ಬಿ. ಎಂ. ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ

(ಸ್ವಾಯತ್ತ ವಿದ್ಯಾ ಸಂಸ್ಥೆ)

B.M.S. COLLEGE OF ENGINEERING, BANGALORE - 19

(Autonomous College under VTU)

Department of Computer Science and Engineering

Scheme and Syllabus
For the Batch Admitted in the Year 2022-23

ಬಿ. ಎಂ. ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ

ಬುಲ್ ಟೆಂಪಲ್ ರಸ್ತೆ, ಬೆಂಗಳೂರು – 560 019

B.M.S. COLLEGE OF ENGINEERING, BANGALORE - 19

Bull Temple Road, Bangalore - 560 019

VISION OF INSTITUTE

Promoting Prosperity of mankind by augmenting human resource capital through Quality Technical Education & Training

MISSION OF INSTITUTE

Accomplish excellence in the field of Technical Education through Education, Research and Service needs of society.

DEPARTMENT VISION & MISSION

VISION

To be a model centre for education and training in the frontier areas of Computer Science and Engineering.

MISSION

The department will achieve the Vision through:

The mission of Computer Science and Engineering department is to educate students in the areas of computer science by providing best practices of teaching learning process for careers in software industry / higher education/ research.

COURSE TYPES:

Basic Science Course	BS
Engineering Science Course	ES
Professional Core Course	PC
Professional Elective Course	PE
Group Core	GC
Cluster Core	CC
Open Elective Course	OE
Project / Mini-Project	PW
Seminar–Internship	SR
Humanities and Social Sciences, Management Course	HS
Non-Credit Mandatory Course	NCMC

BMS COLLEGE OF ENGINEERING, BANGALORE-19

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

III Semester Scheme:

Course Code	Course Title	Type	L:T:P	Credits	Hours	CIE	SEE	Total
22MA3BSSDM	Statistics and Discrete Mathematics	BS-7	2:1:0	3	4	50	50	100
22CS3PCCOA	Computer Organization and Architecture	PC-1	3:0:0	3	3	50	50	100
22CS3PCOOJ	Object Oriented Java Programming	PC-2	2:0:1	3	4	50	50	100
22CS3PCDST	Data Structures	PC-3	3:0:1	4	5	50	50	100
22CS3PCDBM	Database Management Systems	PC-4	3:0:1	4	5	50	50	100
22CS3PCLOD	Logic Design	PC-5	2:0:0	2	2	50	50	100
22CS3AEWAD	Web Application Development	AE-3	0:0:1	1	2	50	50	100
22CV3HSEVS	Environmental Studies	HS-3	1:0:0	1	1	50	50	100
22MA3HSCPH	Constitution of India, Professional Ethics and Human Rights	HS-4	1:0:0	1	1	50	50	100
22CS3NCPYA	Physical Activity	NCMC -1	---	---	----	P/NP	--	--
Total			**17:1:4**	**22**	**26**	**450**	**450**	**900**

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IV Semester Scheme:

Course Code	Course Title	Type	L:T:P	Credits	Hours	CIE	SEE	Total
22MA4BSLIA	Linear Algebra	BS-8	2:1:0	3	4	50	50	100
22CS4PCOPS	Operating Systems	PC-6	3:0:1	4	5	50	50	100
22CS4PCTFC	Theoretical Foundations of Computations	PC-7	2:1:0	3	4	50	50	100
22CS4PCADA	Analysis and Design of Algorithms	PC-8	3:0:1	4	5	50	50	100
22CS4PCCON	Computer Networks	PC-9	3:0:1	4	5	50	50	100
22CS4SRIN1	Seminar- Internship involving Social Activity	INT-1	0:0:1	1	2	50	50	100
22MA4HSUHV	Universal Human Values	AE-4	0:1:0	1	2	50	50	100
22CS4AEFWD	Full Stack Web development and DevOps	AE-5	0:0:1	1	2	50	50	100
22MA4HSSAK / 22MA4HSBAK	Samskrutika Kannada / Balake Kannada	HS-5	1:0:0	1	1	50	50	100
22CS4NCCLA	Cultural Activity	NCMC-2	---	---	----	P/NP	--	--
			14:3:5	**22**	**30**	**450**	**450**	**900**

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V Semester Scheme

Course Code		Course Title	Type	L:T:P	Credits	Hours	CIE	SEE	Total
22CS5PCCRP		Cryptography	PC-10	3:1:0	4	5	50	50	100
22CS5PCIOT		Internet of Things	PC-11	3:0:1	4	5	50	50	100
22CS5PCAIN		Artificial Intelligence	PC-12	3:0:1	4	5	50	50	100
22CS5PCCPD		Compiler Design	PC-13	3:0:1	4	5	50	50	100
22CS5PEXXX	WMC	Wireless and Mobile Communication	PE-1	3:0:0	3	4	50	50	100
	DEV	Data Exploration and Visualization							
	CGH	Computer Graphics							
	AAM	Advanced Algorithms							
22CS5PWMP1		Mini Project -1	PW-1	0:0:2	2	2	50	50	100
22CS5BSBCS		Biology for CS Engineers	BS-9	1:0:0	1	1	50	50	100
22CS5NCINL		Indian Literature	NCMC-3	----	---	P/NP	---	---	---
Total				**16:1:5**	**22**	**27**	**350**	**350**	**700**

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

3rd Semester

Course Title	STATISTICS AND DISCRETE MATHEMATICS	Course Code	22MA3BSSDM

Credits	**3**	**L – T – P**	**2-1-0**
Contact hours	**40**		

Course Objectives:

- Understand an intense foundational introduction to fundamental concepts in discrete mathematics.
- Interpret, identify, and solve the language associated with logical structure, sets, relations andfunctions, modular arithmetic.
- To develop probability distribution of discrete and continuous random variables. Joint probability distribution occurs in digital signal processing, design engineering and microwave engineering.

Teaching-Learning Process (General Instructions)

- These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.
- Lecturer method (L) does not mean only traditional lecture method, but different type ofteaching methods may be adopted to develop the outcomes.
- Show Video/animation films to explain functioning of various concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- Ask at least three HOT (Higher order Thinking) questions in the class, which promotes criticalthinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recallit.
- Topics will be introduced in a multiple representation.
- Show the different ways to solve the same problem and encourage the students to come up withtheir own creative ways to solve them.
- Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

UNIT-1

GRAPH THEORY **[8 hours]**

Basic concepts: Types of graphs, order and size of a graph, in-degree and out-degree, connected and disconnected graphs, Eulerian graph, Hamiltonian graphs, sub-graphs, isomorphic graphs. Matrix representation of graphs: adjacency matrix, incidence matrix. Trees: spanning tree, minimal spanning tree: Kruskal's algorithm, Prim's algorithm, shortest path-Dijkstra's algorithm.

Teaching-Learning Process: Chalk and Board, Problem based learning

UNIT-2

COMBINATORICS / RECURRENCE RELATIONS AND GENERATING FUNCTIONS:
[8 hours]

Principles of counting: The rules of sum and product, permutations. Combinations- Binomial and multinomial theorems. Catalan numbers, the principle of inclusion and exclusion. Derangements

Rook Polynomials, Generating functions

First order recurrence relations, second-order homogeneous recurrence relations, third order linear homogeneous recurrence relations.

Teaching-Learning Process: Chalk and Board, Problem based learning

UNIT-3

PROBABILITY **[8 hours]**

Theoretical distributions: Poisson distribution, Exponential and Normal distributions.

Joint probability distributions: Discrete random variable, Mathematical expectations, Covariance and Correlation.

Teaching-Learning Process: Chalk and Board, Problem based learning

UNIT-4

STATISTICAL INFERENCE **[8 hours]**

Introduction, procedure for testing of hypothesis, level of significance.

[Large sample] Test of significance for single mean, difference between two means, single proportion, difference between two proportions.

[Small sample] Test of significance for single mean, difference between two means, paired t-test, ratio of variances (F- distribution), Chi-Square distribution-goodness of fit.

Teaching-Learning Process: Chalk and Board, Problem based learning

UNIT-5

MARKOV CHAIN AND QUEUING THEORY **[8 hours]**

Markov Chain, Probability vectors, stochastic matrices, fixed point vector, regular stochastic matrices. Higher transition probabilities, stationary distribution of regular Markov chains. Queuing models: Concept of Queue, M/M/1 queuing systems. Teaching-Learning Process: Chalk and Board, Problem based learning

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Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO	Strength
22MA3BSSDM	CO 1	Utilize graphs as representation tool in optimization techniques.	1, 5, 9, 10	3, 1, 1, 1
	CO 2	Demonstrate the applications of Combinatorics, Mathematical Induction, Recurrence relations and generatingfunctions.	1, 5, 9, 10	3, 1, 1, 1
	CO 3	Apply the concepts of congruence's to various applications.	1, 5, 9, 10	3, 1, 1, 1

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	50 % Weightage	Total
CIE – Theory	Project	20	100	10	50
	Test 1	40		20	
	Test 2	40		20	
	Test 3	40		20	
SEE	End Exam	100		50	

Two best scores out of the three tests will be considered for CIE.
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

SEMESTER END EXAMINATION:

- Each unit consists of one full question.
- Five full questions to be answered.
- To set one question each from Units 1, 2 & 5 and two questions each from Unit 3 and Unit 4.

SUGGESTED LEARNING RESOURCES:

Text Books:

1. Discrete Mathematics, Seymour Lipchitz. M. Lipson, 2005, Tata McGraw Hill.
2. Graph Theory and Combinatorics, D. S. Chandrasekharaiah, 4th edition, 2011-12, Prism Engineering Education Series.
3. Higher Engineering Mathematics, B. V. Ramana, 2007, Tata McGraw Hill.

Reference Books:

1. Discrete Mathematics and its Applications, Kenneth H. Rosen, 2002, McGraw Hill.
2. Discrete Mathematics, Kolman, Busby Ross, 5th edition, 2004, Prentice Hall.
3. Graph Theory with Applications to Engineering and Computer Science, Narsingh Deo, Eastern Economy Edition, PHI Learning Pvt., Ltd.

E books and online course materials:

1. http://jlmartin.faculty.ku.edu/~jlmartin/courses/math725-S16/
2. https://www.whitman.edu/mathematics/cgt_online/cgt.pdf

Online Courses and Video Lectures:

1. https://www.coursera.org/learn/probability-intro
2. https://nptel.ac.in/courses/111104026/ (Discrete Mathematics)
3. https://nptel.ac.in/courses/111106086/ (Combinatorics)
4. https://nptel.ac.in/courses/111102112/ (Statistical Inference)

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Sem	**3rd**		
Course Title:	**Computer Organization and Architecture**		
Course Code:	**22CS3PCCOA**	**Total Contact Hours: 40**	
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hrs
1	Basic Structure of Computers and Instruction Set Architecture: Functional Units, Basic Operational Concepts, Number Representation and Arithmetic Operations, Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes	8
2	Introduction to Assembly Language Concepts, Stacks, Subroutines, Additional Instructions, Basic Input/Output: Accessing I/O Devices, Interrupts, Bus Structure, Bus Operation, Arbitration	8
3	Memory System: Basic Concepts, Semiconductor RAM Memories, Read-only Memories, Direct Memory Access, Memory Hierarchy, Cache Memories: Mapping Functions, Virtual Memory	8
4	Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Unsigned Numbers, Multiplication of Signed Numbers Fast Multiplication: Bit-Pair Recoding of Multipliers, Carry-Save Addition of Summands, Summand Addition Tree using 3-2 Reducers, Integer Division, Floating-Point Numbers and Operations: Arithmetic Operations on Floating-Point Numbers, Guard Bits and Truncation, Implementing Floating-Point Operations	8
5	Basic Processing Unit: Some Fundamental Concepts, Instruction Execution, Hardware Components, Instruction Fetch and Execution Steps, Hardwired Control Parallel Computer Architecture: Processor Architecture and Technology Trends, Flynn's Taxonomy of Parallel Architectures, Memory Organization of Parallel Computers: Computers with Distributed Memory Organization, Computers with Shared Memory Organization, Thread-Level Parallelism: Simultaneous Multithreading, Multicore Processors	8

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Computer Organization And Embedded Systems	Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian	6th Edition	McGraw-Hil	2012
2.	Parallel Programming for Multicore and Cluster	Thomas Rauber, Gudula Runger	2nd Edition	Springer	2013

	Systems				

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Computer Organization and Design - The Hardware/Software Interface	David A. Patterson, John L. Hennessy	5th Edition	Elsevier	2014
2.	Computer Organization & Architecture	William Stallings	11th Edition	Pearson	2018

MOOC Course

Sl. No.	Course name	Course Offered By	Year	URL
1.	Computer Architecture and Organization	NPTEL	2021	https://onlinecourses.nptel.ac.in/noc21_cs61/preview

Course Outcomes

CO1	To apply the concepts of basic functional units to demonstrate the working of computational system.
CO2	To analyse the issues of the processor architecture to improve the efficiency in computer design.
CO3	To design Memory modules and Arithmetic Logic unit for a given specification by analysing performance issues.

CO-PO-PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**														
CO2		**3**												**1**	
CO3			**2**											**2**	

BMS COLLEGE OF ENGINEERING, BANGALORE-19

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Assessment Plan (for 50 marks of CIE)

Tool	Remarks	Marks
Internals	**---**	**40**
QUIZ	**---**	**10**
Lab Component	**---**	**--**
Total		**50**

SEE Exam Question paper format

Unit-1	Mandatory	One Question to be asked for 20 Marks
Unit-2	Mandatory	One Question to be asked for 20 Marks
Unit-3	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-4	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-5	Mandatory	One Question to be asked for 20 Marks

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Sem	**3rd**		
Course Title:	**Object Oriented Java Programming**		
Course Code:	**22CS3PCOOJ**	**Total Contact Hours: 25**	
L-T-P:	**2-0-1**	**Total Credits:**	**3**

Unit No.	Topics	Hrs
1	**The History and Evolution of Java:** The Byte code, Features of Java **An overview of Java:** Object-Oriented Programming, Structure of a Java program **Data Types, Variables, and Arrays:** Integers, Floating-Point Types, Characters, The Primitive Types, Booleans, Variables, Arrays **Classes: Fundamentals, Declaring Objects,** Assigning Object Reference Variables, Methods, Constructors, *this* Keyword, Garbage Collection, Stack application **Methods and Classes:** Overloading Methods, Using Objects as Parameters, Argument Passing, Returning Objects, Access Control, static, final, Command-Line Arguments	**5**
2	**Inheritance:** Basic concepts, Member Access and Inheritance, Practical Example Inheritance types, super, constructors, Method Overriding, Dynamic Method Dispatch, Abstract Classes, final keyword	**5**
3	**Interfaces:** Defining Interface, Implementing Interface **Exception handling:** Fundamentals, Exception types, uncaught exceptions, try and catch, multiple catch clauses, nested try statements, throw, throws, finally, Java's built-in exceptions, User-defined exceptions	**5**
4	**Multithreaded Programming:** Java thread model, main thread, creating thread, creating multiple threads, isalive() and Join(), thread priorities, synchronization	**5**
5	**Event Handling:** Two Event Handling Mechanisms, The Delegation Event Model, Events- Event Sources, Event Listeners, Event Classes- The MouseEventClass, Event Listener Interfaces-The MouseListener Interface, the MouseMotionListener Interface, Delegation Event Model – Handling Mouse Events. **AWT: Working with Windows, Graphics and Text** AWT Classes, Window Fundamentals, Working with Frame Windows, Graphics	**5**

Prescribed Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Java the Complete Reference	Herbert Schildt	11th Edition	Tata McGraw-hill Edition	2019

Reference Text Books					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Introduction to JAVA Programming	Y. Daniel Liang	9th edition	Pearson education	2012
2.	Programming in JAVA 5.0	James P Cohoon, Jack W Davidson	1st Edition	TATA McGraw hill	2006
3.	Programming with Java A Primer	E. Balagurusamy	5th Edition	McGraw Hill Education	2014

E-books						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1	Java, Java, Java Object-Oriented Problem Solving	R. Morelli and R. Walde	Third edition	Pearson Education, Inc	2012	https://ia800303.us.archive.org/26/items/JavaJavaJavaObject-orientedProblemSolving/jjj-os.pdf
2	The Art and Science of Java	Eric S. Roberts		Greg Tobin	2007	http://people.reed.edu/~jerry/121/materials/artsciencejava.pdf
3	Java Programming	Wikibooks Contributors	Seventh Edition	wikibooks.org	2016	https://upload.wikimedia.org/wikipedia/commons/e/e7/Java_Programming.pdf

4	Think Java How to Think Like a Computer Scientist	Allen B. Downey and Chris Mayfield	6.1.3	Green Tea Press Needham, Massachusetts	2016	https://www.pdfdrive.com/think-java-how-to-think-like-a-computer-scientist-e17327018.html
5	Introduction to Programming Using Java,	David J. Eck	Seventh Edition	CreateSpace	2014	http://math.hws.edu/javanotes/index.html

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Object Oriented Programming in Java	Coursera	2022	https://www.classcentral.com/course/coursera-object-oriented-programming-in-java-4212
2	Java Programming Basics	Udacity	2022	https://www.udacity.com/course/java-programming-basics--ud282
3.	Java	Swayam-NPTEL	2022	https://onlinecourses.swayam2.ac.in/aic20_sp13/preview

Course Outcomes

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

CO1	Apply the knowledge of Java concepts to find the solution for a given problem.
CO2	Analyse the given Java application for correctness/functionalities.
CO3	Develop Java programs / applications for a given requirement.
CO4	Conduct practical experiments for demonstrating features of Java.

CO-PO-PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**														
CO2		**2**													
CO3			**3**												
CO4			**3**		**1**					**1**					**1**

Assessment Plan (for 50 marks of CIE)

Tool	Remarks	Marks
Internals	2 Internals	20
QUIZ	1 Quiz	5
Lab Component	Lab CIE + Lab Test	25
Alternate Assessment Tool	NA	--
Total		50

Laboratory Plan *(if applicable)*

Lab Program	Unit #	Program Details
1	I	Develop a Java program that prints all real solutions to the quadratic equation $ax^2+bx+c = 0$. Read in a, b, c and use the quadratic formula. If the discriminate b^2-4ac is negative, display a message stating that there are no real solutions.
2	I	Develop a Java program to create a class Student with members usn, name, an array credits and an array marks. Include methods to accept and display details and a method to calculate SGPA of a student.
3	I	Create a class Book which contains four members: name, author, price, num_pages. Include a constructor to set the values for the members. Include methods to set and get the details of the objects. Include a toString( ) method that could display the complete details of the book. Develop a Java program to create n book objects.
4	II	Develop a Java program to create an abstract class named Shape that contains two integers and an empty method named printArea( ). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea( ) that prints the area of the given shape.
5	II	Develop a Java program to create a class Bank that maintains two kinds of account for its customers, one called savings account and the other current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. Create a class Account that stores customer name, account number and type of account. From this derive the classes Cur-acct and Sav-acct to make them more specific to their requirements. Include the necessary methods in order to achieve the following tasks: a) Accept deposit from customer and update the balance. b) Display the balance. c) Compute and deposit interest d) Permit withdrawal and update the balance Check for the minimum balance, impose penalty if necessary and update the balance.

