolean Expression Simplification:** Simplify given Boolean expressions and realize them using Logisim. **Half/Full Adder Design:** Design and verify the operation of a half/full adder using Logisim. **Half/Full Subtractor Design:** Design and verify the operation of a half/full subtractor using Logisim. **4-Bit Magnitude Comparator:** Design a 4-bit magnitude comparator using combinational circuits in Logisim. **Flip-Flop Implementation:** Verify the operation of flip-flops (e.g., D, JK) using logic gates in Logisim. **Counter Operation Verification:** Verify the operation of a counter using Logisim. **4-Bit Shift Register Operation:** Verify the operation of a 4-bit shift register using Logisim. **Multiplexer/Demultiplexer Design:** Design and implement expressions using multiplexers/demultiplexers in Logisim.

	3-Bit Binary Ripple Counter: Design and implement a 3-bit binary ripple counter using JK flip-flops in Logisim. The above practical can be performed using any open source simulator (like Logisim) (Download it from https://sourceforge.net/projects/circuit/)
	Module 2 (30 hours):
	Fundamentals of Database Systems – Practical **Conceptual Design Using ER Diagrams:** Identify entities, attributes, keys, and relationships. Apply generalization and specialization. **Database Management Operations:** View all databases, create a database, view all tables in a database, create tables with and without constraints, perform CRUD operations. **Table Management Operations:** Alter a table, drop/truncate/rename tables, perform backup/restore operations on a database. **Basic Queries and Aggregate Functions:** Execute simple queries and utilize aggregate functions (e.g., COUNT, SUM, AVG). **Advanced Query Functions:** Utilize date, string, and math functions in queries. **Join Queries:** Execute inner and outer join queries. **Subqueries:** Apply subqueries with IN and EXISTS clauses. **ER Model to Relational Model Conversion and Normalization:** Convert ER model to a relational model and apply normalization up to 3rd Normal Form. **Views:** Create views with and without check options, drop views, select data from views. **Data Control Language (DCL) Statements:** Implement DCL statements for granting and revoking permissions. Demonstrate COMMIT and ROLLBACK statements. These experiments can be implemented using a database management system like MySQL.

<table>
<tr><td>10</td><td colspan="2">Text Books
1. R P Jain, Modern Digital Electronics, Tata McGraw Hill Education Pvt. Ltd. , 4th Edition, 2010
2. Murach's MySQL, Joel Murach, 3rd Edition, 3rd Edition, 2019</td></tr>
<tr><td>11</td><td colspan="2">Reference Books
1. MySQL: The Complete Reference, VikramVaswani , McGraw Hill, 2017
2. Learn SQL with MySQL: Retrieve and Manipulate Data Using SQL Commands with Ease, Ashwin Pajankar, BPB Publications, 2020</td></tr>
<tr><td>12</td><td>Internal Continuous Assessment: 40%</td><td>Semester End Examination: 60%</td></tr>
<tr><td>13</td><td>The internal evaluation will be determined by the completion of practical tasks and the submission of corresponding write-ups for each session. Each practical exercise holds a maximum value of 5 marks. The total evaluation, out of 100 marks, should be scaled down to a final score of 20 marks.
Total: 20 marks</td><td>A Semester End Practical Examination of 2 hours duration for 30 marks as per the paper pattern given below.

Certified Journal is compulsory for appearing at the time of Practical Exam
Total: 30 Marks</td></tr>
<tr><td>14</td><td colspan="2">Format of Question Paper:

Total Marks: 30 Duration: 2 Hours
<table>
<tr><th>Question</th><th>Practical Question Based On</th><th>Marks</th></tr>
<tr><td>Q. 1</td><td>Module 1</td><td>12</td></tr>
<tr><td>Q. 2</td><td>Module 2</td><td>12</td></tr>
<tr><td>Q. 3</td><td>Viva</td><td>06</td></tr>
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