COURSE PLAN

Rev. No 9 Dated: September 2024

School of Computer Science

Cluster	Data Science
Program	BCA
Course	Advanced Databases
Course Code	CSEG2070
No. of credits	4
Semester	III
Session	July 2025 – December 2025
Academic Year	2025 - 2026

COURSE PLAN

Prerequisite	Databases	
Credit	4	
Lecture	Tutorial	Practical
3	0	1

A. The expected Program Outcome are:

PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and cultural, societal, and environmental considerations.
PO4	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO5	**Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.
PO6	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.
	Individual and team work: Function effectively as an individual, and as a member or leader in diverse

PO7	teams, and in multidisciplinary settings.
PO8	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO9	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO10	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

B. Expected Program specific Outcome are:

PSO1	Perform system and application programming using computer system concepts, concepts of Data Structures, algorithm development, problem solving and optimizing techniques.		
PSO2	Apply software development and project management methodologies using concepts of front-end and back-end development and emerging technologies and platforms.		
PSO3	Exhibit a commitment to ethical practices, societal responsibilities, and continuous learning, contributing to the advancement of technology and addressing challenges in diverse computing domains.		

C. The expected Course Outcomes are:

CO 1	Understand the foundational concepts of data models, schema design, and relational databases to effectively manage and query data.
CO 2	Learn to design efficient and normalized databases, apply entity-relationship modeling, and optimizing schema structures.
CO 3	Acquire skills in database security, user access control, backup and recovery, and performance tuning to ensure robust database management.
CO 4	Develop database application design and its implementation including integrity constraints, transaction management and concurrent control algorithms.

D. CO-PO Relationship Matrix

Indicate the relationships by1- Slight (low) 2- Moderate (Medium) 3-Substantial (high)

Program Outcomes / Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2	PSO3
CO 1		3	2	2	3						2	3	
CO 2		3	2	2	2						2	3	
CO 3		3	2	3	1						2	3	
CO 4		3	2	2	2						2	3	
Average		3	2	2.25	2						2	3	

E. Course Outcomes assessment plan:

Components / Course Outcomes	Assignment	Test/Quiz	Mid Semester	End Semester	Viva/ Lab Test
CO 1	✓		✓	✓	✓
CO 2		✓	✓	✓	✓
CO3	✓			✓	✓
CO4		✓		✓	✓

F. Course Syllabus Template

Unit Number	Content
Unit I	**Disk Storage, File Structures, and Indexing**

	Introduction, Secondary Storage Devices, Buffering of Blocks and Placing File Records on Disk, Operations on Files, Heap Files, Sorted Files, Hashing Techniques, Parallelizing Disk Access using RAID Technology, Secondary Access Paths, Types of Single-Level Ordered Indexes, Multilevel Indexes, Dynamic Multilevel Indexes Using B-Trees and B+ Trees, Indexes on Multiple Keys.
Unit II	**Transaction Management** Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules based on Recoverability, Characterizing Schedules based on Serializability.
Unit III	**Concurrency Control and Recovery** Introduction to Concurrency Control, Two Phase Locking Techniques, Concurrency Control on Timestamp Ordering, Validation Concurrency Control Techniques, Granularity of Data items and Multiple Granularity Locking, Recovery Concepts, Recovery Techniques Based on Deferred and Immediate Update, Shadow Paging.
Unit IV	**NoSQL Database Management** Introduction, Need of NoSQL, different NoSQL data models, Introduction to MongoDB, Datatypes, Document Data Model-Creating, Inserting, Updating and Deleting Documents, MongoDB Query Language, Indexing, Aggregation, Sharding in MongoDB, Join Operations, Pagination.
Unit V	**OODB and Distributed Database** Overview of Object-Oriented Concepts, Object Model of ODMG, Object Definition Language, Object Query Language, Object Database Conceptual Design, Distributed Database Concepts, Data Fragmentation, Replication and Allocation Techniques for Distributed Design, Types of Distributed Database Systems, Query Processing in Distributed Databases, Overview of Concurrency Control and recovery techniques in Distributed Databases.

List of Experiments

Experiment 1: To understand the concepts of PL/SQL programming.

Objective: Students will be able to implement the basic concepts of Pl/SQL.

1. Write a PL/SQL code to accept the value of A, B & C display which is greater.
2. Using PL/SQL Statements create a simple loop that display message “Welcome to PL/SQL Programming” 20 times.
3. Write a PL/SQL code block to find the factorial of a number.
4. Write a PL/SQL program to generate Fibonacci series.
5. Write a PL/SQL code to fund the sum of first N numbers

Experiment 2: To understand concepts of function and procedure in PL/SQL.

Objective: Students will be able to implement the Pl/SQL programs using function and procedure.