6	**III**	Write a program that demonstrates handling of exceptions in inheritance tree. Create a base class called "Father" and derived class called "Son" which extends the base class. In Father class, implement a constructor which takes the age and throws the exception WrongAge( ) when the input age<0. In Son class, implement a constructor that cases both father and son's age and throws an exception if son's age is >=father's age.
7	**IV**	Write a program which creates two threads, one thread displaying "BMS College of Engineering" once every ten seconds and another displaying "CSE" once every two seconds.
8	Open Ended Exercise	Develop a Generic Class with Two Type Parameters.
9	Open Ended Exercise	Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.
10	Open Ended Exercise	Create a package CIE which has two classes- Student and Internals. The class Personal has members like usn, name, sem. The class internals has an array that stores the internal marks scored in five courses of the current semester of the student. Create another package SEE which has the class External which is a derived class of Student. This class has an array that stores the SEE marks scored in five courses of the current semester of the student. Import the two packages in a file that declares the final marks of n students in all five courses.
11	Open Ended Exercise	Develop a Java program that demonstrates Inter process Communication and deadlock

Note: Collect a report for the open-ended exercise

Alternate assessment Tool :
Not Applicable

SEE Exam Question paper format:

Unit-1	Mandatory	One Question to be asked for 20Marks
Unit-2	Mandatory	One Question to be asked for 20Marks
Unit-3	Internal Choice	Two Questions to be asked for 20Marks each
Unit-4	Mandatory	One Question to be asked for 20Marks
Unit-5	Internal Choice	Two Questions to be asked for 20Marks each

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Sem	**3rd**		
Course Title:	**Data Structures**		
Course Code:	**22CS3PCDST**	**Total Contact Hours: 40**	
L-T-P:	**3-0-1**	**Total Credits:**	**4**

A. Syllabus

Unit No.	Topics	Hrs.
1	**Introduction To Data Structure**: Data Management concepts, Data types – primitive and non-primitive, Types of Data Structures- Linear & Non-Linear Data Structures. **Stacks**-Operations, array representations of stacks, stack applications -infix to postfix conversion, postfix expression evaluation, and function call tracing, recursion.	**8**
2	**Queues** – Introduction, Basic concept, linear queue operations, circular queue, priority queues, double ended queues. Applications of Queues. Introduction to Structures, Introduction to pointers, Dynamic memory allocation, allocating a block of memory: Malloc, allocating multiple blocks of memory: Calloc, Releasing the used space: Free Altering the size of memory: Realloc.	**8**
3	**Linear list** – Singly linked list implementation, insertion, deletion and searching operations on linear list, circularly linked lists- insertion, deletion and searching operations for circularly linked lists, doubly linked list implementation, insertion, deletion and searching operations, applications of linked lists – Stack and queue implementation, maintaining directory of names, Manipulation of polynomials (addition), representing sparse matrices.	**9**
4	**Trees** – Definitions, tree representation, properties of trees, Binary tree, Binary tree representation, binary tree properties, binary tree traversals, binary tree implementation, Binary Search Tree operations and its implementation, applications of trees.	**8**
5	**Hash Table** Representation: hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing and extendible hashing.	**7**

Prescribed Text Book:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Fundamentals of Data Structures in C	Horowitz, Sahni, Anderson Freed	Second	Universities Press	2008
2	Data Structures using C	Reema Thareja	Second	Oxford University press	2014

Reference Text Book:

Book Title	Authors	Edition	Publisher	Year
Data Structures using C	Aaron M.Tenenbaum, Yedidyah Langsam, Moshe J. Augenstein	Fifth Edition	Pearson education	2007

E-Book:

Sl. No.	Book Title	Authors	Edition	Publisher	Year	URL
1.	Data Structures using C	Reema Thareja	Second Edition	Oxford University press	2014	https://aa.bbs.tr/lab/cen215-data-structures/Data-Structures-Using-C-2nd-edition.pdf

MOOC Course:

Sl. No.	Course name	Course Offered By	Year	URL
1.	Data Structures	Coursera		https://www.coursera.org/learn/data-structures
2.	Data Structures and algorithms	NPTEL		https://nptel.ac.in/courses/106102064/

B. Course Outcomes:

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

CO1	Apply the concept of linear and nonlinear data structures.
CO2	Analyse data structure operations for a given problem.
CO3	Design and develop solutions using the operations of linear and nonlinear data structure for a given specification.
CO4	Conduct practical experiments for demonstrating the operations of different data structures.

C. CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**														
CO2		**3**													
CO3			**3**												
CO4			**3**		**3**					**1**					**3**

D. Proposed Assessment Plan (for 50 marks of CIE)

Tool	Remarks	Marks
Internals	**Best 2 of 3**	**20**
QUIZ	**One quiz**	**5**
Lab Component	CIE, lab test	**25**
Self-Study Component	*Project viva-voce*	**---**
AAT	**Seminar/ Mini-project/ any other (specify)**	**---**
Total		**50**

E. Proposed Tutorial Plan *(if applicable)*

F. Data Structures Lab - Plan of Activities:

Instructions to Students to be followed in each lab:

1. Each Student should write down the program in the observation book and get it evaluated by the respective lab faculty in-charge and then execute the program.
2. Each Student should bring the lab record with the programs and output written for the programs completed in their respective previous week and get it evaluated by the lab faculty in-charge. In the record book students should
   a) Handwrite the Program
   b) Pasting of the printout of the Output or Handwriting of the Output (Output should be written for all the cases).
3. Each Student should practice the extra exercise given in each lab.

Lab Program	Unit #	Program Details
1	**1**	Write a program to simulate the working of stack using an array with the following: a) Push b) Pop c) Display The program should print appropriate messages for stack overflow, stack underflow
2	**1**	WAP to convert a given valid parenthesized infix arithmetic expression to postfix expression. The expression consists of single character operands and the binary operators + (plus), - (minus), * (multiply) and / (divide)

3	**2**	WAP to simulate the working of a queue of integers using an array. Provide the following operations a) Insert b) Delete c) Display The program should print appropriate messages for queue empty and queue overflow conditions
4	**2**	WAP to simulate the working of a circular queue of integers using an array. Provide the following operations. a) Insert b) Delete c) Display The program should print appropriate messages for queue empty and queue overflow conditions
5	**3**	WAP to Implement Singly Linked List with following operations a) Create a linked list. b) Insertion of a node at first position, at any position and at end of list. c) Display the contents of the linked list.
6	**3**	WAP to Implement Singly Linked List with following operations a) Create a linked list. b) Deletion of first element, specified element and last element in the list. c) Display the contents of the linked list.
7	**3**	WAP to Implement Single Link List with following operations a) Sort the linked list. b) Reverse the linked list. c) Concatenation of two linked lists
8	**3**	WAP to implement Stack & Queues using Linked Representation
9	**4**	WAP to Implement doubly link list with primitive operations a) Create a doubly linked list. b) Insert a new node to the left of the node. c) Delete the node based on a specific value d) Display the contents of the list

10	**5**	Write a program a) To construct a binary Search tree. b) To traverse the tree using all the methods i.e., in-order, preorder and post order c) To display the elements in the tree.

G. Proposed Alternate Assessment Tool Plan *(if applicable):*

H. SEE Exam Question paper format:

Unit-1	Mandatory	One Question to be asked for 20 Marks
Unit-2	Mandatory	One Question to be asked for 20 Marks
Unit-3	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-4	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-5	Mandatory	One Question to be asked for 20 Marks

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Sem	**3rd**		
Course Title:	**Database Management Systems**		
Course Code:	**22CS3PCDBM**	**Total Contact Hours: 40**	
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hrs
1	**Introduction to Databases**: Introduction, An Example, Characteristics of Database approach, Advantages of using DBMS approach, When not to use a DBMS. **Database System Concepts and Architecture:** Data models, Schemas and instances, Three schema architecture. **SQL**: SQL Data Definition and Data Types specifying basic constraints in SQL, Basic retrieval queries in SQL, Insert, Delete and Update statements in SQL, Additional features of SQL, more complex SQL Queries, Specifying Constraints as Assertions and Triggers, Views (Virtual Tables) in SQL, Schema Change Statement in SQL.	8
2	**Data Modelling using the Entity-Relationship (ER) model**: Using High-Level conceptual Data Models for Database Design, A sample Database Application, Entity types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity types, Refining the ER Design, ER Diagrams, Relationship Types of Degree Higher than two, Relational Database Design using ER-to-Relational Mapping. **Relational Algebra**: Unary Relational Operations, SELECT and PROJECT, Relational Algebra Operations from Set Theory Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra.	8
3	**Database Design Theory and Normalization:** Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multi-valued Dependencies and a Fourth Normal Form, Join Dependencies, Fifth Normal Form.	8
4	**NoSQL**: An overview of NoSQL, Characteristics of NoSQL, NoSQL storage types, Advantages and Drawbacks of NoSQL, Case Study: Application definition, Requirement Analysis, Implementation using MongoDB, Database Queries, Writing Queries.	8
5	**Transaction Processing, Concurrency Control:** Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Two-Phase Locking Techniques for Concurrency Control. Recovery Concepts, NO-UNDO/REDO Recovery Techniques based on Deferred Update. Recovery Techniques Based on Immediate Update. Shadow Paging, The ARIES Recovery Algorithm.	8

Prescribed Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	**Fundamental of Database Systems**	Ramez Elmasri and Shamkant B Navathe	Sixth Edition	Pearson	2017
2.	**Getting Started with NoSQL**	Gaurav Vaish	-	PACKT	2013

Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	**Database Management Systems**	Ramakrishnan and Gehrke	3rd Edition	McGraw Hill	2014
2.	**Database Systems: The Complete Book**	Hector Garcia-Molina,JeffreyD.Ullman, Jennifer Widom ,	Second Edition	Pearson Education	2001
3.	**Database System Concepts**	Abraham Silberschatz, HenryF. Korth, S. Sudarshan	Sixth Edition	Tata McGraw-Hill	2010

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1.	An Introduction to Relational Database Theory	Hugh Darwen	3rd Edition	Ventus Publishing ApS	2012	https://zodml.org/sites/default/files/An_Introduction_to_Relational_Database_Theory_0.pdf
2.	Database Systems: Design, Implementation, and Management, Eighth Edition	Peter Rob and Carlos Coronel	8th Edition		2009	http://m5zn.com/newuploads/2015/04/27/pdf/b38963a5c2824b9.pdf

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Data Base Management System	NPTEL	2019	https://onlinecourses.nptel.ac.in/noc19_cs12/preview
2.	Data Base Management System	SWAYAM	2017	https://swayam.gov.in/course/220-database-management-system
3.	SQL tutorial	W3 schools	--	www.w3schools.com/sql/
4.	Introduction to the Fundamentals of Databases	Simply Learn	-	https://www.simplilearn.com/learn-basics-of-databases-free-course-skillup

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

CO1	**Apply** the concepts of database management system for various applications.
CO2	**Analyse** database concepts for a given problem.
CO3	**Design** conceptual data model for database applications.
CO4	**Demonstrate** SQL commands to create, manipulate and query data in a database.

CO-PO-PSO mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**3**														
CO2		**3**													
CO3			**3**										**2**		
CO4			**3**		**3**									**2**	

Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**	**Marks**
Internals	**Average of two**	**20**
QUIZ	**ONE**	**5**
Lab Component	Lab Test	**25**
Alternate Assessment Tool	---	
Total		**50**

Tutorial Plan *(if applicable)*

Laboratory Plan *(if applicable)*

Instructions to Students to be followed in each DBMS lab:

Each Student should write down the work carried out and the outputs in the observation book and get it evaluated by the respective lab faculty in-charge.

Experiment #	Name of Experiment
1	Insurance Database Creation
2	Insurance Database – Query Execution
3	Banking Enterprise Database Creation
4	Banking Enterprise Database – Query Execution
5	Employee Database Creation
6	Employee Database – Query Execution
7	Airline Flight Database Creation
8	Airline Flight Database - Query Execution
9	NO SQL - Student Database

Alternate Assessment ToolPlan *(if applicable)*

SEE Exam Question paper format

Unit-1	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-2	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-3	Mandatory	One Question to be asked for 20 Marks
Unit-4	Mandatory	One Question to be asked for 20 Marks
Unit-5	Mandatory	One Question to be asked for 20 Marks

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Sem	**3rd**		
Course Title:	**Logic Design**		
Course Code:	**22CS3PCLOD**	**Total Contact Hours: 25**	
L-T-P:	**2-0-0**	**Total Credits:**	**2**

Unit No.	Topics	Hrs.
1	**Simplification of Boolean Expressions** Boolean expressions and Notations, Karnaugh Maps- Upto Four-variable maps, Product and Sum term Representations on Karnaugh Maps, Minimization using Karnaugh Maps to obtain Minimal Expressions for Complete Boolean Functions, Minimal Sum and Product with Don't Care Conditions, The Quine-McClusky Method.	6
2	**Combinational Circuits** Binary Adders and Subtractor, Parity checkers and parity generator, Comparators, Decoders, Encoders, Multiplexers, Demultiplexers.	5
3	**Programmable Logic Devices (PLDs)** PLD Notation, Programmable Read-Only Memories (PROMs), Programmable Logic Arrays (PLAs), Programmable Array Logic (PAL)	4
4	**Flip-Flops** The Basic Bistable Element, Latches-SR Latch, The Gated D Latch, The Master Slave JK Flip Flop, Edge Triggered Flip Flops, Timing Diagram of Flip Flops, Characteristic equation of Flip Flop, Applications- Registers.	5
5	**Counters and Design of Synchronous Sequential Circuits** Introduction to Counters-Binary Ripple Counters, Design of Synchronous Counters using JK Flip Flops. **Design of Synchronous Sequential circuits**- Model selection, State Transition Diagram, State Synthesis Table.	5

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Digital Principles and Design	Donald. D. Givone	First Edition	Tata McGraw Hill	2017
2.	Digital Principles and Applications	Donald P Leach, Albert Paul Malvino & Goutam Saha	8e Edition	Tata McGraw Hill	2015

Reference Text Book					
Sl. No	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Illustrative Approach to Logic Design	R D Sudhaker Samuel	--	Sanguine-Pearson	2010
2.	Digital Logic and Computer Design	M Morris Mano	10th Edition	Pearson	2008

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1.	Introduction to Logic Design	Alan B. Marcovitz	Third Edition	McGraw Hill	2010	https://dl.icdst.org/pdfs/files3/fcba7ca1c74a45934f11dbb72e6678b9.pdf
2.	Foundation of Digital Electronics and Logic Design	Subir Kumar Sarkar, Asish Kumar De, Souvik Sarkar	--	Panstan Ford Publishing	2014	https://engineeringbookspdf.com/download/?file=3105&format=pdf

MOOC Course				
Sl No	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Hardware modeling using verilog	NPTEL- IIT Kharagpur	2019	https://onlinecourses.nptel.ac.in/noc19_cs72
2.	Digital Circuits	NPTEL- IIT Kharagpur	2022	https://onlinecourses.nptel.ac.in/noc22_ee110

Course Outcomes:

CO1	Apply principles of logic design to construct various digital circuits.
CO2	Analyse the functionalities of digital circuits.
CO3	Design combinational and sequential logic circuit from functional description.
CO4	Demonstrate the functionalities of logic circuits using simulation software.

CO-PO-PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3														
CO2		3													
CO3			2												
CO4			2		2			1	1	1					

Proposed Assessment Plan (for 50 marks of CIE)

Tool	Remarks	Marks
Internals	Best 2 out of 3	40
AAT	Simulation + Assignment	10
Lab Component	--	-
Total		50

Proposed Alternate Assessment Tool Plan

Plan 1:	Implementation of any given digital circuit using iVerilog or any other open source simulation software. Note: Demonstration of iVerilog software with few working codes will be shown to students. The problem statement to be framed for which the student has to come up with design first using pen and paper and then implement using iVerilogor any other open source simulation software and demonstrate the same. The evaluation is done for 20 marks.
Plan 2:	Assignments to be given to students at the end of each unit where students solve problems related to each unit. All faculties handling the course need to discuss and come up with problems to be given to students.
Total: 5 assignments Each assignment carries 5 marks and the sum of the best 4 out of 5 assignments to be taken for consideration. 5*4=20 marks Timely submission of the assignment is must and it must be handwritten only. The criteria for evaluation depend on the correctness and timely submission. Plagiarism also to be taken care of. The AAT marks will be the sum of Plan 1 and Plan 2. Plan 1=20 Plan 2=20 Total: 40 marks which will be scaled down to 10 marks.	

SEE Exam Question paper format:

Unit-1	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-2	Mandatory	One Question to be asked for 20 Marks
Unit-3	Mandatory	One Question to be asked for 20 Marks
Unit-4	Mandatory	One Question to be asked for 20 Marks
Unit-5	Internal Choice	Two Questions to be asked for 20 Marks each

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Sem :	**3rd**		
Course Title:	**Web Application Development**		
Course Code:	**22CS3AEWAD**		
L-T-P:	**0-0-1**	**Total Credits:**	**1**

A. Introduction

1	Website based Application Development - Only Front End: Under this ability enhancement course, student should develop front end for the websites of any chosen topic. Students can form a group with minimum of two and maximum of four.
2	Teacher allotted for project work to students should teach students front end web technologies such as HTML, CSS, Java Script and basics of PHP (Sessions/Cookies Management) during Class/Lab hours as per the allotment.
3	Teacher allotted for Web programming course should guide the students in choosing the topic and towards carrying out project work and complete the evaluation of assigned students.
4	The evaluation of project work will be based on the rubrics set by the department.

B. Course Outcomes

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

CO1	Apply web technologies in the construction of a website.
CO2	Design and develop website effectively using available resources for the given specification.
CO3	Orally present and document effectively the implemented solutions.

C. CO-PO-PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**3**				**3**								**1**	**3**	
CO2		**2**	**3**		**3**								**1**	**3**	
CO3								**1**	**3**	**3**					

D. Assessment Plan (for 50 marks of CIE)

Tool	Remarks	Marks
Internals	**---**	**---**
QUIZ	**---**	**---**
Lab Component	**---**	**50**
Alternate Assessment Tool	**----**	**--**
Total		**50**

Rubrics for Project Evaluation:

Criteria	Exemplary	Proficient	Partially Proficient	Points
Layout	(10) The Web site has an exceptional design, attractive and usable layout. It is easy to locate all important elements.	(6) The Web pages have an attractive design and usable layout. It is easy to locate all important elements.	(4) The Web pages have a usable design layout, but may appear busy or boring. It is easy to locate most of the important elements.	__ / 10
Navigation	(5) Links for navigation are clearly labeled, consistently placed, allow the reader to easily move from a page to related pages (forward and back), and take the reader where s/he expects to go. A user does not become lost.	(3) Links for navigation are clearly labeled, allow the reader to easily move from a page to related pages (forward and back), and internal links take the reader where s/he expects to go. A user rarely becomes lost.	(2) Links for navigation take the reader where s/he expects to go, but some needed links seem to be missing. A user sometimes gets lost.	___ / 5
Validation of Form fields	(10) Validations have been carried out for all form fields completely in all the webpages.	(6) Most of the validations have been carried out for all form fields completely in all the webpages.	(4) Few of the validations has been carried out for the form fields in the webpages.	___ /10
Background	(5) Background is exceptionally attractive, consistent across pages, adds to the theme or purpose of the site, and does not detract from readability.	(3) Background is attractive, consistent across pages, adds to the theme or purpose of the site, and does not detract from readability.	(2) Background is consistent across pages and does not detract from readability.	___ /5

Content Accuracy	(5) All information provided by the student on the Web site is accurate, Legal and all the requirements of the assignment have been met.	(3) Almost all the information provided by the student on the Web site is accurate, legal and most of the requirements of the assignment have been met.	(2) Almost all of the information provided by the student on the Web site is accurate, legal and few of the requirements of the assignment have been met.	___ / 5
Report	(5) Clear and Effective writing and adherence to appropriate style guidelines	(3) Writing that is clear and effective for the most part and minor errors in adherence to appropriate style guidelines	(2) Unclear and ineffective writing and multiple errors in adherence to appropriate style guidelines	___/5
Oral communication / Presentation	(5) Clear and effective communication	(3) Communication is clear	(2) Unclear communication	___/5
Participation in Discussions	(5) Provided many good ideas; inspired others; clearly communicated ideas, needs, and feelings.	(3) Participated in discussions; on some occasions, made suggestions.	(2) Listened mainly; Rarely spoke up, and ideas were off the mark.	___/5
Total				__/ **50**

E. Tutorial Plan *(if applicable)*

F. **Laboratory Plan** *(if applicable)*

Project Topics for Website Development:

Department Lab Stock Book Maintenance System; Department Faculty Weekly Report Submission System. Department Faculty Self-Assessment Report Submission System; Department Faculty Self – Appraisal form Submission System; Department Student Project Submission System; Department Conference Paper Submission System; College TEQIP student project proposal submission system; College TEQIP Faculty Workshop/Conference/Seminar Application Submission System; College Exam Application Form Submission System.
Note: Apart from the above-mentioned project topics if student groups come up with any innovative project ideas which are useful for the Department / College academic purpose will be considered based on the approval and acceptance from class teacher.

Sl. No	Week	Activity	Content deliverables by the assigned teacher
1	1st	Formation of groups. Note: Student groups of size 2 or 3 or 4	Getting Started in Web Design, How the Web Works, Deploying source code in the web server (XAAMP) and server setup.
2	2nd	Project topic selection by each Group.	Demonstration of essential HTML document structure, essential HTML for content, HTML forms,
3	3rd	Presentation: Student and Project topic introduction by each group	Demonstration of CSS mechanics and basic selectors, CSS text properties, CSS block model, Colors and Images, and CSS and lists.
4	4th, 5th, and 6th	Design Layout of the Web Pages	Introduction to JavaScript, JavaScript Events, DOM. Program to demonstrate basics of Java Script concepts. A table of the numbers from 5 to 15 and their squares and cubes. The first 20 Fibonacci numbers. The words of the input text, in alphabetical order. The number of names in the given array that end in either “A” or “Y” The position in the String of the leftmost vowel. The numbers of negative elements, zeros, and values greater than Zeros in the given array.
5	7th	Presentation on Front-end Design by each group	Demonstration on using and integrating JavaScript functionality, Slideshows, form validation, navigation, social media widgets.
6	8th and 9th	Design and Development of connecting among different web pages	Program to demonstrate basics of PHP concepts.
7	10th	Presentation by each group	
8	11th	Complete Project Work Demonstration by each group	
	12th	Project Report Preparation	

Text Book :	Jennifer Niederst Robbins, 2018. Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics, 5th ed (Links to an external site.). O'Reilly Media. 500 p. ISBN 978-1-4493-3753-8
Supplementary texts and resources	1. Free code camp : https://www.freecodecamp.org/ 2. Eloquent JavaScript : http://eloquentjavascript.net/ 3. Learn to Code HTML & CSS : http://learn.shayhowe.com/html-css 4. Learn Php : https://www.learn-php.org
Tutorial Link:	1. http://www.tutorialspoint.com 2. http://www.w3schools.com

G. SEE Exam (50 Marks)

Evaluation of Projects carried out by students from External examiner along with internal faculty.

Course	Environmental studies	Course Code	22CV3HSEVS	SEE QP Duration	1Hr 30 Mins
Credits	01	L:T:P	1: 0 : 0	SEE marks	50

COURSE OBJECTIVE: The students will be able to develop a sense of responsibility about the environment, natural resources, their conservation and Understand the concept, structure and function of different ecosystems and the ill effects of environmental pollution and other environmental issues like population growth, Acid rain, global warming etc.,

Unit No.	Topics	Hrs.
1	**Introduction to Environment:** 1. Definition, about the Earth, Earth's Structure i.e. Atmosphere and its parts, Hydrosphere, Lithosphere and Biosphere. 2. Ecology & Ecosystem, Balanced ecosystem, types of Ecosystem.	03
2	**Human Activities on Environment:** 1. Human activities - Food, Shelter, Economic and Social Security. 2. Effects of Human activities on Environment: a) Agriculture, b) Housing, c) Industries, d) Mining and e) Transportation activities. 3. Environmental Impact Assessment (E I A) 4. Sustainable development	03
3	**Natural Resources:** 1. Definition, Renewable and Non-Renewable sources. 2. Major Natural Resources are: a) Water resources, its availability, quality, water borne & water induced diseases, b) Mineral resources, classification, uses in various Industries as byproducts. c) Forest resources: causes & consequences of deforestation, various afforestation programs. 3. Conventional and Non-conventional energy resources: a) Hydroelectric, Wind power, Solar, Biogas, geothermal energy.	03

	b) Fossil fuel based energy resources: Coal, Oil & Gas, Nuclear power c) Hydrogen as an alternate future sources of energy.	
4	**Environmental pollution:** **Introduction, following are few types of pollutions to study**: 1. Water pollution: definition, types, sources, effects and control of water pollution. 2. Land pollution: definition, types, sources, effects, Solid waste management. 3. Noise pollution: definition, sources, effects & control of noise pollution. 4. Air pollution: definition, sources, effects & control of air pollution.	03
5	**Current Environmental Issues & Importance:** 1. Population growth, effects & Control, Climatic changes, Global warming, Acid rain, Ozone layer depletion and its effects. 2. Environmental protection: initiatives by Government and non–Govt. Organizations (NGO's), Role of Legal aspects. 3. Environmental Education, Women education.	03

Total contact hours = 15 (Weekly 1 Hr.)

COURSE OUTCOME : Student can an ability to	
CO1:	Discuss the components and impacts of human activities on environment.
CO2:	Apply the environmental concepts for conservation and protection of natural resources.
CO3:	Identify and establish relationship between social, economic and ethical values from environmental perspectives.

C I E Marks: Conduct 3 Tests, considering best of 2. The pattern of Test paper consists of two parts. Part-A consists of 20 MCQs for 1 mark each; Part-B consists of 3 descriptive questions, 10 marks each. Student should answer 2 full questions from part-B. Two quizzes, each quiz is for 5 marks covering full syllabus.

TOTAL C I E MARKS: 20+20+10=50 MARKS

SEE QUESTION PAPER PATTERN
PART-A

- 20 Multiple Choice Questions Covering full syllabus
- 1 Mark each, students have to attend all questions

PART-B

- Consist of 4 main questions. It may be subdivisions of 3 or 4.
- Each question consists of 10 marks, covering full syllabus
- Student should answer only 3 full questions.

30 marks

SEE TOTAL MARKS: 20+30=50 MARKS

TEXT BOOKS:

1. Environmental studies by - Dr. Geetha Balakrishna (Revised Edition-Sun star publication).
2. Ecology by – Subramanyam (Tata McGraw Hill Publication).
3. Environmental studies by – Dr. J.P. Sharma (Fourth edition).
4. Environmental studies by – Smriti Srivastav (Published by Kataria & Sons).

REFERENCES:

1. Environmental studies by – Benny Joseph
2. Environmental studies by – Dr. D.L. Manjunath

LEARNING RESOURCES:

1. NPTEL (Open Sources / power point and visuals)
2. Ecological studies / IITR / Open Sources
3. Ministry of Environment and forest & wildlife.

MOOCs:

1. MOOCS – https://www.coursera.org / course / sustain

CO-PO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	2	2										
CO3	1	1										

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Semester :	**3rd**		
Course Title:	**Constitution of India, Professional Ethics and Human Rights**		
Course Code:	**22MA3HSCPH**	**Total Contact Hours**	**15**
L-T-P:	**1-0-0**	**Total Credits:**	**1**

A. Syllabus

Unit No.	Topics	Hrs
1	**Introduction to Indian Constitution** Framing of the Indian constitution: Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India, Fundamental Rights and its limitations. Fundamental Duties and their significance. Directive Principles of State Policy: Importance and its relevance. Case Studies	3
2	**Union Executive and State Executive** The Union Executive – The President and the Vice President, the Prime Minister and The Council of Ministers. The Union Parliament – Lok Sabha & Rajya Sabha. The Supreme Court of India. State Executive – The Governors, the Chief Ministers and the Council of Ministers. The State Legislature – Legislative Assembly and Legislative Council. State High Courts	3
3	**Election Commission of India, Amendments and Emergency Provisions** Election Commission of India – Powers & Functions – Electoral Process in India. Methods of Constitutional Amendments and their Limitations. Important Constitutional Amendments – 42nd, 44th, 61st, 74th, 76th, 77th, 86th and 91st. Emergency Provisions. Case Studies	3
4	**Human Rights** Human Rights – Meaning and significance, Types Human Rights, Powers and Functions of National and State Human Rights Commission of India. Human rights in constitution of India.	3
5	**Professional Ethics** Scope and Aims of Engineering Ethics, Responsibilities of Engineers and impediments to Responsibilities. Honesty, Integrity and Reliability; Risks – Safety and Liability in Engineering. Case Studies.	3

B. Course Outcomes

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

CO1	Recognize the significance of the Indian Constitution as the supreme legal authority
CO2	Analyse human rights and concepts.
CO3	Apply the principles of moral obligations and duties to safeguard the public's welfare and safety

Prescribed Text Book					
Sl. No	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	"An Introduction to Constitution of India and Professional Ethics"	Merunandan K.B. and B.R. Venkatesh,	3rd edition	Meragu Publications	2011
2.	"Constitution of India & Professional Ethics & Human Rights"	Phaneesh K. R	10th edition	Sudha Publications	2016

Reference Text Book					
Sl. No	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	V.N. Shukla's Constitution of India"	Prof (Dr.) Mahendra Pal Singh (Revised)	13th Edition	Eastern Book Company	2017, Reprint 2019
2.	"Ethics in Engineering"	Martin, W. Mike.,Schinzinger, Roland	4th edition	McGraw-Hill Education	2004

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1.	Constitution of India and Professional Ethics	G.B. Reddy and Mohd Suhaib	-	I.K. International Publishing House Pvt. Ltd	2006	https://books.google.co.in/books/about/Constitution_of_India_and_Professional_E.html?id=VcvuVt-d88QC
2.	-	M. Raja Ram, New Age International Pvt. Limited	-	-	2009	http://www.scribd.com/doc/82372282/Indian-Constitution-M-Raja-Ram-2009#scribd Indian Constitution

Course Outcomes and Programme outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						✔						✔
CO2						✔						✔
CO3								✔				✔

Correlation between programme outcome and course outcome:

Programme Outcome	Course Outcome	Blooms Taxonomy
PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. **PO12: 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. **PO8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. **PO12: 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.	**CO1:** Recognize the significance of the Indian Constitution as the supreme legal authority. **CO2:** Analyse human rights theories and concepts. **CO3:** Apply the principles of moral obligations and duties to safeguard the public's welfare and safety.	Remember Analyse Application

Course Assessment and Evaluation:

Type of Assessment	Marks	Course outcome attained
Average of the two internal tests will be taken.		
Test 1,2 & 3 (Online Test) Multiple Choice Questions	Test 1 (20 Marks) Test 2 (20 Marks) Test 3 (20 Marks)	CO1 CO1 CO1
AAT-1 (Assessment) AAT-2 (Assessment)	AAT-1 (5 Marks) AAT-2 (5 Marks)	CO2 CO3

SEE Exam Question paper format:

CO1,CO2 , CO3, CO4 & CO5	
Online Examination	
50 Multiple Choice Questions	Total Marks 50X2=100

BMS COLLEGE OF ENGINEERING, BANGALORE-19

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Semester:	**3rd**		
Course Title:	**Physical Activity (Sports/ Yoga Etc.)**		
Course Code:	**22CS3NCPYA**		
L-T-P:	**0-0-0**	**Total Credits:**	**ZERO(Pass/Fail)**

A. Introduction

1. Student can participate in any of the physical activities such as Sports, Marathon, Yoga conducted by college or any organization.
2. Student should produce participation certificate for clearing this mandatory course.
3. Note: If student is unable to participate in outside physical activities then department Head should take care of conducting Yoga and Meditation of one or two day event in the college.
4. Physically challenged students can produce participation certificate of any technical/cultural events conducted by college/department clubs.

B. Course Outcomes

CO1	Promoting comprehensive health, safety, and physical fitness by engaging in competitive activities
CO2	Demonstrates personalities of virtuous sportsmanship and teamwork in both competition and practice.

C. CO-PO-PS O mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PS01	PSO 2	PSO 3
CO1						**3**									
CO2									**3**						

Assessment Plan

Category	Marks (Range)	Sports and Games
L1	90 (90-100)	• Winning Certificates/ at International/National / Zonal Level Competitions. • Representing State & Zonal level teams
L2	80 (80-89)	Winning Certificates/ at State University Level Competitions. Representing VTU team.
L3	70 (70-79)	Winning Certificates Inter-Collegiate competitions. Representing college team.
L4	60 (60-69)	Winning Certificates at college level events.
L5	50 (50-59)	• Winning Certificates at Departmental events. • Coordinators- Blood donations (Volunteers)
L6	40 (40-49)	Participation in Inter-Collegiate /College level events/ Blood donation /NGO/ Personality development Programs

D. SEE Exam Question paper

Student should produce participation certificate for clearing this mandatory course.

4th Semester

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Semester	**4th**		
Course Title:	**LINEAR ALGEBRA**		
Course Code:	**22MA4BSLIA**	**Total Contact Hours:**	**40 hours**
L-T-P:	**2-1-0**	**Total Credits:**	**3**

Course Objectives:

- The objectives of the course are to facilitate the learners to
- Appreciate the importance of linear algebra in computer and allied engineering science.
- Gain the knowledge of linear algebra tools and concepts to implement them in their core domain.
- Improve their mathematical thinking and acquire skills required for sustained lifelong learning.

Teaching-Learning Process (General Instructions):

- These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes
- Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
- Show Video/animation films to explain functioning of various concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
- Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the students' understanding.

Unit No.	Topics	Hrs.
1	**VECTOR SPACES:** Introduction, Vector spaces, Subspaces, Linear Combinations, Linear Spans, row space and column space of a Matrix, Linear Dependence and Independence, Basis and Dimension, Coordinates. **Teaching-Learning Process: Chalk and Board, Problem based learning.**	**8**

2	**LINEAR TRANSFORMATIONS:** Introduction, Linear Mappings, Geometric linear transformation of i^2, Kernel and Image of a linear transformations, Rank-Nullity Theorem (No proof), Matrix representation of linear transformations, Singular and Non-singular linear transformations, Invertible linear transformations **Teaching-Learning Process: Chalk and Board, Problem based learning.**	**8**
3	**EIGENVALUES AND EIGENVECTORS:** Introduction, Polynomials of Matrices, Applications of Cayley-Hamilton Theorem, eigen spaces of a linear transformation, Characteristic and Minimal Polynomials of Block Matrices, Jordan Canonical form. **Teaching-Learning Process: Chalk and Board, Problem based learning.**	**8**
4	**INNER PRODUCT SPACES:** Inner products, inner product spaces, length and orthogonality, orthogonal sets and Bases, projections, Gram-Schmidt process, QR-factorization, least squares problem and least square error. **Teaching-Learning Process: Chalk and Board, Problem based learning.**	**8**
5	**OPTIMIZATION TECHNIQUES IN LINEAR ALGEBRA** Diagonalization and Orthogonal diagonalization of real symmetric matrices, quadratic forms and its classifications, Hessian Matrix, Method of steepest descent, Singular value decomposition. Dimensionality reduction – Principal component analysis. **Teaching-Learning Process: Chalk and Board, Problem based learning.**	**8**

Course outcomes (Course Skills Set):

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO	Strength
22MA4BSLIA	**CO 1**	Apply the concepts of linear algebra in Computer and allied Engineering Sciences.	1	3
	CO 2	Analyze the computer science and allied engineering Sciences applications using Linear algebra.	1	2
	CO 3	Demonstrate the applications of computer science and allied engineering Science applications using Linear algebra tools.	1, 5, 9, 10	1

Assessment Details (both CIE and SEE):

Component	Type of assessment	Max. Marks	Total	50 % Weightage	Total
CIE – Theory	Quiz	10	100	5	50
	AAT	10		5	
	Test 1	40		20	
	Test 2	40		20	
	Test 3	40		20	
SEE	End Exam	100		50	

Two best scores out of the three tests will be considered for CIE.

CIE methods/question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

SEMESTER END EXAMINATION:

- Each unit consists of one full question.
- Five full questions to be answered.
- To set one question each from Units 1, 4 and 5 and two questions each from Unit 2 and Unit 3.

SUGGESTED LEARNING RESOURCES:

Text Books:

1. Linear Algebra and its applications, David C. Lay, Steven R. Lay, Judi J Mc. Donald, 6th Edition, 2021, Pearson Education.
2. Linear Algebra and its applications, Gilbert Strang, 4th edition, 2005, Brooks Cole.
3. Linear Algebra: An Introduction, Richard Bronson & Gabriel B. Costa, 2nd edition.

Reference Books:

1. Schaum's outline series -Theory and problems of linear algebra, Seymour Lipschutz, Marc Lipson, 6th edition, 2017, McGraw-Hill Education.
2. Mathematics for Machine learning, Marc Peter Deisennroth, A. Aldo Faisal, Cheng Soon Ong, 2020, Cambridge University Press.

E books and online course materials:

1. https://ocw.mit.edu/courses/mathematics/18-06sc-linear-algebra-fall-2011/index.htm
2. https://www.math.ucdavis.edu/~linear/linear.pdf

Online Courses and Video Lectures:

1. https://www.coursera.org/learn/linear-algebra-machine-learning
2. https://nptel.ac.in/syllabus/111106051/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Semester	**4**		
Course Title:	**Operating Systems**		
Course Code:	**22CS4PCOPS**		
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hrs.
1	**Introduction**: What Operating Systems Do?, Computer-System Architecture, Operating System Structure, Operating system operations **System Structures**: Operating system services, User and Operating system interface, System Calls, Types of System calls, System programs, Operating System Structure **Process Concept**: Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication.	**8**
2	**Multithreaded Programming**: Overview, Multi-core Programming, Multithreading Models, Implicit Threading, Threading Issues. **Process Scheduling**: Basic concepts, Scheduling Criteria, Scheduling Algorithms. Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling.	**8**
3	**Synchronization**: Background, Critical Section Problem, Mutex locks, Semaphores, Classic Problems of Synchronization **Deadlocks**: System Model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock Detection and Recovery from deadlock.	**8**
4	**Memory management strategies**: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table **Virtual Memory Management**: Background, Demand paging, Copy on write, Page replacement algorithms, Allocation of frames, Thrashing.	**8**
5	**Implementing File-system**: File-System Structure, File-System Implementation, Directory Implementation, Allocation methods, Free-space management. **Mass-storage structure**: Disk Structure, Disk Attachment, Disk Scheduling. **System Protection**: Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix.	**8**

Prescribed Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1	Operating System Concepts	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne	9th Edition	John Wiley &Sons, Inc.	2012

Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1	Modern Operating System3	Andrew S. Tanenbaum	3rd Edition	Prentice Hall	2007
2	Operating System: Internals and Design Principles	William Stallings	8th Edition	Prentice Hall	2014
3	Schaum's Outline of Operating Systems (Schaum's Outline Series)	J. Archer Harris	Kindle Edition	McGraw-Hill	2001

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1	Operating Systems Guide	Tim Bower	-	Kansas State Polytechnic	2009	**http://faculty.salina.k-state.edu/tim/ossg/**
2	Operating Systems Course Notes	Dr. John T.Bell	-	University of Illinois Chicago	2006 & 2013	**https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/index.html**

3	Schaum's Outline of Operating Systems (Schaum's Outline Series)	J. Archer Harris.	[Kindle Edition]		2002	**http://www.naturligtraw.com/schaum-s-outline-of-operating-systems.pdf**

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1	Introduction to operating system	Course era		www.coursera.org/lecture/technical-support-fundamentals/module-introduction-I3n9l https://www.coursera.org/specializations/codio-introduction-operating-systems
2	Introduction to operating system	IIT, Madras	2017	https://onlinecourses.nptel.ac.in/noc17_cs29/preview
3	Introduction to operating system	Udacity Georgia Tech		in.udacity.com/course/introduction-to-operating-systems--ud923

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

CO1	Apply the different concepts and functionalities of Operating System
CO2	Analyse various Operating system strategies and techniques
CO3	Demonstrate the different functionalities of Operating System.
CO4	Conduct practical experiments to implement the functionalities of Operating system.

CO-PO-PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**														
CO2		**3**													
CO3			**2**												**3**
CO4				**3**	**2**										**3**

Proposed Assessment Plan (for 50 marks of CIE)

Tool	Remarks	Marks
Internals	2	25
QUIZ	1	5
Lab Component	CIE + 2 Lab Tests	25
Alternate Assessment Tool	-	-
Total		50

Proposed Tutorial Plan *(if applicable)*

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Proposed Laboratory Plan *(if applicable)*

Lab Program	Unit#	Program Details
1	Unit-1	Write a C program to simulate the following non-pre-emptive CPU scheduling algorithm to find turnaround time and waiting time. • FCFS • SJF (pre-emptive & Non-pre-emptive)
2	Unit-1	Write a C program to simulate the following CPU scheduling algorithm to find turnaround time and waiting time. • Priority (pre-emptive & Non-pre-emptive) • Round Robin (Experiment with different quantum sizes for RR algorithm)
3	Unit-1	Write a C program to simulate multi-level queue scheduling algorithm considering the following scenario. All the processes in the system are divided into two categories – system processes and user processes. System processes are to be given higher priority than user processes. Use FCFS scheduling for the processes in each queue.
4	Unit-2	Write a C program to simulate Real-Time CPU Scheduling algorithms: • Rate- Monotonic • Earliest-deadline First • Proportional scheduling
5	Unit-3	Write a C program to simulate producer-consumer problem using semaphores.
6	Unit-3	Write a C program to simulate the concept of Dining-Philosophers problem.
7	Unit-3	Write a C program to simulate Bankers algorithm for the purpose of deadlock avoidance.
8	Unit-3	Write a C program to simulate deadlock detection

9	Unit-4	Write a C program to simulate the following contiguous memory allocation techniques • Worst-fit • Best-fit • First-fit
10	Unit-4	Write a C program to simulate paging technique of memory management.
11	Unit-4	Write a C program to simulate page replacement algorithms • FIFO • LRU • Optimal
12	Unit-5	Write a C program to simulate the following file allocation strategies. • Sequential • Indexed • c) Linked
13	Unit-5	Write a C program to simulate the following file organization techniques • Single level directory • Two level directory • c) Hierarchical
14	Unit-5	Write a C program to simulate disk scheduling algorithms • FCFS • SCAN • c) C-SCAN
15	Unit-5	Write a C program to simulate disk scheduling algorithms • SSTF • LOOK • c) c-LOOK

Proposed Alternate Assessment Tool Plan *(if applicable):*
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SEE Exam Question paper format:

Unit-1	Mandatory	One Question to be asked for 20Marks
Unit-2	Mandatory	One Question to be asked for 20Marks
Unit-3	Mandatory	One Question to be asked for 20Marks
Unit-4	Internal Choice	Two Questions to be asked for 20Marks each
Unit-5	Internal Choice	Two Questions to be asked for 20Marks each

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Semester	**4th**		
Course Title:	**Theoretical Foundations of Computations**		
Course Code:	**22CS4PCTFC**	**Total Contact Hours: 40 hours**	
L-T-P:	**2-1-0**	**Total Credits:**	**3**

Unit No.	Topics	Hrs
1	**Introduction to Finite Automata:** Central Concepts of Automata Theory, Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), Finite Automata with Epsilon Transition, An Application Text Search.	8
2	**Regular Expressions and Languages:** Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions, Proving Languages Not to Be Regular, Closure Properties of Regular Languages, Equivalence and Minimization of Automata	8
3	**Context Free Grammars and Languages Parse Trees:** Context Free Grammars, Parse trees, Applications of Context Free Grammars, Ambiguity in Grammars and Languages, Eliminating Useless Symbols, Computing the Generating and Reachable Symbols, Eliminating Epsilon Productions, Eliminating Unit Productions, Chomsky Normal Form, Greibach Normal form	8
4	**Pushdown Automata:** Definition of the Pushdown Automaton, The Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata, The Pumping Lemma for Context Free Languages, Closure Properties of Context Free Languages	8
5	**Introduction to Turing Machine:** Problems That Computers Cannot Solve, The Turing Machine, Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine, Restricted Turing Machines, Turing Machines and Computers, Definition of Post's Correspondence Problem, A Language That Is Not Recursively Enumerable, An Undecidable Problem That is RE, Other Undecidable Problems	8

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Introduction to Automata Theory, Languages and Computation	John E. Hop croft, Rajeev Motwani, Jeffrey D. Ullman: education	3rdEdition	Pearson	2007

Prescribed Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1	Introduction to Automata Theory, Languages and Computation	John E. Hop croft, Rajeev Motwani, Jeffrey D. Ullman: education	3rdEdition	Pearson	2007

Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1	Introduction to Languages and Automata Theory	John C Martin	3rdEdition	Tata McGraw-Hill	2007
2	An Introduction to formal Languages and Automata	Peter Linz	5th edition	Narosa publishing house	2012

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1	Introduction to Theory of Computation	Anil Maheshwari, Michiel Smid	---	Carleton University	2019	https://cglab.ca/~michiel/TheoryOfComputation/TheoryOfComputation.pdf

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Automata Theory	Edx	2022	https://www.edx.org/course/automata-theory
2.	Introduction to Automata, Languages and Computation	IIT B	2022	https://onlinecourses.nptel.ac.in/noc21_cs19/preview
3.	Automata Theory	Stanford University	2022	https://online.stanford.edu/courses/soe-ycsautomata-automata-theory

Course Outcomes

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

CO1	Apply the knowledge of Automata Theory, Grammars & Regular Expressions for the given requirement of the formal language.
CO2	Analyze the given Automata to identify the formal language it represents.
CO3	Design Automata and Grammar for pattern recognition and syntax checking of the given formal language.

CO-PO-PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
CO1	3														
CO2		2													
CO3			2												

Assessment Plan (for 50 marks of CIE)

Tool	Remarks	Marks
Internals	**Two**	40
QUIZ/AAT	**Two**	10
Lab Component	**---**	**---**
Total		**50**

Tutorial Plan

Tutorial #	Unit #	Topic
1	I	Problems on DFA Book 1, Chapter 2. Exercise 2.2.1,2.2.6, 2.2.7,
2	I	Problems on NFA Book 1, Chapter 2. Exercise 2.3.1,2.3.2, 2.3.3, 2.4.1
3	I	Problems on conversion of NFA to DFA Book 1, Chapter 2. Exercise 2.5.1,2.5.2,2.5.3
4	I	Real-life examples for DFA and NFA Book 1, Chapter 2. Exercise 2.2.10 Design a Vending Machines, Video Games, Traffic lights
5	II	Problems on regular expressions Book 1, Chapter 3. Exercise 3.1.1, 3.1.2,3.1.3
6	II	Problems on regular expressions Book 1, Chapter 3. Exercise 3.1.4, 3.1.5,3.1.3,3.2.1,3.2.3
7	III	Problems on Grammar and Minimization Book 1, Chapter 4. Exercise 4.2.1, 4.4.1,4.4.2
8	III	Problems on CFG Book 1, Chapter 5. Exercise 5.1.1,5.1.2,5.4.5,5.4.7
9	IV	Problems on PDA Book 1, Chapter 6. Exercise 6.2.1,6.2.2,6.2.3
10	IV	Problems on conversion of CGF to PDA and vice versa Book 1, Chapter 6. Exercise 6.3.1,6.3.2,6.3.3 Book 1, Chapter 7. Problem 7.4,7.8

11	V	Problems on Turing machine Book 1, Chapter 8. Exercise 8.2.1, 8.2.2, 8.2.3
12	V	Book 1, Chapter 8. Exercise 8.4.9, 8.4.10

SEE Exam Question paper format:

Unit-1	Mandatory	One Question to be asked for 20 Marks
Unit-2	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-3	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-4	Mandatory	One Question to be asked for 20 Marks
Unit-5	Mandatory	One Question to be asked for 20 Marks

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Sem	**4th**		
Course Title:	**Analysis and Design of Algorithms**		
Course Code:	**22CS4PCADA**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hrs.
1	Introduction to Algorithm, Fundamentals of Algorithmic Problem Solving. Analysis of Algorithm Efficiency: The Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non Recursive Algorithm, Mathematical Analysis of Recursive Algorithms.	8
2	Brute-Force: String Matching, Exhaustive Search: TSP, Knapsack Problem, Assignment Problem, Depth-First Search and Breadth-FirstSearch. Decrease-and-Conquer: Topological Sorting, Algorithms for Generating Combinatorial Objects: Generating Permutations, Decrease by-a-Constant-Factor Algorithms: Binary Search, Russian Peasant Multiplication, Variable Size-Decrease Algorithms: Computing Median and the Selection Problem	8
3	Divide-and-Conquer: Merge sort, Quicksort, Multiplication of Large Integers and Strassen's Matrix Multiplication. Transform-and-Conquer: Presorting, Heaps and Heap sort, Horner's Rule. Space and Time Tradeoffs: Horspool Algorithm, Boyer-Moore Algorithm.	8
4	Dynamic Programming: Coin Problem, The Knapsack Problem, Warshall's and Floyd's Algorithms. Greedy Technique: Prim's Algorithm, Kruskal's Algorithm-Without disjoint subsets and Union Find algorithms, Dijkstra's Algorithm, Huffman Trees.	8
5	Backtracking: *n*-Queens Problem, Subset-Sum Problem. Branch-and-Bound: Knapsack Problem, Traveling Salesman Problem. NP-Completeness: Polynomial time, Polynomial-time verification, NP-completeness and reducibility. NP-Complete Problems: The Clique problem, The Vertex Cover problem, Approximation Algorithms: The Vertex-Cover problem.	8

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Introduction to the Design and Analysis of Algorithms	Anany Levitin	Third Edition	Pearson	2014
2	Introduction to Algorithms	Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein	Third Edition	The MIT Press	2009

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Fundamentals of Computer Algorithms	Ellis Horowitz, Satraj Sahni and Rajasekhara M	2nd Edition	University Press Pvt. Ltd,	2009
2	Analysis and design of Algorithms	Padma Reddy		Sri Nandi Publications	2009

E-Books

Sl. No.	Book Title	Authors	Edition	Publisher	Year	URL
1	Introduction to Design & Analysis of Algorithms	K. Raghava Rao		Smash words	2013	https://www.smashwords.com/books/view/365630
2	Data structures and Algorithm Analysis in C++	Allen Weiss	Fourth edition	Pearson education	2014	http://www.uoitc.edu.iq/images/documents/informatics-institute/Competitive_exam/DataStructures.pdf

MOOC Courses

Sl. No.	Course name	Course Offered By	Year	URL
1	Design and Analysis of Algorithms	NPTEL	2019	https://onlinecourses.nptel.ac.in/noc19_cs47/preview
2	Design and Analysis of Algorithms	SWAYAM	2020	https://onlinecourses.swayam2.ac.in/cec20_cs03/preview

Course Outcomes

CO1	Analyze time complexity of Recursive and Non-recursive algorithms using asymptotic notations.
CO2	Apply various design techniques for the given problem.
CO3	Apply the knowledge of complexity classes P, NP, and NP-Complete and prove certain problems are NP-Complete
CO4	Design efficient algorithms and conduct practical experiments to solve problems.

CO-PO-PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3													
CO2	3														
CO3	1														
CO4			3	3	1										3

Assessment Plan (for50marksofCIE):

Tool	Remarks	Marks
Internals	**TWO**	**20**
QUIZ/AAT	**ONE**	**5**
Lab Component	**CIE+ Two Lab Tests**	**25**
Total		**50**

Laboratory Plan:

Instructions:

Design, develop and implement the specified algorithms for the following problems using any programming Language in LINUX/Windows environment, preferably using C language.

For sorting and searching problems, the program should allow both manual entry of the array elements and also reading of array elements using random number generator. Plot a graph of the time taken versus N using MS Excel and paste the same in the record. Observation book to be maintained for Continuous Internal Evaluation. Lab Record–Soft copy of the record.

For the first three lab session the students are to be introduced on the Hacker rank/ Leetcode platform to solve problems (eg: Tower of Hanoi, linear search, binary search, Bubble sort, selection sort, insertion sort, etc.).

Lab Program	Unit#	Program Details
1	1	Hacker rank / Leetcode exercises.
2	2	Hacker rank / Leetcode exercises.
3	2	Hacker rank / Leetcode exercises.
4	2	Write program to do the following: a. Print all the nodes reachable from a given starting node in a digraph using BFS method. b. Check whether a given graph is connected or not using DFS method.
5	2	Write program to obtain the Topological ordering of vertices in a given digraph.
6	2	Implement Johnson Trotter algorithm to generate permutations.
7	3	Sort a given set of N integer elements using Merge Sort technique and compute its time taken. Run the program for different values of N and record the time taken to sort.
8	3	Sort a given set of N integer elements using Quick Sort technique and compute its time taken.
9	3	Sort a given set of N integer elements using Heap Sort technique and compute its time taken.
10	4	Implement 0/1 Knapsack problem using dynamic programming.
11	4	Implement All Pair Shortest paths problem using Floyd's algorithm.
12	4	Find Minimum Cost Spanning Tree of a given undirected graph using Prim/Kruskal's algorithm.
13	4	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
14	5	Implement "N-Queens Problem" using Backtracking.

SEE Question paper format

Unit-1	Mandatory	One Question to be asked for 20 Marks
Unit-2	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-3	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-4	Mandatory	One Question to be asked for 20 Marks
Unit-5	Mandatory	One Question to be asked for 20 Marks

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Semester	**4th**		
Course Title:	**Computer Networks**		
Course Code:	**22CS4PCCON**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hrs.
1	**Introduction**: Data Communications, Networks, Network Types, Network Models, Protocol Layering, TCP/IP Protocol Suite, OSI Model. **Physical Layer:** Data and signals Digital Transmission, (D-D Conversion) Bandwidth Utilization, Multiplexing, Switching, Circuit Switched Networks, Packet Switching.	**8**
2	**Data Link Layer:** Link Layer Addressing, Error Detection and Correction, Block Coding, Cyclic Codes, Checksum. **Data Link Control:** DLC Services, Data-Link Layer Protocols, Media Access Control, Wired LANs, Ethernet protocol.	**8**
3	**Network Layer:** Network Layer Services, Packet Switching, Network Layer Performance, IPV4 Addresses. **Network Layer Protocols:** Internet Protocol, ICMPV4, Unicast Routing, Routing algorithms, Unicast routing protocols, Internet Structure, Routing Information Protocol (RIP), Next Generation IP: IPV6 Addressing, IPV6 Protocol, ICMPv6 Protocol, Transition from IPV4 to IPV6	**9**
4	**Transport Layer**: Transport Layer Protocols, User Datagram Protocol, Transmission Control Protocol.	**7**
5	**Application Layer:** Introduction, Standard Client Server Protocols.	**8**

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Data Communications and Networking 5E	Behrouz A Forouzan	Fifth	McGraw Hill	2013

Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1	Data and Computer Communication	William Stallings	Eight	Pearson Education	2008
2	Computer Networks – A Systems Approach	Larry L. Peterson and Bruce S. Davie	Fourth	Elsevier	2007

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1	An Introduction to Computer Networks	Peter L Dordal	First	-	2020	http://intronetworks.cs.luc.edu/current/ComputerNetworks.pdf

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1	Computer Networks and Internet Protocols	NPTEL	2020	https://nptel.ac.in/courses/106105183/
2	Network Protocols and Architecture	Coursera	2020	https://www.coursera.org/learn/network-protocols-architecture

Course Outcomes:

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

CO1	Apply the fundamental concepts of communication in networking.
CO2	Analyze the various protocols, techniques in TCP/IP network architecture
CO3	Develop programs that demonstrate the functionalities of physical, Data Link, Network, Transport or Application layer

CO-PO-PSO mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**														
CO2		**3**													
CO3			**3**		**1**									**2**	

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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	**Best of TWO**	**20**
QUIZ	**ONE**	**05**
Lab Component	**TWO**	**25**
Alternate Assessment Tool		**-**
Total		**50**

COMPUTER NETWORKS Lab - Plan of Activities:

CYCLE 1: Exercises done using CISCO Packet Tracer
CYCLE 2: Execution of Lab Programs using C/C++/Python

Experiment #	Unit #	Name of Experiment	Remarks
CYCLE 1			
1	2	Create a topology and simulate sending a simple PDU from source to destination using hub and switch as connecting devices and demonstrate ping message.	
2	3	Configure IP address to routers in packet tracer. Explore the following messages: ping responses, destination unreachable, request timed out, reply	
3	3	Configure default route, static route to the Router	
4	5	Configure DHCP within a LAN and outside LAN. ,.	
5	3	Configure RIP routing Protocol in Routers	
6	3	Configure OSPF routing protocol	
7	3	Demonstrate the TTL/ Life of a Packet	
8	5	Configure Web Server, DNS within a LAN.	
9	2	To construct simple LAN and understand the concept and operation of Address Resolution Protocol (ARP)	
10	5	To understand the operation of TELNET by accessing the router in server room from a PC in IT office.	
11	3	To construct a VLAN and make the PC's communicate among a VLAN	
12		To construct a WLAN and make the nodes communicate wirelessly	

CYCLE - 2			
13	2	Write a program for error detecting code using CRC-CCITT (16-bits).	
14		Write a program for congestion control using Leaky bucket algorithm.	
15	4	Using TCP/IP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.	
16	4	Using UDP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.	
17	3,4,5	Tool Exploration -Wireshark	

SEE Exam Question paper format:

Unit-1	Mandatory	One Question to be asked for 20 Marks
Unit-2	Internal Choice	Two Questions to be asked for 20 Marks
Unit-3	Internal Choice	Two Questions to be asked for 20 Marks
Unit-4	Mandatory	One Question to be asked for 20 Marks
Unit-5	Mandatory	One Question to be asked for 20 Marks

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Sem	**4th**		
Course Title:	**Seminar- Internship Involving Social Activity**		
Course Code:	**22CS4SRIN1**		
L-T-P:	**0-0-1**	**Total Credits:**	**1**

Syllabus:

Introduction: Technical Seminar Based on,

i. Summer/Winter Internship (with any NGO or company during mandatory internship of at least one week (at least five days) during the vacation period of 1st, 2nd and 3rd Semester) or

ii. Research paper presentation based on Technology Trends in Healthcare, Finance etc.

Course Outcomes

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

CO1	Ability to apply domain knowledge during the course of internship or research paper presentation
CO2	Ability to work independently and in a collaboration/multidisciplinary environment.
CO3	Ability to demonstrate effective verbal and written communication skills
CO4	Ability to exhibit integrity and ethical behavior while research paper communication or carrying out the internship on site and for the preparation of report.
CO5	Ability to allocate time effectively and manage to complete the work allotted within appropriate time

CO-PO-PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**														
CO2									**3**						
CO3										**3**					
CO4								**3**							
CO5											**3**				

Proposed Assessment Plan (for 50 marks of CIE):

Evaluation will be based on the rubrics set by the department under the committee of HOD, UG NBA coordinator, one Professor, one Associate Professor and one Assistant Professor.

Evaluation Rubrics:

Criteria	Excellent	Good	Average	Poor
Ability to apply domain knowledge during the course of internship (10M)	Apply domain knowledge for design and development of all issues during the course of internship (10M)	Apply domain knowledge for design and development of most issues during the course of internship (7M)	Apply domain knowledge for design and development of specific issues during the course of internship (5M)	Unable to apply complete domain knowledge for design and development issues during the course of internship (2M)
Ability to develop/implement the solutions with appropriate techniques, resources and contemporary tools (10M)	Able to develop/implement all the solutions with appropriate techniques, resources and contemporary tools (10M)	Able to develop/implement most of the solutions with appropriate techniques, resources and contemporary tools (7M)	Able to develop/implement specific solutions with appropriate techniques, resources and contemporary tools (5M)	Not confident to develop/implement solutions with appropriate techniques, resources and contemporary tools (2M)
Ability to work independently and in a collaboration/multidisciplinary environment. (10 M)	Able to work independently and in a collaboration/multidisciplinary environment. (10 M)	Able to work independently with minimal guidance and in a collaboration/multidisciplinary environment. (7M)	Able to work independently with more guidance and in a collaboration/multidisciplinary environment.(5M)	Unable to work independently without guide support and in a collaboration/multidisciplinary environment. (2M)
Ability to allocate time effectively and manage to complete the work allotted within appropriate time. (5M)	Able to allocate time effectively and complete all the work allotted within appropriate time. (5M)	Able to allocate time effectively and complete most of the work allotted within appropriate time. (4M)	Able to allocate time effectively and manage to complete the work allotted (3M)	Unable to use time effectively and complete the work allotted. (1M)

Ability to exhibit integrity and ethical behavior while carrying out the internship and for the preparation of internship report. (5M)	Able to effectively exhibit integrity and ethical behavior while carrying out the internship and for the preparation of internship report. (5M)	Able to moderately exhibit integrity and ethical behavior while carrying out the internship and for the preparation of internship report. (4M)	Able to partially exhibit integrity and ethical behavior while carrying out the internship and for the preparation of internship report. (3M)	Unable to exhibit integrity and ethical behavior while carrying out the internship and for the preparation of internship report. (1M)
Ability to demonstrate effective oral and written communication skills (10M)	Able to demonstrate effective oral and written communication skills (10M)	Able to demonstrate oral and written communication skills moderately. (7M)	Able to demonstrate oral and written communication skills minimally. (5M)	Unable to demonstrate effective verbal and written communication skills (2M)

SEE Exam (for 50 Marks):

Seminar Technical / Internship evaluation is will be carried out by External examiner along with internal faculty.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Sem	**4th**		
Course Title:	**Universal Human Values**		
Course Code:	**22MA4HSUHV**	**Total Contact Hours: 15 hours**	
L-T-P:	**0-1-0**	**Total Credits:**	**1**

Course Objectives:

To develop a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.

Unit No.	Topics
1	**Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education** 1. Purpose and motivation for the course, recapitulation from Universal Human Values-I. 2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration. 3. Continuous Happiness and Prosperity- A look at basic Human Aspirations. 4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. 5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. 6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.
2	**Understanding Harmony in the Human Being - Harmony in Myself!** 1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. 2. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. 3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). 4. Understanding the characteristics and activities of 'I' and harmony in 'I'. 5. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. 6. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

3	**Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship** 1. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship 2. Understanding the meaning of Trust; Difference between intention and competence 3. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship 4. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals 5. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives
4	**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence** 1. Understanding the harmony in the Nature 2. Holistic perception of harmony at all levels of existence.
5	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** 1. Natural acceptance of human values 2. Definitiveness of Ethical Human Conduct Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

At the end of the course, the student will have the ability to

CO1	Conduct self-exploration and distinguish between values and skills, happiness and accumulation of physical facilities, the self and the body, Intension and Competence of an individual
CO2	Analyze the value of harmonious relationship based on trust and respect in personal and professional life
CO3	Examine the role of a human being in ensuring harmony in society and nature
CO4	Apply the understanding of ethics in life and profession

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCE MATERIAL:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)

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Sem:	**4th**		
Course Title:	**Full Stack Web development & DevOps**		
Course Code:	**22CS4AEFWD**		
L-T-P:	**0-0-1**	**Total Credits:**	**1**

Introduction:

1. Database Application Development - Under this project work, student should develop back end data base table for any chosen data base applications. It can be extension of 3rd sem. project with back-end connection.
2. Under this project work, student should develop Advanced Web based Application using technologies such as PHP, Python, Node JS, React, Angular.
3. It can be extension of 3rd semester project with back-end connection but it should be a Front end with advanced web technologies.
4. Students can form a group with minimum of two and maximum of four.
5. Teacher allotted for project work to students should teach students technologies like Node JS, React etc., during Class/Lab hours as per the allotment. Teacher allotted for project work should guide the students in choosing the topic and towards carrying out project work and complete the evaluation of assigned students.

Course Outcomes:

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

CO1	Apply web technologies in the construction of a website.
CO2	Design and develop website effectively using available resources for the given specification.
CO3	Orally present and document effectively the implemented solutions.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3				3								1	3	
CO2		2	3		3								1	3	
CO3								1	3	3					

Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	---	---
QUIZ	---	---
Lab Component	---	**50**
Alternate Assessment Tool	----	--
Total		**50**

Rubrics for Project Evaluation:

Criteria	Exemplary	Proficient	Partially Proficient	Points
Layout	(10) The Web site has an exceptional design, attractive and usable layout. It is easy to locate all important elements.	(6) The Web pages have an attractive design and usable layout. It is easy to locate all important elements.	(4) The Web pages have a usable design layout, but may appear busy or boring. It is easy to locate most of the important elements.	__ / 10
Navigation	(5) Links for navigation are clearly labeled, consistently placed, allow the reader to easily move from a page to related pages (forward and back), and take the reader where s/he expects to go. A user does not become lost.	(3) Links for navigation are clearly labeled, allow the reader to easily move from a page to related pages (forward and back), and internal links take the reader where s/he expects to go. A user rarely becomes lost.	(2) Links for navigation take the reader where s/he expects to go, but some needed links seem to be missing. A user sometimes gets lost.	___ / 5
Validation of Form fields	(10) Validations have been carried out for all form fields completely in all the webpages.	(6) Most of the validations have been carried out for all form fields completely in all the webpages.	(4) Few of the validations has been carried out for the form fields in the webpages.	___ /10
Background	(5) Background is exceptionally attractive, consistent across pages, adds to the theme or purpose of the site, and does not detract from readability.	(3) Background is attractive, consistent across pages, adds to the theme or purpose of the site, and does not detract from readability.	(2) Background is consistent across pages and does not detract from readability.	___ /5

Content Accuracy	(5) All information provided by the student on the Web site is accurate, Legal and all the requirements of the assignment have been met.	(3) Almost all the information provided by the student on the Web site is accurate, legal and most of the requirements of the assignment have been met.	(2) Almost all of the information provided by the student on the Web site is accurate, legal and few of the requirements of the assignment have been met.	___ / 5
Report	(5) Clear and Effective writing and adherence to appropriate style guidelines	(3) Writing that is clear and effective for the most part and minor errors in adherence to appropriate style guidelines	(2) Unclear and ineffective writing and multiple errors in adherence to appropriate style guidelines	___/5
Oral communication / Presentation	(5) Clear and effective communication	(3) Communication is clear	(2) Unclear communication	___/5
Participation in Discussions	(5) Provided many good ideas; inspired others; clearly communicated ideas, needs, and feelings.	(3) Participated in discussions; on some occasions, made suggestions.	(2) Listened mainly; Rarely spoke up, and ideas were off the mark.	___/5
Total				__/ **50**

Tutorial Plan *(if applicable)*

Laboratory Plan *(if applicable)*

Project Topics for Website Development:

Department Lab Stock Book Maintenance System; Department Faculty Weekly Report Submission System. Department Faculty Self-Assessment Report Submission System; Department Faculty Self – Appraisal form Submission System; Department Student Project Submission System; Department Conference Paper Submission System; College TEQIP student project proposal submission system; College TEQIP Faculty Workshop / Conference / Seminar Application Submission System; College Exam Application Form Submission System

Note: Apart from the above-mentioned project topics if student groups come up with any innovative project ideas which are useful for the Department / College academic purpose will be considered based on the approval and acceptance from class teacher.

Sl. No	Week	Activity	Content deliverables by the assigned teacher
1	1st	Formation of groups. Note: Student groups of size 2 or 3 or 4	Introduction to full stack web development
2	2nd	Project topic selection by each Group.	Create basic web applications with Node.js and back-end database connection.
3	3rd	Presentation: Student and Project topic introduction by each group	Development and deployment of Web application.
4	4th ,5th, and 6th	Design Layout of the Web Pages	DEVOPS ADVANCE CONFIGURATION MANAGEMENT Chef is a popular tool for configuration management of IT infrastructure. Its flagship enterprise solution, Chef, is a strong choice for experienced DevOps teams who want to automate their development and deployment infrastructure. DEVOPS VIRTUALIZATION AND CONFIGURATION MANAGEMENT Demonstration on using and integrating JavaScript functionality, Slideshows, form validation, navigation, social media widgets.
5	7th	Presentation on Front-end Design by each group	ENTERPRISE APPLICATION AUTOMATION Kubernetes enables you to make the potential of container technology an operational reality by automating and simplifying your daily container workflow. Kubernetes automates deploying, scaling and managing containerized applications on a group (cluster) of (bare metal or virtual)
6	8th and 9th	Design and Development of connecting among different web pages	FUNDAMENTALS OF DEVOPS This course will give an introduction to DevOps. It will also cover various DevOps trends, working with GIT commands for software version control and using maven for build.
7	10th	Presentation by each group	
8	11th	Complete Project Work Demonstration by each group	
9	12th	Project Report Preparation	

Text Book:

Supplementary texts and resources:

1. **A Beginners guide to DevOps Basics**: https://www.edureka.co/blog/ebook/devops-ebook
2. **Learning DevOps**: https://online-pmo.com/wp-content/Education/Learning%20DevOps.pdf

Tutorial Link:

1. https://www.coursera.org/learn/intro-to-devops
2. https://www.udacity.com/course/intro-to-devops--ud611
3. https://www.classcentral.com/subject/devops

SEE Exam (50 Marks):

Evaluation of Projects carried out by students from External examiner along with internal faculty.

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ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

ವಿಷಯ ಸಂಕೇತ (Course Code)	**22MA4HSSAK**	**ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯ ಮಾಪನ ಅಂಕಗಳು.**	**50**
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ (Teaching Hours / week (L:T:P:S)	**1-0-0**	**ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಅಂಕಗಳು**	**50**
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ Total Hours of Pedagogy	**15 ಗಂಟೆಗಳು**	**ಒಟ್ಟು ಅಂಕಗಳು**	**100**
ಕ್ರೆಡಿಟ್ಸ್ (Credits)	**01**		

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು :

1. ವೃತ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಪರಿಚಯಿಸಿ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.
3. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾದಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು. ಕನ್ನಡ ಶಬ್ದ ಸಂಪತ್ತಿನ ಪರಿಚಯ.

ಭೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching – Learning Process – General Instructions):
These are sample Strategies; which teacher can use to accelerate the attainment of the course outcomes.

1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡವನ್ನು ಬೋಧಿಸಲು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಪ್ರಸ್ತುತ ಪುಸ್ತಕ ಆಧರಿಸಿ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನವನ್ನು ಅನುಸರಿಸುವುದು. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಪ್ರೇರೇಪಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.
2. ಇವತ್ತಿನ ತಂತ್ರಜ್ಞಾನದ ಅನುಕೂಲಗಳನ್ನು ಬಳಸಿಕೊಳ್ಳುವುದು - ಅಂದರೆ ಕವಿ - ಕಾವ್ಯ ಪರಿಚಯದಲ್ಲಿ ಕವಿಗಳ ಚಿತ್ರಣ ಮತ್ತು ಲೇಖನಗಳು ಮತ್ತು ಕಥೆ ಕಾವ್ಯಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂದಪಟ್ಟ ಧ್ವನಿ ಚಿತ್ರಗಳು, ಸಂಭಾಷಣೆಗಳು. ಈಗಾಗಲೇ ಇತರ ವಿಮರ್ಶಕರು ಬರೆದಿರುವ ವಿಮರ್ಶನಾತ್ಮಕ ವಿಷಯಗಳನ್ನು ಟಿಪಿಟಿ, ಡಿಜಿಟಲ್ ಮಾಧ್ಯಮಗಳ ಮುಕಾಂತರ ವಿಶ್ಲೇಷಿಸುವುದು.
3. ನವೀನ ಮಾದರಿಯ ಸಾಹಿತ್ಯ ಬೋಧನೆಗೆ ಸಂಬಂಧಪಟ್ಟ ವಿಧಾನಗಳನ್ನು ಶಿಕ್ಷಕರು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಅನುಕೂಲವಾಗುವ ರೀತಿಯಲ್ಲಿ ಅಳವಡಿಸುವುದು.

ಘಟಕ - 1	**3 Hours**

ಲೇಖನಗಳು:

1. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ: ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ.
2. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ.

ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪ್ಟ್ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು.
ಘಟಕ - 2	**4 Hours**
ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ: 1. ವಚನಗಳು: ಬಸವಣ್ಣ, ಅಕ್ಕ ಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಜೇಡರದಾಸಿಮಯ್ಯ , ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ. 2. ಕೀರ್ತನೆಗಳು: ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ - ಪುರಂದರದಾಸರು ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ - ಕನಕದಾಸರು	
ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪ್ಟ್ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು
ಘಟಕ - 3	**3 Hours**
ಆಧುನಿಕ ಕಾವ್ಯ ಭಾಗ: 1. ಕುರುಡು ಕಾಂಚಾಣ : ದಾ. ರಾ. ಬೇಂದ್ರೆ. 2. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು.	
ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪ್ಟ್ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು.
ಘಟಕ - 4	**3 Hours**
ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ, ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ: 1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ: ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ ಎನ್ ಮೂರ್ತಿರಾವ್. 2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ: ಹಿ. ಚಿ. ಬೋರಲಿಂಗಯ್ಯ.	
ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪ್ಟ್ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು .
<u>ಘಟಕ - 5</u>	**2 Hours**

ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ: ಕನ್ನಡ - ಕಂಪ್ಯೂಟರ್ ಶಬ್ದಕೋಶ	
ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪ್ಟ್ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು.

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಪರಿಣಾಮಗಳು (Course Outcomes):
Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO
22HS44CSAK	CO 1	ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯವಾಗುತ್ತದೆ.	PO10
	CO 2	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕ ಪೂರಾ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳು ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಆಸಕ್ತಿ ಮೂಡುತ್ತದೆ.	PO10
	CO 3	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ, ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗು ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.	PO9

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	50 % Weightage	Total
CIE – Theory	AAT 1	10	100	5	50
	AAT 2	10		5	
	Test 1	40		20	
	Test 2	40		20	
	Test 3	40		20	
SEE	End Exam	100		50	

Two best scores out of the three tests will be considered for CIE.

ಪಠ್ಯ ಪುಸ್ತಕ:

ಡಾ. ಹಿ. ಚಿ. ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ, ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ, ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

ಬಳಕೆ ಕನ್ನಡ			
ವಿಷಯ ಸಂಕೇತ (Course Code)	**22MA4HSBAK**	**ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯ ಮಾಪನ ಅಂಕಗಳು.**	**50**
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ (Teaching Hours / week (L:T:P:S)	**1-0-0**	**ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಅಂಕಗಳು**	**50**
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ Total Hours of Pedagogy	**15 ಗಂಟೆಗಳು**	**ಒಟ್ಟು ಅಂಕಗಳು**	**100**
ಕ್ರೆಡಿಟ್ಸ್ (Credits)	**01**		

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

- To create the awareness regarding the necessity of learning local language for comfortable and healthy life.
- To enable learners to Listen and understand the Kannada language properly.
- To speak, read and write Kannada language as per requirement and train the learners for correct and polite conservation.

ಭೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching – Learning Process – General Instructions):

These are sample Strategies; which teacher can use to accelerate the attainment of the course outcomes.

1. ಬಳಕೆ ಕನ್ನಡವನ್ನು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಬೋಧಿಸಲು ವಿಟಿಯು ಸೂಚಿಸಿರುವ ಪಠ್ಯಪುಸ್ತಕವನ್ನು ಉಪಯೋಗಿಸಬೇಕು.
2. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ಸ್‌ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಉತ್ತೇಜಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿ ಕೊಡುವುದು.
3. ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿ ಪುಸ್ತಕವನ್ನು ತರಗತಿಯಲ್ಲಿ ಬಳಸುವಂತೆ ನೋಡಿಕೊಳ್ಳುವುದು ಮತ್ತು ಪ್ರತಿ ಪಾಠ ಮತ್ತು ಪ್ರವಚನಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧ ಪಟ್ಟ ಪೂರಕ ಚಟುವಟಿಕೆಗಳಿಗೆ ತೊಡಗಿಸತಕ್ಕದ್ದು.
4. ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನದ ಮುಖಾಂತರ ಇತ್ತೀಚಿಗೆ ಡಿಜಿಟಲೀಕರಣ ಗೊಂಡಿರುವ ಭಾಷೆ ಕಲಿಕೆಯ ವಿಧಾನಗಳನ್ನು ಪಿಪಿಟಿ ದೃಶ್ಯ ಮಾಧ್ಯಮದ ಮುಖಾಂತರ ಚರ್ಚಿಸಲು ಕ್ರಮ ಕೈಗೊಳ್ಳುವುದು . ಇದರಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ತರಗತಿಯಲ್ಲಿ ಹೆಚ್ಚು ಏಕಾಗ್ರತೆಯಿಂದ ಪಾಠ ಕೇಳಲು ಮತ್ತು ಅಧ್ಯಯನದಲ್ಲಿ ತೊಡಗಲು ಅನುಕೂಲವಾಗುತ್ತದೆ.
5. ಭಾಷಾಕಲಿಕೆಯ ಪ್ರಯೋಗಾಲಯದ ಮುಖಾಂತರ ಬಹುಬೇಗ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಕಲಿಯಲು ಅನುಕೂಲವಾಗುವಂತೆ ಕಾರ್ಯ ಚಟುವಟಿಕೆಗಳನ್ನು ಮತ್ತು ಕ್ರಿಯಾ ಯೋಜನೆಗಳನ್ನು ರೂಪಿಸುವುದು.

UNIT – 1	**2 Hours**
1. Introduction, Necessity of learning a local language. Methods to learn the Kannada language. 2. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities 3. Key to Transcription. 4. ವ್ಯಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯ ಸೂಚಕ / ಸಂಬಂಧಿತ ಸಾರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು - **Personal Pronouns, Possessive Forms, Interrogative words**	
ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು.
UNIT – 2	**3 Hours**
1. ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣ ಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು Qualitative, quantitative and colour adjectives, numerals. 2. ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು - ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು - (ಅ, ಅದು, ಅವು, ಅಲ್ಲಿ) predictive forms, locative case.	
ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು.
UNIT – 3	**3 Hours**
1. ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು – Dative cases, and numerals. 2. ಸಂಖ್ಯಾವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು – Ordinal numerals and Plural markers.	
ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು.
UNIT – 4	**3 Hours**
1. ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತ್ತು ಒತ್ತಾಯ ಅರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು. Permission, Commands, encouraging and Urging words (Imperative words and sentences) 2. "ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯ ಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು. – Helping verbs “iru and iralla”, corresponding Future and negation verbs.	

ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು.
UNIT – 5	**4 Hours**
1. ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮತ್ತು ರಾಜ್ಯದ ಬಗ್ಗೆ ಕುರಿತಾದ ಇತರ ಮಾಹಿತಿಗಳು. Karnataka State and General Information about the State. 2. ಕನ್ನಡ ಭಾಷೆ ಮತ್ತು ಸಾಹಿತ್ಯ. Kannada Language and History. 3. Kannada Language Script Part – 1	
ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವ್ರುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು.

ಬಳಕೆ ಕನ್ನಡ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು:
Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO	Strength
22HS44CBAK	CO 1	To create an awareness regarding the necessity of learning local language for a comfortable living and to know more about Kannada culture and literature.	PO10	3
	CO 2	To develop proper speaking, reading and writing skills in Kannada.	PO10	3
	CO 3	To engage as a member of a team and enhance the skill in group communication and presentation.	PO9	1

Assessment Details (both CIE and SEE):

Component	Type of assessment	Max. Marks	Total	50 % Weightage	Total
CIE – Theory	AAT 1	10	100	5	50
	AAT 2	10		5	
	Test 1	40		20	
	Test 2	40		20	
	Test 3	40		20	
SEE	End Exam	100		50	

Two best scores out of the three tests will be considered for CIE.

ಪಠ್ಯ ಪುಸ್ತಕ:

ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ, ಬಳಕೆ ಕನ್ನಡ, ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Semester	**4th**		
Course Title:	**Cultural Activity**		
Course Code:	**22CS4NCCLA**		
L-T-P:	**0-0-0**	**Total Credits:**	**ZERO PASS / FAIL**

Introduction:

- Student can participate in any of the cultural activities such as Music, dance conducted by college or any other institute.
- Student should produce participation certificate for clearing this mandatory course.
- Note: If student is unable to participate in outside cultural activities then department Head
- should take care of conducting any small cultural event (like Essay, Debate etc.) of one or two day event in the college.
- Physically challenged students can produce participation certificate of any technical/cultural events conducted by college/department clubs.

Course Outcomes:

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

CO1	Able to reflect creatively on artistic and cultural processes of the society.
CO2	Demonstrate characters of individuality and teamwork in both competition and practice.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						3									
CO2									3						

Assessment Plan (for 50 marks of CIE)

CATEGORY	MARKS (RANGE)	CULTURAL ACTIVITIES
L1	90 (90-100)	Winning Certificates at International/National/Zonal Level Competitions.
L2	80 (80-89)	Winning Certificates at State and University Level Competitions
L3	70 (70-79)	• Winning Certificates/ at Inter-Collegiate competitions. • Representing college team Organizing • National/ State/University level events. • Core Committee of techno cultural activity. • Debating society (Adjudicator, Secretary, and President). • NGO activity with registered NGO recognized by the Institution.

L4	60 (60-69)	Organizing Inter –Collegiate/ College level Events (Organizer and volunteers)
L5	50 (50-59)	• Participation in International/National/ Zonal/State//University Level Events. • NGO activity with registered NGO recognized by the institution (Participation only)
L6	40 (40-49)	Participation in Inter-Collegiate /College level events/ Blood donation /NGO/ Personality development Programs

SEE Exam Question paper:

Student should produce participation certificate for clearing this mandatory course.

5th Semester

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Semester	**5**		
Course Title:	**Cryptography**		
Course Code:	**22CS5PCCRP**		
L-T-P:	**3-1-0**	**Total Credits:**	**4**

Unit No.	Topics	Hrs.
1	**Introduction:** Security Goals, Cryptographic Attacks **Mathematics of Cryptography:** Integer Arithmetic, Modular Arithmetic, Linear Congruence **Traditional symmetric-Key Ciphers:** Introduction, Substitution Ciphers, Transposition Ciphers, **Mathematics of Symmetric-key cryptography:** Algebraic Structures, GF (2^n) Fields	**8**
2	**Introduction to Modern Symmetric Key Ciphers:** Modern Block Ciphers, Modern Stream Ciphers. **Data Encryption Standard (DES):** Introduction, DES Structure, DES Analysis, Security of DES, Multiple DES **Advanced Encryption Standard (AES):** Introduction, Transformations, Key Expansion, AES Ciphers, analysis of AES	**8**
3	**Encipherment using Modern Symmetric-Key Ciphers:** Use of Modern Block Ciphers, Use of Stream Ciphers. **Mathematics of Asymmetric-Key Cryptography:** Primes, Primality Testing, Chinese Remainder Theorem, Quadratic Congruence, Legendre Symbol.	**8**
4	**Asymmetric -Key Cryptography:** Introduction, RSA cryptosystem, ElGamal Cryptosystem, Elliptic Curve cryptosystems. Cryptographic hash functions, Secure hash algorithm,	**8**
5	**Message Integrity and Message Authentication:** Message authentication, Digital Signature, RSA digital signature. **Key Management:** KERBEROS , Diffie-Hellman Key Agreement, X.509	**8**

Course Outcomes (Co):

CO1	**Apply** cryptographic techniques to ensure data confidentiality, integrity, and authentication.
CO2	**Analyze** various symmetric and asymmetric cryptosystems and types of attacks on these cryptosystems.
CO3	**Demonstrate** cryptographic encryption and decryption techniques.

CO-PO-PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3														3
CO2		3													
CO3				2	3				1	1					

Tool	Remarks	Marks
Internals	Best 2 out of 3	40
Quiz	--	--
Lab Component	--	--
Self-Study Component	--	--
AAT	ONE	10
Total		50

Prescribed Text Book:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	"Cryptography and Network Security"	Behrouz A. Forouzan and Debdeep Mukhopadhyay	2nd edition	Tata McGraw Hill	2013

Reference Text Book:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	"Cryptography: Theory and Practice"	Stinson. D.	3rd edition	Chapman & Hall/CRC	2012
2	"Cryptography and Network Security"	Atul Kahate		Tata McGraw-Hill	2003
3	"Cryptography and Network Security Principles and practice"	W. Stallings	5th edition	Pearson Education Asia	2013

E-Book:

Sl. No.	Book Title	Authors	Edition	Publisher	Year	URL
1	Cryptography and Network Security. Principles and Practice	William Stallings	3rd edition	Pearson Education	2007	http://williamstallings.com/Crypto3e.html
2	Handbook of Applied Cryptography	Menez, van Oorschot, Vanstone	ISBN: 0-8493-8523-7	CRC Press	2001	http://www.cacr.math.uwaterloo.ca/hac/

Mooc Course:

Sl. No.	Course name	Course Offered By	Year	URL
1	Cryptography and Network Security	NPTEL	2017	http://nptel.ac.in/courses/106105031/
2	Cryptography 1	Coursera	2019	https://www.coursera.org/course/crypto

Alternate Assessment Tool Plan:

PLAN:

Students are supposed to develop a Cryptographic algorithm/Digital Signature (using C/C++ preferably) without using libraries or built-in functions. Code demonstration along with a report has to be submitted.

Example: Implement of RSA Digital Signature, Elgamal Digital Signature, Diffie Hellman Signature, and Modified RSA algorithm for practical purpose, Hybrid encryption schemes.

Sl. No	Week	Activity
1	1st and 2nd	Formation of groups. Note: Student groups of size 2 members only
2	3rd	AAT topic selection by each group
3	4th	Presentation: Student team and topic introduction by each group
4	5th, 6th	Design the workflow along with Front-end Design
5	7th	Presentation on Front-end Design of the application
6	8th, 9th, 10th	Design and Development of the actual algorithm and testing it for various test cases.
7	11th	Complete code demonstration
8	12th	AAT Report Preparation

Rubrics Used For Evaluation (AAT):

Criteria	Exemplary	Proficient	Partially Proficient	Points
User Interface / Front End Design OR Tool Usage	(1) The designed application has an exceptional design, attractive and usable interface. It is easy to locate all important elements.	(0.75) The designed application has an attractive design and usable interface. It is easy to locate all important elements.	(0.5) The designed application has a usable design interface, but may appear busy or boring. It is easy to locate most of the important elements.	___ / 1
Implementation of the Algorithm OR Implementation done in the Tool	(4) Implementation of the algorithm has been done accurately without the usage of any library functions.	(2.5) Implementation of the algorithm has been done appropriately without the usage of any library functions.	(1.5) Implementation of the algorithm has been done with usage of few library functions.	___ /4
Testing for various cases	(1) The implemented algorithm works for any given valid input.	(0.75) The implemented algorithm works for almost all valid inputs.	(0.5) The implemented algorithm works for any some valid inputs.	___ /1
Application/Relevance	(1) The designed algorithm has several applications and is relevant in the area of cryptography.	(0.75) The designed algorithm has few applications and is relevant in the area of cryptography.	(0.5) The designed algorithm has few applications and is not very relevant in the area of cryptography.	___ /1
Report	(1) Clear and Effective writing and adherence to appropriate style guidelines	(0.75) Writing that is clear and effective for the most part and minor errors in adherence to appropriate style guidelines	(0.5) Unclear and ineffective writing and multiple errors in adherence to appropriate style guidelines	___/1
Oral communication (presentation)	(1) Clear and effective communication	(0.75) Communication is clear	(0.5) Unclear communication	___/1
Participation in Discussions	(1) Provided many good ideas; inspired others; clearly communicated ideas, needs, and feelings.	(0.75) Participated in discussions; on some occasions, made suggestions.	(0.5) Listened mainly; Rarely spoke up, and ideas were off the mark.	___/1
Total				__/ **10**

Tutorial Plan :

Tutorial #	Topic
1	**Open SSL Library Features and Application in Cryptography https://www.openssl.org/docs/**
2	**Introduction to CrypTool and Installation** **Demonstration of basic features available in CrypTool**
3	**Demonstration of Caesar cipher** In the message to decode, any punctuation is left unchanged in the encoded message, as too are any numbers. To change this **Options > Text Options** and from here you can select what attributes of a message the cipher will alter and which it will leave unchanged. Experiment encrypting the same message with the Caesar cipher with different settings selected from the text options. Decipher each message after doing so and see if the deciphered message still has the same punctuation, spacing etc.
4	**Demonstration of Vigenere cipher** Animal is a tool within the CrypTool that displays the concepts behind a cipher in a user friendly fashion, by the means of an animation. Demonstrate the use of animal tool for the above cipher.
5	**Demonstration of DES** Open a new file and type a plaintext message. Next click from the menu **Crypt/Decrypt > Symmetric (modern) > DES (ECB)…** This presents a key selection window, this key must be 64 bits long, which equates to 16 hexadecimal figures. For simplicity use the default key of: 00 00 00 00 00 00 00 00 Select **Encrypt** and there should be presented a window showing the data encrypted in hexadecimal form and its corresponding ASCII representation. To decrypt the message again select **Crypt/Decrypt > Symmetric (modern) > DES (ECB)…** Use the same key and select **Decrypt**, and the original message will be displayed in hexadecimal representation. Selecting **View > Show as text** displays it in ASCII; you may also notice some of the formatting is lost in the process or some padding is added. Encrypt the same message using the same process as above only selecting **Crypt/Decrypt > Symmetric (modern) > DES (CBC)…** instead. Compare the two encrypted messages.
6	**Compare ECB versus CBC mode of operation for the following applications: a) An online bank statement** **b) An encrypted VoIP session** **c) Viewing of a website using TCP/IP**
7	**Demonstrate DES encryption and decryption using Animal.**
8	**Demonstration of RSA** Now, encrypt a message of your choice using the values: p = 59, q = 71, e = 13 Observe the results. Encrypt the same message with the values: p = 673, q = 619, e = 13
9	**Demonstrate RSA encryption and decryption using Animal.**
10	**Demonstrate RSA implementation using PKI.**

11	**1963497163 is the product of two prime numbers, use tools within the CrypTool to find these two prime numbers. Mention what tools you used to do this.**
12	**Demonstrate hybrid encryption** Combine aspects of AES and RSA algorithm and demonstrate encryption of different plaintext.
13	**Demonstration of** OWASP vulnerabilities

SEE Exam Question Paper Format:

Unit-1	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-2	Mandatory	One Question to be asked for 20 Marks
Unit-3	Mandatory	One Question to be asked for 20 Marks
Unit-4	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-5	Mandatory	One Question to be asked for 20 Marks

Bloom's Level	Percentage of Questions to be Covered
Remember / Understand	35%
Apply / Analyze	40%
Create / Evaluate	25%

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Semester	**5**		
Course Title:	**Internet of Things**		
Course Code:	**22CS5PCIOT**		
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hrs
1	Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies, IoT Levels and Templates. IoT Physical Devices and Endpoints - Arduino UNO Introduction, Fundamentals of Arduino Programming, Sensor and actuator interfacing with Arduino.	8
2	IoT Processing Tools and Protocols Arduino and communication modules - Connecting microcontroller with mobile devices, communication through Bluetooth, Wi-Fi, RFID. Architecture Reference Model- Architecture with layers	8
3	Introduction to Raspberry Pi - Implementation of IoT with Raspberry Pi. Introduction to SDN, SDN for IoT. Resource constraint networks and Protocols- 6LoWPAN, RPL, CoAP, MQTT. Intel IOTivity – Device discovery functionality	8
4	Introduction to Cloud Storage and IoT data processing. Integrated cloud computing with IoT, Cloud Services, Cloud Service Providers. Edge Analytics: Introduction, Streaming data, Data stream Management systems, Edge analytics-event processing.	8
5	Data Handling and Analytics, Big Data in IoT: Foundation and principles of Data Science, Big Data Analytics in IoT, Machine learning and Deep Learning tools.	8

Course Outcomes (Co):

CO1	Apply various protocols, device discovery and cloud services in resource constraint networks for IoT applications.
CO2	Analyse the various IoT architectural components.
CO3	Design IOT systems using the Arduino development board and Raspberry Pi by interfacing sensors, communication modules and actuators.
CO4	Conduct experiments to demonstrate the working of IoT components and develop IoT applications for various real time problems.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2														
CO2		1													1
CO3			3												
CO4			3	1	3			2	2	1	1				

Tool	Remarks	Marks
Internals	Best 2 of 3	20
Lab Component	Lab Test-10 Marks Project-15 Marks	25
AAT	Quiz	05
Total		50

Prescribed Text Book:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Internet of Things: A Hands-On Approach	Arsheep Bahga, Vijay Madisetti	1st	Orient Blackswan Private Limited	2015
2	Arduino Cookbook	Michael Margolis	2nd	O'Reilly Media	2011
3	Internet of Things: Architecture and Design Principles	Raj Kamal	1st	McGraw Hill Education	2017

Reference Text Book:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Arduino Applied: Comprehensive Projects for Everyday Electronics	Neil Cameron	1st	Apress	2019
2	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things	David Hanes, Gonzalo Salgueiro	-	Cisco Press	2017
3	Online reference:	https://biet.ac.in/pdfs/III%20-%20II%20IT_IOT.pdf	-	-	-

E-Book:

Sl. No.	Book Title	Authors	Edition	Publisher	Year	URL
1	Designing for the Internet of Things	---	2	O'reilly	2017	https://www.oreilly.com/design/free/designing-for-the-internet-of-things.csp
2	Using the Web to Build the IoT	DOMINIQUE GUINARD	2	Manning Publisher	2016	https://webofthings.org/2016/04/24/free-book-using-the-web-to-build-the-iot/

MOOC Course:

Sl. No.	Course name	Course Offered By	Year	URL
1	Introduction to Internet of Things	IIT Kharagpur	2018	https://nptel.ac.in/courses/106/105/106105166/
2	AWS IoT: Developing and Deploying an Internet of Things	Edx	2020	https://www.edx.org/course/aws-iot-developing-and-deploying-an-internet-of-th

Internet of Things Lab - Plan of Activities
(Evaluation: 10 Marks)

Instructions to Students to be followed in each IOT lab:

1. Each Student should write down the work carried out and the outputs in the observation book and get it evaluated by the respective lab faculty in-charge.
2. Each Student should bring the lab record with the programs and output written for the programs completed in their respective previous week and get it evaluated by the lab faculty in-charge. In the record book students should
    - Handwrite the Circuit diagram
    - Handwrite the Program
3. Each Student should practice programs using different sensor and actuator combinations also.

Note: Lab test will consist of a new set of programs, but designed using the sensor and actuators practiced in the lab.

Experiment #	Name of Experiment
1	Design and implement ON/OFF the light based on human presence in the room using PIR sensor and LED
2	Design and implement Fire alarm system using flame sensor and buzzer
3	Design and implement smart irrigation system using Soil Moisture sensor and Servo Motor
4	To design and implement an obstacle detection system using ultrasonic sensors and LCD.
5	Design and implement Color recognizing system using color sensor and RGB LED.
6	Design and implement an access control system using RFID.
7	Design and implement a system to realise Bluetooth Master/Slave scenario.
8	Design and implement Home Automation using Relay and Bluetooth.
9	Design and implement a Fire alert system using GSM.
10	Study of Connectivity and Configuration of Raspberry Pi/ BeagleBoard circuit with basic peripherals, LEDs, Understanding GPIO and its use in programs.
11	Write a program on Arduino/Raspberry Pi to upload and retrieve temperature and humidity data from thingspeak cloud or any cloud platform.
12	To install MySQL database on Raspberry Pi and perform basic SQL queries

Sl. No	Project Evaluation Rubrics-15 marks			
	Criteria	Excellent	Proficient	Partially Proficient
1	Creativity, Originality and Planning	Project is creative, original and well planned (3)	Project is moderately creative, original and planned (1.5)	Project is not creative, neither original nor planned (1)
2	Hardware circuit Design	All modules are designed appropriately in accordance to the requirements. (3)	All modules are designed moderately in accordance to the requirements. (1.5)	All modules are designed inappropriately in accordance to the requirements. (1)
3	Implementation	Ideal implementation of modules for all set objectives. (4)	Appropriate implementation of modules for most of the set objectives. (2)	Concern to implementation of modules for a few set objectives. (1)
4	Report	Clear and Effective writing and adherence to appropriate style guidelines (2)	Writing that is clear and effective for the most part and minor errors in adherence to appropriate style guidelines (1)	Unclear and ineffective writing and multiple errors in adherence to appropriate style guidelines (0.5)

Sl. No	Project Evaluation Rubrics-15 marks			
	Criteria	**Excellent**	**Proficient**	**Partially Proficient**
5	Oral communication (presentation)	Clear and effective communication (2)	Communication is clear (1.75)	Unclear communication (0.5)
6	Participation in Discussions	Provided many good ideas; inspired others; clearly communicated ideas, needs, and feelings. (1)	Participated in discussions; on some occasions, made suggestions. (0.75)	Listened mainly; Rarely spoke up, and ideas were off the mark. (0.5)

SEE Exam Question paper format:

Unit-1	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-2	Mandatory	One Question to be asked for 20 Marks
Unit-3	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-4	Mandatory	One Question to be asked for 20 Marks
Unit-5	Mandatory	One Question to be asked for 20 Marks

Bloom's Level	Percentage of Questions to be Covered
Remember / Understand	20%
Apply / Analyze	40%
Create / Evaluate	40%

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Semester	**5**		
Course Title:	**Artificial Intelligence**		
Course Code:	**22CS5PCAIN**		
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hrs
1	Introduction: Definition, Foundations and History of AI Intelligent Agents: Agents and environment, Concept of Rationality, The nature of environment, The structure of agents. Problem-solving: Problem-solving agents, Example problems, Searching for Solutions	8 Hrs
2	Uninformed Search Strategies: Breadth First search, Depth First Search, Iterative deepening depth first search, Hill Climbing, Simulated annealing and Monotonicity; Informed Search Strategies: Heuristic functions, Greedy best first search, A*search. Heuristic Functions	8 Hrs
3	Logical Agents: Knowledge–based agents, The Wumpus world, Logic, Propositional logic, Propositional theorem proving , First Order Logic: Representation Revisited, Syntax and Semantics of First Order logic, Using First Order logic	8 Hrs
4	Inference in First Order Logic: Propositional Versus First Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution	8 Hrs
5	Uncertain Knowledge and Reasoning: Quantifying Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference using Full Joint Distributions, Independence, Baye's Rule and its use. Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, Semantics of Bayesian Networks, Exact and approximate inference in Bayesian Networks	8 Hrs

CO1	A**pply** knowledge of agent architecture, searching and reasoning techniques for different applications.
CO2	A**nalyse** Searching and Inferencing Techniques.
CO3	**Design** a reasoning system for a given requirement
CO4	**Conduct** practical experiments for demonstrating agents, searching and inferencing.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3														
CO2		2													
CO3			3												3
CO4				3											

Tool	Remarks	Marks
Internals	**TWO**	**20**
QUIZ	**ONE**	**5**
Lab Component	**Two Lab Test (12M + 13M)**	**25**
Alternate Assessment Tool	**--**	**--**
Total		**50**

Prescribed Text Book					
Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Artificial Intelligence	Stuart J.Russell and Peter Norvig	Third	Pearson	2015

Reference Text Book					
Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Artificial Intelligence	Elaine Rich, Kevin Knight, Shivashankar B Nair	Third	Tata McGraw Hill	2013
2.	Artificial Intelligence o-	George F Luger	Fifth	Pearson Education	2009

E-Book						
Sl. No.	Book Title	Authors	Edition	Publisher	Year	URL
1.	Artificial Intelligence: Foundations of Computational Agents	David L. Poole and Alan K. Mackworth	Second		2017	https://www.kdnuggets.com/2019/11/10-free-must-read-books-ai.html

MOOC Course				
Sl. No.	Course name	Course Offered By	Year	URL
1.	Knowledge-Based AI: Cognitive Systems	UDACITY		https://www.udacity.com/course/knowledge-based-ai-cognitive-systems--ud409
2.	Artificial Intelligence -	NPTEL	2009	https://nptel.ac.in/courses/106/105/106105077/

BMS COLLEGE OF ENGINEERING, BANGALORE-19

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Laboratory Plan

Instructions- a) Design, develop and implement the specified algorithms for the following problems using Python Language in LINUX / Windows environment.

b) Lab Record - Handwrite the algorithm and attach the printout of the Program and the output.

Note: The faculty in charge of Artificial Intelligence course of all the sections must come up with two to three test cases for the programs in the laboratory set at the beginning of the semester. The students are expected to write the algorithm /program to solve these test cases. Depending on the number of test cases executed by the student the evaluation for the week must be done.

Experiment #	Unit #	Name of Experiment	Remarks
1	1	Implement Tic –Tac –Toe Game.	
2	1	Solve 8 puzzle problems.	
3	2	Implement Iterative deepening search algorithm.	
4	2	Implement A* search algorithm.	
5	2	Write a program to implement Simulated Annealing Algorithm	
6	1	Implement vaccum cleaner agent.	
7	3	Create a knowledge base using prepositional logic and show that the given query entails the knowledge base or not .	
8	3	Create a knowledge base using prepositional logic and prove the given query using resolution	
9	3	Implement unification in first order logic	
10	3	Convert a given first order logic statement into Conjunctive Normal Form (CNF).	
11	4	Create a knowledge base consisting of first order logic statements and prove the given query using forward reasoning.	

Question paper pattern

Unit-1	Internal Choice	Two Questions to be asked for 20Marks each
Unit-2	Mandatory	One Question to be asked for 20Marks
Unit-3	Internal Choice	Two Questions to be asked for 20Marks each
Unit-4	Mandatory	One Question to be asked for 20Marks
Unit-5	Mandatory	One Question to be asked for 20Marks

Bloom's Level	Percentage of Questions to be Covered
Remember / Understand	25%
Apply / Analyze	50%
Create / Evaluate	25%

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Semester	**5**		
Course Title:	**Compiler Design**		
Course Code:	**22CS5PCCPD**		
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hrs
Unit-1	Introduction, Lexical Analysis: Language processors, The Structure of Compilers, Lexical analysis: The Role of Lexical Analyzer, Input Buffering, Specifications of Tokens, recognition of Tokens.	8 Hrs
Unit-2	Syntax Analysis: Introduction, Parsing: Top-down Parsing, Bottom-up Parsing, Introduction to LR Parsing: Simple LR parser, More Powerful LR Parsers	8 Hrs
Unit-3	Syntax-Directed Definitions, Evaluation order for SDDs, Applications of Syntax-directed translation, Syntax-directed translation schemes.	8 Hrs
Unit-4	Intermediate Code Generation: Variants of syntax trees, Three-address code, Types and declarations, Translation of expressions, Type checking, Control flow, Back patching, and Switch statements	8 Hrs
Unit-5	Code Generation: Issues in the design of Code Generator, The Target language, Addresses in the target code, Basic blocks and Flow graphs, Optimization of basic blocks, A Simple Code Generator.	8 Hrs

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Compilers Principles, Techniques and Tools	Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman	**2nd**	Pearson education	2012

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Kenneth C Louden	Compiler Construction - Principles & Practice	**1st**	CENGAGE learning	1997
2.	Andrew W Appel	Modern Compiler Implementation	**1st**	Cambridge University Press	2101

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Compiler Design	NPTEL	2021	https://onlinecourses.nptel.ac.in/noc21_cs07/preview

Course Outcomes (CO's):

CO1	Apply the fundamental concepts for the various phases of compiler design.
CO2	Analyse the syntax and semantic concepts of a compiler.
CO3	Design various types of parsers and Address code generation
CO4	Implement compiler principles, methodologies using lex, yacc tools

CO-PO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3														
CO2		3													
CO3			2												
CO4			3		2										

Evaluation Rubrics:

Tool	Remarks	Marks
Internals	20 M	20
QUIZ	5 M	5
Lab Component	25 M	25
Alternate Assessment Tool	--	--
Total		50

List of Lab Programs for Compiler Design course (21CS5PCCPD):

Part-A: Implementation of Lexical Analyzer, By using C/C++/Java/Python language and using LEX tool.

1. Write a program to design Lexical Analyzer in C/C++/Java/*Python* Language (to recognize any five keywords, identifiers, numbers, operators and punctuations)

2. Write a program in LEX to recognize Floating Point Numbers.

3. Write a program in LEX to recognize different tokens: Keywords, Identifiers, Constants, Operators and Punctuation symbols.

4. Write a LEX program that copies a file, replacing each nonempty sequence of white spaces by a single blank.

5. Write a LEX program to recognize the following tokens over the alphabets {0,1,..,9}

   a) The set of all string ending in 00.

   b) The set of all strings with three consecutive 222's.

   c) The set of all string such that every block of five consecutive symbols contains at least two 5's.

   d) The set of all strings beginning with a 1 which, interpreted as the binary representation of an integer, is congruent to zero modulo 5.

   e) The set of all strings such that the 10th symbol from the right end is 1.

   f) The set of all four digits numbers whose sum is 9 g) The set of all four digital numbers, whose individual digits are in ascending order from left to right.

Part-B: Part-B: Implementation of Parsers (Syntax Analyzers) Using C/C++/Java/Python language)

1. Write a program to implement

(a) Recursive Descent Parsing with back tracking (Brute Force Method). S→ cAd , A →ab /a

(b) Recursive Descent Parsing with back tracking (Brute Force Method). S→ cAd , A → a / ab

2. Write a program to implement: Recursive Descent Parsing with back tracking (Brute Force Method).

   (a) S→ aaSaa | aa

   (b) S → aaaSaaa | aa

   (c) S → aaaaSaaaa | aa

   (d) S → aaaSaaa |aSa | aa

Part-C: Syntax Directed Translation using YACC tool

   1. Write a program to design LALR parsing using YACC.

2. Use YACC to Convert Binary to Decimal (including fractional numbers)
3. Use YACC to implement, evaluator for arithmetic expressions (Desktop calculator)
4. Use YACC to convert: Infix expression to Postfix expression.
5. Use YACC to generate Syntax tree for a given expression
6. Use YACC to generate 3-Address code for a given expression
7. Use YACC to generate the 3-Address code which contains Arrays.

SEE Exam Question paper format

Unit-1	Mandatory	One Question to be asked for 20 Marks
Unit-2	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-3	Mandatory	One Question to be asked for 20 Marks
Unit-4	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-5	Mandatory	One Question to be asked for 20 Marks

Bloom's Level	**Percentage of Questions to be Covered**
Remember / Understand	25%
Apply / Analyze	50%
Create / Evaluate	25%

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Semester	**5th**		
Course Title:	**Wireless and Mobile Communication**		
Course Code:	**22CS5PEWMC**		
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hrs
1	**Applications and requirements of wireless services**: History, Types of Services, Requirements for the services, Economic and social aspects. **Technical Challenges of wireless communications:** Multipath propagation, Spectrum limitations, Limited energy, User mobility	8 Hrs
2	**Cellular Wireless Networks:** Principles of cellular networks, First-General Analog, Second generation TDMA, Second generation CDMA, Third generation systems. **Antennas and wave propagation:** Antennas, Propagation Modes. **Wireless Systems Operations and Standards:** Cordless systems, Wireless local loop, WiMAX and 802.16 broadband wireless access standards.	8 Hrs
3	**Wireless LAN Technology:** Overview, Infrared LANs **Wi-Fi and IEEE 802.11:** IEEE 802.11 Architecture, IEEE 802.11 Architecture and services **Bluetooth and IEEE 802.15:** Overview, Radio Specification, **IEEE 802.15 -** IEEE 802.15.3- Medium access control	8 Hrs
4	**Telecommunication Systems:** GSM, TETRA, UMTS and IMT-2000. **Satellite Systems:** Applications, Basics, Routing, Localisations, Handover. **Mobile IP and Wireless Application Protocol:** Mobile IP, Wireless Application Protocol	8 Hrs
5	**Mobile Transport Layer:** Traditional TCP, Classical TCP improvements, TCP over 2.5/3G wireless networks. **Support for Mobility:** World Wide Web, Wireless Application Protocol (version 1.x), WAP 2.0.	8 Hrs

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Wireless Communications	Andreas F Molisch	First	Wiley, India	2010
2	Wireless Communications and Networks	William Stallings	Second	Pearson	2009
3	Mobile Communications	Joschen Schiller	Second	Pearson	2009

Reference Books					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1	Wireless Communications Principles and practices	Theodore S. Rappaport	Second	Pearson	2018
2	Mobile Communications Engineering: Theory and Applications	William C. Y. Lee	Second	McGraw-Hill Publications	2017

MOOC Course				
Sl. No.	**Course name**	**Course offered by**	**Year**	**URL**
1	Introduction To Wireless and Cellular Communications	NPTEL	2023	https://nptel.ac.in/courses/106106167
2	Wireless Network	Udemy	2023	https://www.udemy.com/course/wireless-network-q/

Course Outcomes: **At the end of the course the student will be able to**	
CO1	Apply the concepts of cellular, wireless and mobile standards in wireless environments
CO2	Analyse the functionalities of various wireless technologies
CO3	Explore a network simulator and demonstrate the working of a wireless scenario

CO-PO-PSO- Mapping															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**														
CO2		**2**													
CO3				**1**	**3**				**2**	**2**				**2**	

Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**	**Marks**
Internals	Two internals	40
AAT	One	10
	Total	**50**

SEE Exam Question paper format:

Unit-1	Mandatory	One Question to be asked for 20 Marks
Unit-2	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-3	Mandatory	One Question to be asked for 20 Marks
Unit-4	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-5	Mandatory	One Question to be asked for 20 Marks

Bloom's Level	**Percentage of Questions to be Covered**
Remember / Understand	30%
Apply / Analyze	50%
Create / Evaluate	20%

Alternate Assessment Tool Plan:

Students are supposed to explore any of network simulators and demonstrate the working of a wireless scenario. A report has to be submitted. Demonstration of simulated scenarios (preferably with code) along with a report has to be submitted.

Sl. No	**Week**	**Activity**
1	1st and 2nd	Formation of groups. Note: Student groups of size 2 to 4 members only
2	3rd	AAT topic selection by each group
3	4th	Presentation: Student team and topic introduction by each group
4	5th, 6th,7th	Demonstration of the significant modules of the network simulators through simple case studies
5	8th , 9th , 10th	Demonstration of the various functionalities validating the wireless scenario chosen in the chosen network simulator.
6	11th,12th	AAT Report Preparation

Rubrics used for evaluation:

Criteria	Exemplary	Proficient	Partially Proficient	Points
Selection of scenario for demonstration	(2) The chosen scenario has an exceptional application. It demonstrates most of the wireless communication concepts.	(1) The chosen scenario has an acceptable application. It demonstrates some of the wireless communication concepts.	(0.5) The chosen scenario has a simple application. It demonstrates few of the wireless communication concepts.	___/ 2
Selection of an appropriate Network simulator	(2) The network simulator chosen supports the implementation of all the concepts for the chosen scenario.	(1) The network simulator chosen supports the implementation of most of the concepts for the chosen scenario.	(0.5) The network simulator chosen supports the implementation of few of the concepts for the chosen scenario.	___/2
Exploration of the chosen network simulator to validate the various functionalities involved in the chosen scenario.	(2) The chosen simulator has been explored in depth to validate all the functionalities chosen.	(1) The chosen simulator has been explored to validate most of the functionalities chosen.	(0.5) The chosen simulator has been explored to validate some of the functionalities chosen.	___/2
Report	(2) Clear and effective writing and adherence to appropriate style guidelines	(1) Writing that is clear and effective for the most part and minor errors in adherence to appropriate style guidelines	(0.5) Unclear and ineffective writing and multiple errors in adherence to appropriate style guidelines	**_____/2**
Oral communication (presentation)	(1) Clear and effective communication	(0.75) Communication is clear	(0.5) Unclear communication	**_____/1**
Participation in Discussions	(1) Provided many good ideas; inspired others; clearly communicated	(0.75) Participated in discussions; on some occasions,	(0.5) Listened mainly; Rarely spoke up, and ideas were off the	**____/1**

	ideas, needs, and feelings.	made suggestions.	mark.	
Total				__/ **10**

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Academic Year	**Aug-Dec 2023**	**Semester**	**5**
Course Title:	**Data Exploration and Visualization**		
Course Code:	**22CS5PEDEV**		
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hrs
Unit-1	**Introduction to Exploratory Data Analysis (EDA)** –Steps in EDA, Data Types: Numerical Data – Discrete data, continuous data – Categorical data – Measurement Scales: Nominal, Ordinal, Interval, Ratio – Comparing EDA with classical and Bayesian Analysis – Software tools for EDA.	8 Hrs
Unit-2	**Transformation Techniques:** Performing data deduplication - replacing values – Discretization and binning. Introduction to Missing data, handling missing data: Traditional methods - Maximum Likelihood Estimation.	8 Hrs
Unit 3	**Descriptive Statistics:** Understanding statistics , Measures of central tendency , Measures of dispersion , Grouping Datasets Understanding groupby() , Groupby mechanics , Data aggregation , Pivot tables and cross-tabulations , Correlation : Introducing correlation , Types of analysis, Understanding , Correlation does not imply causation	8 Hrs
Unit 4	**Types of analysis:** Univariate analysis - bivariate analysis - multivariate analysis. Time Series Analysis (TSA): Fundamentals of TSA - characteristics of TSA – Time based indexing - visualizing time series – grouping time series data - resampling time series data.	8 Hrs
Unit 5	**Visualizing Data**: Mapping Data onto Aesthetics Data, Scales, Coordinate Systems and Axes, , Directory of Visualizations, Visualizing Amounts, Visualizing Distributions: Histograms and Density Plots, Visualizing Multiple Distributions at the Same Time. **Visualizing Distributions:** Empirical Cumulative Distribution Functions and Q-Q Plots, Visualizing Many Distributions at Once, Visualizing Associations Among Two or More Quantitative Variables, Visualizing Uncertainty, Visualizing proportions, Handling overlapping points: Partial Transparency and Jittering,2D Histograms, Redundant Coding.	8 Hrs

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Hands-On Exploratory Data Analysis with Python	Suresh Kumar Mukhiya, Usman Ahmed	1st Edition	Packt	2020
2	Fundamental of Data Visualization	Claus O. Wilke	1st Edition	O'Reilly	2019

Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1	Data Exploration and Visualization.	Anamitra DehMukh,Nimbalkar	1st Edition	Technical Publications	2022
2	Exploratory Data Analysis with Python	Ayodele Oluleye	1st Edition	Packt	2023
3	Python for Data Analysis.	Wes Mckinney	2nd Edition	O'Reilly Media	2017

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1	Data Visualization,Exploring and Explaining with Data	Jeffery D Comm, James.J.Cochran Michael.J.Fry	First	Cengage	2022	https://www.perlego.com/book/3815910/data-visualization-exploring-and-explaining-with-data-pdf

MOOC Course				
Sl. No.	**Course name**	**Course offered by**	**Year**	**URL**
1	Data Visualization	Coursera		https://www.coursera.org/articles/data-visualization
2	Data Visualization	EDX		http://edx.org/course/data-science-visualization

Course Outcomes: **At the end of the course the student will be able to**	
CO1	Apply the computational approaches to perform Data Exploration and Visualization.
CO2	Analyse the different techniques to perform Data Exploration and Visualization for a given application.
CO3	Demonstrate exploratory data analysis to real data sets and provide interpretations through relevant visualization tools.

CO-PO-PSO- Mapping															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**														
CO2		**3**													
CO3					**3**				**3**	**3**					

Proposed Assessment Plan (for 50 marks of CIE)

Tool	Remarks	Marks
Internals	Best 2 of 3	40
AAT	Mini-project	10
	Total	50

Under AAT component, Students have to form teams of 3 or 4. Each team has to develop an application for analysing a real time dataset (Kaggle dataset) and draw meaningful insights using visualization tools.

Student Project group Plan of Activities: Following are the activities to be carried out by students during project work

Sl. No	Week	Activity
1	1st	Formation of groups. Note: Student groups of size 2 to 4
2	2nd and 3rd	Project topic selection by each group
3	4th	Presentation-1: Student and Project topic introduction by each group
4	5th	Data Acquisition and Data Preparation
5	6th and 7th	Presentation-2: Exploratory tools demonstration
6	8th and 9th	Presentation-3: Techniques applied on EDA
7	10th	Presentation-4: Visualization tools demonstration
8	11th	Complete Project Work Demonstration by each group
9	12th	Project Report Submission

Project Evaluation Rubrics

Criteria	Exemplary	Proficient	Partially Proficient	Points
Selection of the topic (CO2, CO3, PO2, PO3)	(1.5) The topic chosen is relevant to the present scenario and is the emerging aspect pertaining to society.	(1) The topic chosen is relevant to the present scenario and is suitable to already prevalent events.	(0.5) The topic chosen is relevant to the present scenario and it has already been dealt with.	_ / 2
Data Acquisition and Data Preparation (CO2, CO3, PO2, PO3)	(1.5) Students has acquired enough data with accurate data cleaning.	(1) Students has acquired enough data with little accurate data cleaning.	(0.5) Students has acquired enough data with least accurate data cleaning.	_ / 2
Presentation on tools used by each group (CO3, PO5)	(1) Appropriate tools have been chosen to match the identified problem.	(0.75) Partially suitable tools have been chosen to match the identified problem.	(0.5) Unrelated tools have been chosen to match the identified problem.	__ / 2

Presentation on Reporting the findings (CO3, PO9)	(2) Excellent result has been derived from the analysis with proper visualization.	(1) Good result has been derived from the analysis with proper visualization.	(0.75) Satisfactory result has been derived from the analysis with proper visualization.	___ /2
Report (CO3, PO9)	(1) Clear and Effective writing and adherence to appropriate style guidelines	(0.75) Clear and minor errors in writing and adherence to appropriate style guidelines	(0.5) Clear and ineffective writing and multiple errors in adherence to appropriate style guidelines	___/1
Oral communication (presentation) (CO3, PO10)	(1) Clear and effective communication	(0.75) Communication is clear	(0.5) Unclear Communication	___/1
			Total	__/ **10**

Unit-1	Mandatory	One Question to be asked for 20 Marks
Unit-2	Mandatory	One Question to be asked for 20 Marks
Unit-3	Mandatory	One Question to be asked for 20 Marks
Unit-4	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-5	Internal Choice	Two Questions to be asked for 20 Marks each

Bloom's Level	**Percentage of Questions to be Covered**
Remember / Understand	35%
Apply / Analyze	40%
Create / Evaluate	25%

Semester	**5**		
Course Title:	**Computer Graphics**		
Course Code:	**22CS5PECGH**		
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hrs
Unit-1	**Computer Graphics Hardware:** Video Display Devices, Raster-Scan Systems, Graphics Networks, Graphics on the Internet. **Computer Graphics Software**: Coordinate Representations, Graphics Functions, Software Standards, Other Graphics Packages, Introduction to OpenGL. **Graphics Output Primitives**: Coordinate Reference Frames, Specifying a Two-Dimensional World-Coordinate Reference Frame in OpenGL, OpenGL Point Functions, OpenGL Line Functions, OpenGL Curve Functions.	8 Hrs
Unit-2	Fill-Area Primitives, Polygon Fill Areas, OpenGL Polygon Fill-Area Functions, OpenGL Vertex Arrays, Pixel-Array Primitives, OpenGL Pixel-Array Functions, Character Primitives, OpenGL Character Functions, Picture Partitioning, OpenGL Display Lists, OpenGL Display-Window Reshape Function. **Attributes of Graphics Primitives**: OpenGL State Variables, OpenGL Color Functions, OpenGL Point-Attribute Functions, OpenGL Line-Attribute Functions, Curve Attributes, OpenGL Fill-Area Attribute Functions.	8 Hrs
Unit-3	**Implementation Algorithms for Graphics Primitives and Attributes**: Line-Drawing Algorithms, Parallel Line Algorithms, Setting Frame-Buffer Values, Circle-Generating Algorithms. **Two-Dimensional Geometric Transformations**: Basic Two-Dimensional Geometric Transformations, Matrix Representations and Homogeneous Coordinates, Inverse Transformations, Two-Dimensional Composite Transformations, Other Two-Dimensional Transformations, Raster Methods for Geometric Transformations.	8 Hrs
Unit-4	**Two-Dimensional Viewing**: The Two-Dimensional Viewing Pipeline, The Clipping Window, Normalization and Viewport transformations, OpenGL Two-Dimensional Viewing Functions, Clipping Algorithms, Two-Dimensional Point Clipping, Two-dimensional Line Clipping (Cohen-Sutherland Line Clipping and Liang-Barsky Line Clipping), Polygon Fill-Area Clipping (Sutherland- Hodgman Polygon Clipping.	8 Hrs
Unit-5	**Three-Dimensional Viewing**: Overview of Three-Dimensional Viewing Concepts, The Three-Dimensional Viewing Pipeline, Three-Dimensional Viewing-Coordinate Parameters, Transformation from World to Viewing Coordinates, Projection Transformations, Orthogonal Projections, Perspective Projections, The Viewport Transformation and Three-Dimensional Screen Coordinates, OpenGL Three-Dimensional Viewing Functions, Three-Dimensional Clipping Algorithms, OpenGL Optional Clipping Planes.	8 Hrs

Prescribed Text Book				
Book Title	**Authors**	**Edition**	**Publisher**	**Year**
Computer Graphics with OpenGL	Donald Hearn & M Pauline Baker	4th edition	Pearson Education Limited	2012

Reference book				
Book Title	**Authors**	**Edition**	**Publisher**	**Year**
Computer Graphics using OpenGL	FS Hill & Stephen M Kelley	3rd edition	Pearson Education Limited	2007

E book				
Book Title	**Authors**	**Edition**	**Link**	**Year**
Computer Vision: Algorithms and Applications	Richard Szeliski	Second	https://math.hws.edu/graphicsbook/	2022

MOOC Course				
Sl. No.	**Course name**	**Course offered by**	**Year**	**URL**
1	Computer Graphics	edx		https://www.edx.org/course/computer-graphics-2
2	Computer Graphics	NPTEL		https://onlinecourses.nptel.ac.in/noc20_cs90

Course Outcomes (Co's):

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

CO1	Apply suitable software modules for developing graphics applications using OpenGL.
CO2	Analyse various graphic transformation algorithms.
CO3	Design graphics-based applications using different transformations and viewing.

CO-PO-PSO- Mapping															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**													**2**	
CO2		**3**												**2**	
CO3			**3**											**2**	

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	**Best 2 of 3**	**40**

QUIZ	**One Quiz**	**5**
AAT	**Mini-project**	**5**
Total		**50**

SEE Exam Question paper format

Unit-1	Mandatory	One Question to be asked for 20 Marks
Unit-2	Mandatory	One Question to be asked for 20 Marks
Unit-3	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-4	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-5	Mandatory	One Question to be asked for 20 Marks

Bloom's Level	**Percentage of Questions to be Covered**
Remember / Understand	35%
Apply / Analyze	40%
Create / Evaluate	25%

Under AAT component, Students have to form teams of 2 or 3. Each team has to choose a theme and think of an efficient technique to appropriately design it. They are required to present their design and solution and also submit a concluding report.

AAT Week wise Plan

Sl. No	**Week**	**Activity**
1	1st	Formation of groups. Note: Student groups of size 2 or 3
2	2nd and 3rd	Select a theme and submit.
3	4th	Survey and select appropriate design technique.
4	5th	Survey and select appropriate design technique.
5	6th and 7th	Implementation
6	8th and 9th	Implementation
7	10th	Implementation
8	11th	Complete Project Work Demonstration by each group
9	12th	Project Report Submission

Rubrics used for evaluation of AAT

Sl.No.	**Question No.**	**Very Good**	**Good**	**Fair**	**Poor**

1	**Animation and Rendering (7M)**	2D/3D animation and rendering is done extremely well, works properly. (7M)	2D/3D animation and rendering is done well, works properly. (5M)	2D/3D animation and rendering is average, works properly for the most part. (3M)	2D/3D animation and rendering does not work properly or is not saved/rendered properly. (1M)
2	**Model Complexity (4M)**	The model is complex and detailed and shows evidence of substantial sub-object modeling to define/refine modeled details. (4M)	The model is mostly complex and detailed but lacks some evidence of sub-object modeling to define/refine modeled details. (3M)	The model is mostly simplistic and lacks evidence of sub-object modeling to define/refine modeled details. (2M)	Model design is inappropriate or overly simplistic. (1M)
3	**Graphic Design & Visual Appearance(6M)**	2D/3D model shows excellent design qualities and is aesthetically pleasing. (6M)	2D/3D model shows good design qualities and is aesthetically pleasing. (4M)	2D/3D model shows basic design qualities and is aesthetically acceptable. (2M)	2D/3D model shows poor design qualities and is not aesthetically acceptable. (1M)
4	**Documentation (3M)**	Report is as per specified format and complete. (3M)	Report is completed and very contents are not as per format. (2.5M)	Report is complete but does not follow the specified format. (2M)	Report is incomplete and does not comply to the format specified. (1M)

Total – 20M (To be reduced to 5M)

Semester	**V**		
Course Title:	**Advanced Algorithms**		
Course Code:	**22CS5PEAAM**		
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hrs
Unit-1	Dynamic Programming: Rod cutting, Matrix-chain multiplication, Longest common subsequence, Multistage graph, Longest increasing subsequence, Edit Distance, Egg Dropping Puzzle	8
Unit-2	Maximum Flow: Flow networks, The Ford-Fulkerson method, Maximum bipartite matching Multithreaded Algorithms: The basics of dynamic multithreading, Multithreaded matrix multiplication, Multithreaded merge sort	8
Unit-3	String matching: The naive string-matching algorithm, The Rabin-Karp algorithm, String matching with finite automata. Input Enhancement in String Matching: Horspool Algorithm and The Knuth-Morris-Pratt algorithm	8
Unit-4	Linear Programming: Standard and slack forms, Formulating problems as linear programs, The simplex algorithm	8
Unit-5	Computational Geometry: Line-segment properties, Determining whether any pair of segments intersects, Finding the convex hull, Finding the closest pair of points	8

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to Algorithms	Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein	Third Edition	The MIT Press	2009
2.	Introduction to the Design and Analysis of Algorithm	Anany Levitin	Third Edition	Pearson	2011

COURSE OUTCOMES(CO)
Students will be able to

CO1	**Apply** various complex algorithm techniques for various computing situations.

CO2	**Analyse** the given algorithm for complexity
CO3	**Design** efficient algorithms and implement for various complex computing case studies

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3			3										3	
CO2		2												2	
CO3			3	2					1	1				3	

Tool	Remarks	Marks
Internals	**Best 2 out of 3**	**40**
Quiz	**-**	**-**
Lab Component	**--**	**--**
Self-Study Component	**--**	**--**
AAT	**1**	**10**
Total		**50**

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Fundamentals of Computer Algorithms	Ellis Horowitz, Satraj Sahni and Rajasekharam	2nd Edition	University Press Pvt. Ltd	2009

E-Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year	URL
1	**Data structures and Algorithm Analysis in C++**	**Mark Allen Weiss**	**Fourth edition**	**Pearson education**	**2014**	**http://www.uoitc.edu.iq/images/documents/informatics-institute/Competitive_exam/DataStructures.pdf**

MOOC Course

Sl. No.	Course name	Course Offered By	Year	URL
1.	**Advanced**	**Coursera**	**2020**	**https://www.coursera.org/learn/advanced-**

	Algorithms and Complexity			**algorithms-and-complexity**

Under AAT component, Students have to form teams of 3. Each team will be assigned a problem. Student will have to think of an efficient design paradigm, appropriate data structure and solve the given problem. They are required to present their solution and justify the technique used based on its efficiency. To conclude they will have to submit a report.

Student Project group Plan of Activities: Following are the activities to be carried out by students during project work

Sl. No	**Week**	**Activity**
1	1st	Formation of groups. Note: Student groups of size 3
2	2nd and 3rd	Project topic will be assigned
3	4th	Time to analyse the problem and come up with appropriate design technique
4	5th	Time to analyse the problem and come up with appropriate design technique
5	6th and 7th	Implementation
6	8th and 9th	Implementation
7	10th	Implementation
8	11th	Complete Project Work Demonstration by each group
9	12th	Project Report Submission

AAT Rubrics

Problem Solving using efficient Design Techniques				
Criteria	**Exemplary**	**Proficient**	**Partially Proficient**	**Points**
Algorithm Design	(3) An efficient algorithm is designed with appropriate design technique.	(2) An algorithm is designed with appropriate design technique.	(1) An algorithm is designed without concern to complexity	__ / 3
Implementation	(3) Correct implementation of the algorithm with appropriate data structures.	(2) Correct implementation of algorithm.	(1) Algorithm is not implemented in accordance with the design.	__ / 3

Oral communication. (presentation)	(2) Clear and effective communication Answers all the questions	(1) Communication is clear Answered most of the questions	(0.5) Unclear communication Answered only few of the questions	___ / 2
Report	(2) Clear and Effective writing and adherence to appropriate style guidelines	(1) Writing that is clear and effective for the most part and minor errors in adherence to appropriate style guidelines	(0.5) Unclear and ineffective writing and multiple errors in adherence to appropriate style guidelines	__/2
			Total	___/10

SEE Exam Question paper format

Unit-1	Mandatory	One Question to be asked for 20 Marks
Unit-2	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-3	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-4	Mandatory	One Question to be asked for 20 Marks
Unit-5	Mandatory	One Question to be asked for 20 Marks

Bloom's Level	**Percentage of Questions to be Covered**
Remember / Understand	35%
Apply / Analyze	40%
Create / Evaluate	25%

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Semester:	**5th**		
Course Title:	**Mini Project -1 : UI/UX and Mobile App Development**		
Course Code:	**22CS5PWMP1**		
L-T-P:	**0-0-2**	**Total Credits:**	**2**

A. Introduction:

1. This practical course engages students in the process of designing and implementing a native mobile app as an extension to a previously developed full stack web application.

2. Students will work in teams to design UI/UX using tools like Figma and Sketch, create comprehensive wireframes, and implement the app using React Native or Flutter.

3. Teacher allotted for project work to students should teach students' technologies like Node JS, React etc., during Class/Lab hours as per the allotment. Teacher allotted for project work should guide the students in choosing the topic and towards carrying out project work and complete the evaluation of assigned students.

B. Course Outcomes (Co's):

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

CO1	Design and prototype mobile app interfaces, ensuring a user-friendly experience using UI/UX design tools.
CO2	Develop and integrate a fully functional native mobile app by applying industry best practices.
CO3	Present their projects and compile thorough reports, demonstrating teamwork and reflective learning.

C. CO-PO-PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1			**3**		**3**								**1**	**3**	
CO2			**3**		**3**								**1**	**3**	
CO3								**2**	**3**	**3**					

Assessment Plan (for 50 marks of CIE)

Tool	Remarks	Marks
Internals	**---**	**---**
QUIZ	**---**	**---**
Lab Component	**---**	**50**
Alternate Assessment Tool	**----**	**--**

for Project Evaluation:

Criteria	Excellent	Good	Satisfactory	Needs Improvement	Unsatisfactory	Points
UI/UX Design (8):	(8) Designs are exceptionally creative and user-friendly, with attention to detail. All elements are consistent and align with the app's purpose.	(6) Designs are well thought out and user-friendly but may lack some creativity or attention to detail.	(5) Designs meet the basic requirements but may be inconsistent or lack user-friendliness.	(3) Designs are incomplete or not user-friendly, with significant inconsistencies or errors.	(0-2) Little to no effort shown in designs, or designs are entirely missing or unusable.	__ / 8
Wireframing and Prototyping (8):	(8) Wireframes and prototypes are comprehensive, detailed, and clearly demonstrate all functionalities and connections.	(6) Wireframes and prototypes are mostly complete with some details missing or unclear.	(5) Basic wireframes and prototypes are provided, but many details are missing or unclear.	(3) Wireframes and prototypes are incomplete or poorly executed.	(0-2) Little to no effort shown in wireframes and prototypes, or they are entirely missing.	___ / 8
Mobile App Implementation (20):	(18-20) The mobile app is fully implemented with excellent functionality, user experience, and code quality.	(16-18) The mobile app is mostly implemented with good functionality and user experience, but there may be some issues with code quality.	(14-16) The mobile app is partially implemented with basic functionality and user experience, and there may be significant issues with code quality.	(8-14) The mobile app is poorly implemented, with numerous issues in functionality, user experience, and code quality.	(0-8) Little to no effort shown in the mobile app implementation, or it is entirely non-functional.	___ /20

Teamwork and Collaboration (5)	(5) Everyone works well together, actively contributes, and communicates effectively.	(4) The team generally works well together with some good contributions and communication.	(3) The team works together, but contributions and communication are inconsistent.	(2) The team struggles to work together, with few contributions and poor communication.	(0-1) The team does not work well together, with no contributions or communication.	___ /5
Presentation(4)	(4) The presentation is clear, engaging, and well-organized, with great use of visuals.	(3) The presentation is mostly clear, with good organization and some use of visuals.	(2) The presentation is okay but could be more organized, and visuals are used minimally.	(1) The presentation is unclear, disorganized, and lacks effective use of visuals.	(0) The presentation is completely unclear, disorganized, and does not use visuals.	__/ 4
Report & Documentation (5)	(5) The report is comprehensive, well-structured, and covers all aspects of the project thoroughly.	(4) The report covers most of the project aspects in detail and is generally well-organized.	(3) The report covers the basic aspects of the project but may lack detail and organization.	(2) The report does not adequately cover the project, with poor organization and lack of detail.	(0-1) The report fails to cover the project, lacks any clear structure, and is missing most required sections.	___/ 5
Total					__/ **50**	

D. Tutorial Plan *(if applicable)*

E. Laboratory Plan *(if applicable)*

Note: Apart from the previous sem project topics if student groups come up with any innovative project ideas which are useful for the Department / College academic purpose will be considered based on the approval and acceptance from class teacher.

Sl. No	Week	Activity	Content deliverables by the assigned teacher
1	1st	Formation of teams and initial brainstorming sessions. Note: Student groups of size 3 or 4	Introduction: Overview of the course and objectives.

2	2nd	Project topic selection by each Group.	UI/UX Design • Training on Figma/Sketch. • Creation of initial design mockups.
3	3rd	Presentation: Student and Project topic introduction by each group	Wireframing and Prototyping • Development of detailed wireframes. • Creation of interactive prototypes.
4	4th ,5th , and 6th	Presentation of design layout of the user interfaces and user experiences.	Mobile App Development • Introduction to React Native/Flutter. • Implementation of the mobile app.
5	7th,and 8th	Presentation on Mobile app by each group	Testing and Debugging • Testing the mobile app for bugs and issues. • Debugging and finalizing the app.
6	9th , 10th and 11th	Complete Project Work Demonstration by each group	Final Presentation and Evaluation • Presentation of the final mobile app. • Peer evaluation and instructor feedback.
7	12th	Project Report Preparation	

Text Book :

Supplementary texts and resources

1. Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days by Jake Knapp, John Zeratsky, Braden Kowitz , Simon & Schuster , 2016
2. Learning React Native Building Native Mobile Apps with JavaScript By Bonnie Eisenman 2017

Tutorial Link:

1. https://www.youtube.com/playlist?list=PL4cUxeGkcC9jLYyp2Aoh6hcWuxFDX6PBJ : Flutter for Beginners
2. Complete React Native Developer in 2023: Zero to Mastery [with Hooks]
3. Create High-Fidelity Designs and Prototypes in Figma : https://www.coursera.org/learn/high-fidelity-designs-prototype

SEE Exam (50 Marks):

Evaluation of Projects carried out by students from External examiner along with internal faculty.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Semester	**5**		
Course Title:	**Biology for CS Engineers**		
Course Code:	**22CS5BSBCS**		
L-T-P:	**1-0-0**	**Total Credits:**	**1**

Unit No.	Topics	Hrs
1	**Introduction to Cell Biology** Introduction to the cell biology – Cell size and shape - Chemical composition - Classification of cell and its properties; Cell membrane- Nucleus **Basics of Genetics** Inheritance Pattern, Principals of genetics, Human genetics disorders, Biomolecules	**3**
2	**Genetic Engineering** Fine structure of Gene, Gene expression -Transcription, Translation, Post translation processing of the protein, Genetic engineering- Recombinant DNA technology, