Course Title	Programming and Problem Solving in C		
Course Code	25MCA101	L-P-SDA/T-C	3-2-0-4
Exam	03 Hours	Hours/ Week	03 + 02 Hours
CIE	50 Marks	SEE	50
		Total Hours	50

Course Learning objectives: To provide fundamental programming concepts essential to develop program for a given problem.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

Sl. No.	Description	PO
CO1	Describe the concepts of C programming language	1
CO2	Analyze the given program to determine the output and its correctness	2, 3
CO3	Develop and document programs to find a solution for the given problem	3, 4

Course Contents:

Module-1	8 Hrs
BASICS OF C PROGRAMMING: Introduction to programming paradigms, Applications of C Language, Structure of C program, C programming: Data Types, Constants, Enumeration Constants, Keywords. Operators: Precedence and Associativity, Expressions. Input/Output statements, Assignment statements. Decision making statements, Switch statement, Looping statements, Preprocessor directives. Compilation process	
Module-2	**8 Hrs**
ARRAYS AND STRINGS Introduction to Arrays: Declaration, Initialization, One dimensional array, Two dimensional arrays. String operations: length, compare, concatenate, copy. Selection sort, linear and binary search.	
Module-3	**8 Hrs**
FUNCTIONS AND POINTERS Modular programming, Function prototype, function definition, function call, Built-in functions (string functions, math functions). Recursion, Binary Search using recursive functions. Pointers: Pointer operators, Pointer arithmetic. Arrays and pointers: Array of pointers, Parameter passing: Pass by value, Pass by reference.	
Module-4	**8 Hrs**
STRUCTURES AND UNION Structure, Nested structures. Pointer and Structures: Array of structures. Self-referential structures. Dynamic memory allocation. Singly linked list, Typedef, Union, Storage classes and Visibility.	
Module-5	**8 Hrs**
FILE PROCESSING Files, Types of file processing: Sequential access, Random access, Sequential access file, Random access file, Command line arguments.	

Sl. NO	Lab Experiments
1	Simulation of a Simple Calculator.
2	Implement Binary Search on Integers
3	Sort the given set of N numbers using Bubble sort.
4	Implement Matrix multiplication and validate the rules of multiplication.
5	An electricity board charges the following rates for the use of electricity: for the first 200 units 80 paise per unit for the next 100 units 90 paise per unit: beyond 300 units Rs 1 per unit. All users are charged a minimum of R 100 as meter charge. If the total amount is more than Rs 400, then an additional surcharge of 15% of total amount is charged. Write a program to read the name of the user, number of units consumed and print out the charges.
6	Write functions to implement string operations such as compare, concatenate, and find string length. Use the parameter passing techniques.
7	Implement structures to read, write and compute average- marks of the students, list the students scoring above and below the average marks for a class of N students.
8	Write a C program to copy a text file to another, read both the input file name and target file name.

TEXT BOOKS:

1. Reema Thareja, "Programming in C". Oxford University Press, Second Edition,2016
2. Kernighan B.W.and Ritchie D M, "The C programming language", Second Edition, Pearson Education,2015

REFERENCES:

1. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
2. Byron S. Gottfried, " Schaum's Outline of Theory and Problem of Programming with C", Eighth edition, Pearson Education,2018

Skill Development Activity

- Implement the above listed programs using python by acquiring knowledge from MOOC courses by referring to following url: https://www.youtube.com/watch?v=5zx9DI2iDsA

Mapping of COs and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3							
CO2		3	2					
CO3			3	3				

Course Title	Discrete Mathematics and Graph Theory		
Course Code	25MCA102	L-P-SDA/T-C	2-0-1-3
Exam	03 Hours	Hours/ Week	2 + 2 Hours
CIE	50 Marks	SEE	50 Marks
		Total Hours	40

Course Learning objectives: Apply the concepts of mathematical logic such as propositions, proving theorems, sets and graphs to solve real word problems.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