1. Implement the above experiments of PL/SQL using functions and procedures.

Experiment 3: To understand the concepts of implicit and explicit cursor.

Objective: Students will be able to implement the concept of implicit and explicit cursor.

1. Using implicit cursor update the salary by an increase of 10% for all the records in EMPLOYEES table, and finally display how many records have been updated. If no records exist display the message “**No Change**”.
2. Using explicit cursor fetch the employee name, employee_id and salary of all the records from EMPLOYEES table.
3. Using explicit cursor Insert the records from EMPLOYEES table for the columns employee_id, Last_Name and salary for those records whose salary exceeds 2500 into a new table TEMP_EMP

Experiment 4: To understand the concepts of Trigger.

Objective: Students will be able to implement the concept of trigger.

CUSTOMER Table:

ID	NAME	AGE	ADDRESS	SALARY

1	Ramesh	32	Ahmedabad	2000.00
2	Khilan	25	Delhi	1500.00
3	Kaushik	23	Kota	2000.00
4	Chaitali	25	Mumbai	6500.00
5	Hardik	27	Bhopal	8500.00
6	Komal	22	MP	4500.00

1. Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old values and new values.

Experiment 5: To understand the concepts of Trigger.

Objective: Students will be able to implement the concept of trigger.

1. CREATE TRIGGER SALARY_VIOLATION BEFORE INSERT OR UPDATE OF SALARY, SUPERVISOR_SSN ON EMPLOYEE of experiment 3

Experiment 6: To understand the concepts of NoSQL Database

Objective: Students will be able to implement the concept of NoSQL Database MongoDB.

1. Write a MongoDB query to display all the documents in the collection hotel.
2. Write a MongoDB query to display the fields hotel_id, name, Borough and cuisine for all the documents in the collection hotel.
3. Write a MongoDB query to display the fields hotel_id, name, Borough and cuisine, but exclude the field _id for all the documents in the collection hotel.
4. Write a MongoDB query to display the fields hotel_id, name, Borough and zip code, but exclude the field _id for all the documents in the collection hotel. hotel
5. Write a MongoDB query to display all the hotel which is in the Borough Bronx.

Experiment 7: To understand the concepts of NoSQL Database

Objective: Students will be able to implement the concept of NoSQL Database MongoDB.

1. Write a MongoDB query to display the next 5 hotels after skipping first 5 which are in the Borough Bronx.
2. Write a MongoDB query to find hotels who achieved a score more than 90.
3. Write a MongoDB query to find the hotels that achieved a score, more than 80 but less than 100.
4. Write a MongoDB query to find the hotels which locate in latitude value less than -95.75
5. Write a MongoDB query to find the hotels that do not prepare any cuisine of 'American' and their grade score more than 70 and latitude less than -65.754168.

Experiment 8: To understand the concepts of NoSQL Database

Objective: Students will be able to implement the concept of NoSQL Database MongoDB.

1. Write a MongoDB query to arrange the name of the cuisine in ascending order and for that same cuisine Borough should be in descending order.
2. Write a MongoDB query to know whether all the addresses contains the street or not.
3. Write a MongoDB query which will select all documents in the hotels collection where the coord field value is Double.
4. Write a MongoDB query which will select the hotel Id, name and grades for those hotels which returns 0 as a remainder after dividing the score by 7.
5. Write a MongoDB query to find the hotel name, Borough, longitude and attitude and cuisine for those hotels which contains 'mon' as three letters somewhere in its name.
6. Write a MongoDB query to find the hotel name, Borough, longitude and latitude and cuisine for those hotels which contain 'Mad' as first three letters of its name.

Experiment 9: To understand the concepts of NoSQL Database

Objective: Students will be able to implement the concept of NoSQL Database MongoDB.

1. Write a MongoDB query to find the hotels which do not prepare any cuisine of 'American' and achieved a score more than 70 and located in the longitude less than -65.754168.
2. Write a MongoDB query to find the hotels which do not prepare any cuisine of 'American ' and achieved a grade point 'A' not belongs to the Borough Brooklyn. The document must be displayed according to the cuisine in descending order.
3. Write a MongoDB query to find the hotel Id, name, Borough and cuisine for those hotels which contain 'ces' as last three letters for its name.
4. Write a MongoDB query to find the hotel Id, name, Borough and cuisine for those hotels which contain 'Reg' as three letters somewhere in its name.
5. Write a MongoDB query to find the hotels which belong to the Borough Bronx and prepared either American or Chinese dish.
6. Write a MongoDB query to find the hotel Id, name, Borough and cuisine for those hotels which belong to the Borough Staten Island or Queens or Hyatt.
7. Write a MongoDB query to find the hotel Id, name, Borough and cuisine for those hotels which are not belonging to the Borough New Delhi or Queens or Hyatt.
8. Write a MongoDB query to find the hotel Id, name, Borough and cuisine for those hotels which achieved a score which is not more than 10.
9. Write a MongoDB query to find the hotel Id, name, Borough and cuisine for those hotels which prepared dish except 'American' and 'Chinees' or hotel's name begins with letter 'Wil'.
10. Write a MongoDB query to find the hotel Id, name, and grades for those hotels which achieved a grade of "A" and scored 11 on an ISODate "2014-08-11T00:00:00Z" among many of survey dates.

Experiment 10: Mini Project – On SQL

Experiment 11: Mini Project- On NoSQL

COURSE PLAN DELIVERY

UNIT-I

	Session Plan	Actual Delivery			
Lecture	Topics to be Covered	Lecture	Date	Topics Covered	CO covered
1	Introduction to Disk Storage and File Structures				CO1
2	Secondary Storage Devices				CO1
3	Buffering of Blocks and Placing File Records on Disk				CO1
4	Operations on Files (Heap, Sorted, Hashed) Hashing Techniques				CO1
5	Parallelizing Disk Access using RAID Technology				CO1
6	Secondary Access Paths and Single-Level Ordered Indexes				CO1
7	Multilevel Indexes, Dynamic Indexes using B-Trees and B+ Trees				CO1
8	Indexes on Multiple Keys				CO1
9	Assignment-1				CO1

COURSE PLAN DELIVERY

UNIT-II

	Session Plan	Actual Delivery			
Lecture	Topics to be Covered	Lecture	Date	Topics Covered	CO covered
10	Introduction to Transaction Processing Transaction and System Concepts				CO2
11	Desirable Properties of Transactions (ACID)				CO2
12	Characterizing Schedules based on Recoverability				CO2
13					CO2

	Characterizing Schedules based on Serializability				
14	Conflict and View Serializability				CO2
15	Schedule Examples and Analysis				CO2
16	Problems in Transaction Management				CO2
17	Case Studies on Transactions				CO2
18	Quiz-1/Test-1				CO2

COURSE PLAN DELIVERY

UNIT-III

	Session Plan	Actual Delivery

Lecture	Topics to be Covered	Lecture	Date	Topics Covered	CO covered
19	Introduction to Concurrency Control				CO3
20	Two Phase Locking Techniques				CO3
21	Concurrency Control using Timestamp Ordering				CO3
22	Validation Concurrency Control Techniques				CO3
23	Granularity of Data Items and Multiple Granularity Locking				CO3
24	Introduction to Recovery Concepts				CO3
25	Recovery Techniques: Deferred and Immediate Update Shadow Paging				CO3
26	Case Studies on Concurrency and Recovery				CO3
27	Assignment-2				CO3

COURSE PLAN DELIVERY

UNIT-IV

	Session Plan	Actual Delivery			
Lecture	Topics to be Covered	Lecture	Date	Topics Covered	CO covered
28	Introduction and Need for NoSQL				CO4
29	Different NoSQL Data Models				CO4
30	Introduction to MongoDB				CO4
31	Datatypes and Document Data Model				CO4
32	Creating, Inserting, Updating, Deleting Documents				CO4

33	MongoDB Query Language				CO4
34	Indexing and Aggregation in MongoDB				CO4
35	Sharding, Join Operations, Pagination				CO4
36	Quiz-2/Test-2				CO4

COURSE PLAN DELIVERY

UNIT-V

	Session Plan	Actual Delivery			
Lecture	Topics to be Covered	Lecture	Date	Topics Covered	CO covered

37	Overview of Object-Oriented Concepts				CO1
38	Object Model of ODMG				CO1
39	Object Definition Language				CO1
40	Object Query Language Object Database Conceptual Design				CO1
41	Distributed Database Concepts				CO1
42	Data Fragmentation, Replication, Allocation Techniques				CO1
43	Types of Distributed Database Systems Query Processing, Concurrency Control & Recovery in Distributed DBs				CO1
44	Revision				CO1,CO2,CO3,CO4
45	Test				CO1,CO2, CO3, CO4

PERIODIC MONITORING

Actual date of completion and remarks, if any

Components		From	To	From	To	From	To
Duration (Mention from and to dates)							
Percentage of Syllabus covered							
Lectures	Planned						
	Taken						
Tutorials	Planned						
	Taken						
Test/quizzes	Planned						
	Taken						
	CO's Addressed						
	CO's Achieved						
Assignments	Planned						
	Taken						
	COs Addressed						
	COs						

Observations(If any)_____

_____

_____

Signature of Faculty **Signature of Head**

Date **Date**

PLANNING FOR REMEDIAL CLASSES

Sl. No.	Name of Student	Roll No.	Sap ID	Mid Sem Marks	Remedial Classes Held							Class test based on Remedial Classes	End Sem Marks	Improvement (Y/N)
					Date									
					Venue									
					Time									

Signature of Faculty

Signature of Head

G. Target

Target	
Level-1	30
Level-2	50
Level-3	60

H. Method of Evaluation*

UG	**PG**
Quizzes/Tests, Assignments (50%)	Quizzes/Tests, Assignments, seminar (50%)
Mid Examination (20%)	End semester (50%)
End examination (30%)	

*It can be revised as per the assessment scheme of the respective School/Course

I. Passing Criteria

Scale	**PG**	**UG**
Out of 10point scale	SGPA – "6.00" in each semester CGPA – "6.00" Min. Individual Course Grade – "C" Course Grade Point – "4.0"	SGPA – "5.0" in each semester CGPA – "5.0" Min. Individual Course Grade – "C" Course Grade Point – "4.0"

*for PG, passing marks are 40/100 in a paper (Composite)

*for UG, passing marks are 35/100 in a paper (Composite)

J. References:

Text Books	1. R. Elmasri and S. B. Navathe, Fundamentals of Database Systems, Pearson India, 7th Edition, 2017.
	2. R. Ramakrishnan, Database Management Systems, Mcgraw-Hill,4th edition, 2015.
	3. S. Bradshaw, E. Brazil, K. Chodorow, MongoDB: The Definitive Guide, O'Reilly Media 3rd Edition, 2019.
Reference books	1. A. Silberschatz, H. F. Korth S. Sudershan, Database System Concepts, McGraw Hill, 6th Edition 2010. 2. H. Garcia-Molina, J. D. Ullman, J. Widom, Database Systems-The Complete, Pearson India Pearson Education, 2nd Edition, 2013. 3. Pramod J. Sadalage and M. Fowler, NoSQL Distilled: A brief guide to merging world of Polyglot persistence, Addison Wesley, 2012.

SUGGESTIONS FOR FACULTY

- Faculty should keep track of the students with low attendance and counsel them regularly.
- The course coordinator will arrange to communicate the short attendance (as per UPES policy) cases to the students and their parents monthly.
- Topics covered in each class should be recorded in the table of RECORD OF CLASS TEACHING (Suggested Format).
- Internal assessment marks should be communicated to the students twice in a semester.
- The file will be audited by respective IQAC members for theory as well as for lab as per schedule.

- The faculty is required to maintain these files for a period of at least three years.
- This register should be handed over to the head of department, whenever the faculty member goes on long leave or leaves the Colleges/University.
- For labs, continuous evaluation format (break-up given in the guidelines for result preparation in the same file) should be followed.
- The department should monitor the actual execution of the components of continuous lab evaluation regularly.
- Instructor should maintain record of experiments conducted by the students in the lab weekly.
- Instructor should promote students for self-study and to make concept diary, due weightage in the internal should be given under faculty assessment for the same.
- Course outcome assessment: To assess the fulfilment of course outcomes two different approaches have been decided. Degree of fulfillment of course outcomes will be assessed in different ways through direct assessment and indirect assessment. In Direct Assessment, it is measured through quizzes, tests, assignment, Mid-term and/or End-term examinations. It is suggested that each examination is designed in such a way that it can address one or two outcomes (depending upon the course completion). Indirect assessment is done through the student survey which needs to be designed by the faculty (sample format is given below) and it shall be conducted towards the end of course completion. The evaluation of the achievement of the Course Outcomes shall be done by analyzing the inputs received through Direct and Indirect Assessments and then corrective actions suggested for further improvement.
- At the completion of the course, course attainment and other documents should be shared with the program coordinator for computation of Program attainment.
- At the completion of the course Faculty members are suggested to share the innovative teaching techniques along with the course plan (format provided by IQAC).
- Faculties are encouraged to share the master/expert classes evidence (as per the event report format)
- Faculties are also encouraged to include MOOCs,,SWAYAM any other online content and share the evidence of MOOCs courses /online courses referred (as per the event report format).
- Faculties are encouraged to share the evidence related to interventions or initiatives focusing the unique/slow and Fast Leaners along with Course Completion files.

INDIRECT ASSESSMENT

Sample format for Indirect Assessment of Course outcomes:

NAME:
ENROLLMENT NO:

SAP ID:
COURSE:
PROGRAM:

Please rate the following aspects of course outcomes of ----------.

Use the scale 1-3*

Course Outcomes	Statement	1	2	3
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				
CO7				

1.

* 1 WEAK 2 MODERATE 3 STRONG