Sl. No.	Description	PO
CO1	Apply logic, mathematical proof and counting principles to given problem.	2, 3
CO2	Use concepts of functions in analyzing problems on algorithms.	2
CO3	Analyze programming problems related to Graph theory.	2

Course Contents:

Module-1	8 Hrs
Basic Structures: Sets, Principle of Inclusion, Exclusion and Pigeonhole principle Functions and Matrices: Eigenvalues and Eigenvectors.	
Module-2	**8 Hrs**
Mathematical Logic, Propositional Logic, Applications of Propositional Logic, p ropositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference Introduction to Proofs	
Module-3	**8 Hrs**
Introduction to Graphs: Application of graphs – finite, infinite and bipartite graphs – Incidence and Degree – Isolated vertex, pendant vertex and Null graph. Paths and circuits – Isomorphism, sub-graphs, walks, paths and circuits, connected graphs, disconnected graphs and components.	
Module-4	**8 Hrs**
Eulerian and Hamiltonian graphs: Euler graphs, Operations on graphs, Hamiltonian paths and circuits, Travelling salesman problem. Directed graphs – types of digraphs, Digraphs and binary relation.	
Module-5	**8 Hrs**
Graph Colouring: Colouring- Chromatic number, Chromatic polynomial, Matchings, Coverings, Four colour problem and Five colour problem. Greedy colouring algorithm.	

Text Books :

1. Kenneth H Roosen, "Discrete Mathematics and its Applications", McGraw Hill publications 7th edition.
2. Narsingh Deo, Graph theory with the applications to engineering & Computer

Science, Dovers Publications, 2016
3. J.A. Bondy and U.S.R. Murty. Graph theory with Applications, Springer, 1 st edition, 2008.

References Books

1. J. K Sharma "Discrete Mathematics", Mac Millian Publishers India ,3rd edition,2011
2. Garry Chartand and Ping Zhang, Introduction to Graph Theory, Tata McGraw-Hill, 2006.
3. Frank Harary, Graph Theory, Narosa Publishing House, Latest edition.

Web links and Video Lectures (e-Resources):

1. https://archive.nptel.ac.in/courses/111/106/111106086/
2. https://onlinecourses.nptel.ac.in/noc20_cs82/preview

Skill Development Activity

- Translating English Sentences into logical statements
- Applying Graph theory concepts to design State and National highways across the Country

Mapping of COs and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1		3	2					
CO2		3						
CO3		3						

Course Title	Database Management Systems (DBMS)		
Course Code	25MCA103	L-P-SDA/T-C	3-0-0-3
Exam	03 Hours	Hours/ Week	3 Hours
CIE	50 Marks	SEE	50 Marks
		Total Hours	40

Course Learning objectives: To provide fundamental concepts to design a database systems and SQL queries to develop database applications.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

Sl. No.	Description	PO
CO1	Describe the basic concept of database management system	1
CO2	Describe the fundamentals of Entity Relationship model and convert E - R diagrams into DBMS.	3
CO3	Apply normalization techniques to improve database design	3
CO4	Formulate SQL queries on the respect data	4, 8

Course Contents:

Module-1	8 Hrs
Introduction: Purpose of Database System, Views of data, data models, database management system, three- schema architecture of DBMS, components of DBMS. E/R Model- Conceptual data modelling- motivation, entities, entity types, attributes relationships, relationship types, E/R diagram notation, examples. **Data Models:** Introduction to the Relational Model Structure Database Schema, Keys Schema Diagrams. Database design Other Models, ER diagrams ER Model- Entities, Attributes and Entity sets Relationships and Relationship sets – ER Design Issues – Concept Design – Conceptual Design with relevant Examples. Relational Query Languages, Relational Operations	
Module-2	**8 Hrs**
Relational Algebra: Selection and projection set operations, renaming, Joins, Division, Examples of Algebra overviews, Relational calculus, Tuple Relational Calculus (TRC), Domain relational calculus (DRC). **Overview of the SQL Query Language:** Basic Structure of SQL Queries, Data types, Creating a database, create a table, drop the database, drop table, select table, insert a record, update record, delete a record, order by, group by, triggers, Set Operations, Aggregate Functions, Nested Sub queries, Views, Procedures	
Module-3	**8 Hrs**
Normalization – Introduction, Non loss decomposition and functional dependencies, First, Second, and third normal forms – dependency preservation, Boyce/Codd normal form. **Higher Normal Forms** - Introduction, Multi-valued dependencies and Fourth normal form, Join dependencies and Fifth normal form	

Module-4	8 Hrs
Transaction Concept: Transaction State- Implementation of Atomicity and Durability, Concurrent Executions, Serializability- Recoverability, Implementation of Isolation. Testing for serializability- Lock, Based Protocols. Timestamp Based Protocols. Validation-Based Protocols, Multiple Granularity.	
Module-5	**8 Hrs**
Recovery and Atomicity: Log, Based Recovery, Recovery with Concurrent Transactions, Check Points- Buffer Management, Failure with loss of nonvolatile storage.	

Text Books:

1. Database System Concepts, Silberschatz, Korth, Mc Graw hill, 7th edition.
2. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition.
3. Fundamentals of Database Systems, Elmasri and Navathe, 6th Edition, 2011, Pearson Education, ISBN-13: 978-0136086208.

Reference Books:

1. An Introduction to Database systems, C.J. Date, A.Kannan, S.Swami Nadhan, Pearson, Eight Edition.
2. Rob,Coronet, "Database Systems", Seventh Edition, Cengage Learning
3. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah, PHI

Web links and Video Lectures (e-Resources):

1. dev.mysql.com
2. www. Postgressql.org.
3. https://www.w3schools.com/mysql/mysql_rdbms.asp
4. https://www.w3schools.in/dbms/intro

Skill Development Activity

- Based on the given scenario/ user requirement design, develop a database and extract the required information from the database by developing suitable SQL statements.

Mapping of COs and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3							
CO2		3	2					
CO3			3	2				2

Course Title	Operating Systems		
Course Code	25MCA104	L-P-SDA/T-C	2-0-1-3
Exam	03 Hours	Hours/ Week	2 + 2 Hours
CIE	50 Marks	SEE	50
		Total Hours	40

Course Learning objectives: Bring forth insights into how Operating System manages resources.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

Sl. No.	Description	PO
CO1	Describe the elements and various functionalities of the operating system	1
CO2	Apply the techniques of process management and demonstrate process synchronization deadlock handling.	3, 4, 8
CO3	Analyze various memory management strategies and file handling.	2, 4, 8

Course Contents:

Module-1	8 Hrs
Introduction to Operating Systems, System Structure What operating systems do, Operating System Operations, Computing Environments, Operating System Services, System Calls, Types of System Calls, System Programs, Operating System Structure, System Boot, Process Concept Process Concept, Process Scheduling, Interprocess Communication	
Module-2	**8 Hrs**
Process Scheduling Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Synchronization Background, The Critical Section Problem, Mutex Locks, Semaphores, Classic Problems of Synchronization: Readers-Writers Problem, Dining Philosophers Problem using Semaphores	
Module-3	**8 Hrs**
Deadlocks: System model, Deadlock Characterization, Methods for handling deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock	
Module-4	**8 Hrs**
Memory Management Strategies Basic Hardware, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Virtual Memory Management Background, Demand Paging, Page Replacement	
Module-5	**8 Hrs**
File System File concept, Access methods, Directory overview Implementing File System Allocation methods, Free Space Management	

Text Books

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating Systems P rinciples, 10th Edition, Wiley – India, 2019.

Reference Books:

1. D M Dhamdhere: Operating Systems A Concept Based Approach, 3rd Edition, Tata McGraw Hill, 2017.
2. Harvey M Deital: Operating Systems, 3rdEdition, Addison Wesley, 1990.

Web links and Video Lectures (e-Resources):

- https://www.google.com/search?q=Abraham+Silberschatz%2C+Peter+Baer+Galvin%2C+Greg+Gagne%3A+Operating+Systems+Principles%2C+10th+Edition%2C+Wiley+%E2%80%93+India%2C+2019.&oq=Abaham+Silberschatz%2C+Peter+Baer+Galvin%2C+Greg+Gagne%3A+Operating+Systems+Principles%2C+10th+Edition%2C+Wiley+%E2%80%93+India%2C+2019.&gs_lcrp=EgZjaHJvbWUyBggAEEUYOdIBCDEwOTJqMGo3qAIAsAIA&sourceid=chrome&ie=UTF-8
- https://www.youtube.com/results?search_query=Harvey+M+Deital%3A+Operating+Systems%2C+3rdEdi

Skill Development Activity

1. Write a C program for performing the following file handling operations
    - Creation of the new file
    - Opening an existing file
    - Reading from the file
    - Writing to the file
    - Appending the file
    - Copying the file
    - Renaming the file

2. Consider the banking service and use the appropriate scheduling algorithm for the below scenarios.
    - Physically handicap
    - Senior citizen
    - Lapsed token
    - Based on token
    - Different services offered by the bank
3. In an online shopping you wish to purchase an item which is out of stock. Apply producer consumer problem technique to address the given scenario.
4. Simulate the concept of Dining-Philosophers problem.
5. Assume that your wardrobe is full and you want to replace with new ones. Make use of the available replacement technique and solve.
6. Simulate banker's algorithm to avoid a deadlock.
7. Simulate the first fit, best fit and the worst fit contagious memory allocation techniques.
8. Design and develop C program to simulate the following disk scheduling algorithms
    - FCFS
    - Scan
    - SSTF
    - LOOK

Mapping of COs and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3							
CO2			3	2				2
CO3		3		2				2

Course Title	Web Technologies		
Course Code	25MCA105	L-P-SDA/T-C	3-0-0-3
Exam	03 Hours	Hours/ Week	3 Hours
CIE	50 Marks	SEE	50
		Total Hours	40

Course Learning objectives: To create small and interactive web pages using HTML5, CSS, JavaScript & angular JS framework.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

Sl. No.	Description	PO
CO1	Describe the fundamental concepts, architecture, and evolution of web technologies.	1
CO2	Creating structured and well-styled web pages using HTML and CSS.	3
CO3	Building single-page web applications using AngularJS framework.	3, 4

Course Contents:

Module-1	8 Hrs
Web browsers, web servers, MIME, URL, HTTP Introduction to HTML5 tags, Basic syntax and structure, text markups, images, lists, tables, progress, Media tags-audio and video, forms, span and div tags.	
Module-2	**8 Hrs**
Introduction to CSS, Levels of CSS, Selectors, Font, color and Text Properties, BOX Model, Introduction to JavaScript, JavaScript variables, operators, Conditional and loop statements in JavaScript, Functions and Arrays in JavaScript	
Module-3	**8 Hrs**
Event Handling and Document Object model in JavaScript, Handling strings and working with window object	
Module-4	**8 Hrs**
Introduction to AngularJS, Expressions, Modules, Directives, Model, Data binding, Controllers, Scopes, Filters	
Module-5	**8 Hrs**
Services, Tables, Select box, Forms, Events, Validations	

Test Books

1. Web Programming By Chris Bates , Wiley Publications
2. HTML5 Black Book by Dreamtech
3. Angular JS By Krishna Rungta

Reference Books:

1. Kogent Learning Solutions – Web Technologies Black Book (Modules 1 to 3)
2. AngularJS: Up and Running – O'Reilly (Modules 4 and 5)

Web links and Video Lectures (e-Resources):

1. https://www.w3schools.com/angular/default.asp

2. https://www.tutorialspoint.com/angular8/index.htm

Skill Development Activity

- Design and develop a responsive web interface using HTML, CSS, and JavaScript based on the given scenario or user requirement, incorporating interactive features as needed.

Mapping of COs and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3							
CO2			3					
CO3			3	2				

Course Title	DBMS and Web Technologies Laboratory		
Course Code	25MCA106	L-P-SDA/T-C	0-2-0-2
Exam	03 Hours	Hours/ Week	2 Hours
CIE	50 Marks	SEE	50
		Total Hours	28

Course Learning objectives: To create database objects that include tables, constraints, indexes, sequences and SQL queries for the small projects.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

Sl. No.	Description	PO
CO1	Design E-R diagrams, database schema and apply normalization for any given problem	3
CO2	Formulate SQL queries for the given problem.	3
CO3	Creating structured and well-styled static & dynamic web pages for a given database application	3,4

Course Contents:

Sl. NO	Lab Experiments
1	Create the following tables with properly specifying Primary keys, Foreign keys and solve the following queries. BRANCH (Branchid, Branchname, HOD) STUDENT (USN, Name, Address, Branchid, sem) BOOK (Bookid, Bookname, Authorid, Publisher, Branchid) AUTHOR (Authorid, Authorname, Country, age) BORROW (USN, Bookid, Borrowed_Date) Execute the following Queries: i. List the details of Students who are all studying in 1st Sem MCA. ii. List the students who are not borrowed any books. iii. Display the USN, Student name, Branch name, Book name, Author name, Books Borrowed Date of 1st Sem MCA Students who borrowed books. iv. Display the number of books written by each Author. v. Display the student details who borrowed more than two books. vi. Display the student details who borrowed books of more than one Author. vii. Display the Book names in descending order of their names. **viii.** List the details of students who borrowed the books which are all published by the same publisher.
2	Consider the following schema: STUDENT (USN, name, date_of_birth, branch, mark1, mark2, mark3, total, GPA) Execute the following queries: i. Update the column total by adding the columns mark1, mark2, mark3.

	ii. Find the GPA score of all the students. iii. Find the students who born on a particular year of birth from the date of birth column. iv. List the students who are studying in a particular branch of study. v. Find the maximum GPA score of the student branch-wise. vi. Find the students whose name starts with the alphabet "S" vii. Find the students whose name ends with the alphabets "AR" **viii.** Delete the student details whose USN is given as 1001
3	Design an ER-diagram for the following scenario, Convert the same into a relational model and then solve the following queries. Consider a Cricket Tournament "ABC CUP" organized by an organization. The the tournament there are many teams are contesting each having a Teamid, Team Name, City, a coach. Each team is uniquely identified by using Teamid. A team can have many Players and a captain. Each player is uniquely identified by Playerid, having a Name, and multiple phone numbers, age. A player represents only one team. There are many Stadiums to conduct matches. Each stadium is identified using Stadiumid, having a stadium name, Address involves city, area name, pincode. A team can play many matches. Each match played between the two teams in the scheduled date and time in the predefined Stadium. Each match is identified uniquely by using Matchid. Each match won by any of the one team that also wants to record in the database. For each match man of the match award given to a player. Execute the following Queries: i. Display the youngest player (in terms of age) Name, Team name, age in which he belongs of the tournament. ii. List the details of the stadium where the maximum number of matches were played. iii. List the details of the player who is not a captain but got the man_of _match award at least in two matches. iv. Display the Team details who won the maximum matches. **v.** Display the team name where all its won matches played in the same stadium
4	A country wants to conduct an election for the parliament. A country having many constituencies. Each constituency is identified uniquely by Constituency_id, having the Name, belongs to a state,Number_of_voters. A constituency can have many voters. Each voter is uniquely identified by using Voter_id, having the Name, age, address (involves Houseno,city,state,pincode). Each voter belongs to only one constituency. There are many candidates contesting in the election. Each candidates are uniquely identified by using candidate_id, having Name, phone_no, age, state. A candidate belongs to only one party.Thereare many parties. Each party is uniquely identified by using Party_id, having Party_Name,Party_symbol. A candidate can contest from many constituencies under a same party. A party can have many candidates contesting from different constituencies. No constituency having the candidates from the same party. A constituency can have many contesting candidates belongs to different parties. Each voter votes only one candidate of his/her constituency. Queries: i. List the details of the candidates who are contesting from more than one

	constituency which are belongs to different states. ii. Display the state name having maximum number of constituencies. iii. Create a stored procedure to insert the tuple into the voter table by checking the voter age. If voter's age is at least 18 years old. Then insert the tuple into the voter else display the "Not an eligible voter msg. iv. Create a stored procedure to display the number of voters in the specified constituency. Where the constituency name is passed as an argument to the stored procedure. **v.** Create a TRIGGER to UPDATE the count of number of voters of the respective constituency in "CONSTITUENCY" table, AFTER inserting a tuple into the "voters" table.
5	Design an ER-diagram for the following scenario, Convert the same into a relational model, normalize Relations into a suitable Normal form and then solve the following queries. A country can have many Tourist places. Each Tourist place is identified by using tourist_place_id, having a name, belongs to a state, Number of kilometers away from the 02.03.2021 updated 52/ 104 capital city of that state,history. There are many Tourists visits tourist places every year. Each tourist is identified uniquely by using Tourist_id, having a Name, age, Country and multiple emailids. A tourist visits many Tourist places, it is also required to record the visted_date in the database. A tourist can visit a Tourist place many times at different dates. A Tourist place can be visited by many tourists either in the same date or at different dates. Queries: i. List the state name which is having maximum number of tourist places. ii. List details of Tourist place where maximum number of tourists visited. iii. List the details of tourists visited all tourist places of the state "KARNATAKA" iv. Display the details of the tourists visited at least one tourist place of the state, but visited all states tourist places. **v.** Display the details of the tourist place visited by the tourists of all country.
6	Create an XHTML page that provides information about your department. Your XHTML page must use the following tags: • Text Formatting tags • Horizontal rule • Meta element • Links • Images • Tables • (Use of additional tags encouraged).
7.	Develop and demonstrate a XHTML file that includes Javascript script for the following problems: i. Input : A number n obtained using prompt Output : The first n Fibonacci numbers ii. Input : A number n obtained using prompt Output : A table of numbers from 1 to n and their squares using alert
8.	Develop and demonstrate, using JavaScript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each

	showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible. Modify the above document so that when a text is moved from the top stacking position, it returns to its original position rather than to the bottom
9	Consider the following database of student enrollment in courses and books adopted for each course. STUDENT (regno#: string, name: string, major: string, bdate: date) COURSE (course#: int, cname: string, dept: String) TEXT (book_ISBN#: int, book_title: string, publisher: string, author: string) ENROLL (regno#: string, course#: int, sem: int, marks: int) BOOK_ADOPTION(course#: int, sem: int, book_ISBN: int) Create the above tables by properly specifying the primary keys and the foreign keys Enter at least 7 to 10 records to each table. Execute SQL queries for the following requirements: i. List out the student details, and their course details. The records should be ordered in a semester wise manner. ii. List out the student details under a particular department whose name is ordered in a semester wise iii. List out all the book details under a particular course iv. Find out the Courses in which number of students studying will be more than 2. v. Find out the Publisher who has published more than 2 books.
10	Develop, test and validate an XHTML document that has checkboxes for apple (59 cents each), orange (49 cents each), and banana (39 cents each) along with submit button. Each check boxes should have its own onclick event handler. These handlers must add the cost of their fruit to a total cost. An event handler for the submit button must produce an alert window with the message "your total cost is Rs. XXX". Where XXX is the total cost of the chose fruit, including 5 percent sales tax. This handler must return "false" (to avoid actual submission of the form data). Modify the document to accept quantity for each item using textboxes.

Skill Development Activity

- Develop a web application which stores required data in the suitable database for a given scenario.

Mapping of COs and POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1			3					
CO2			3					
CO3			3	2				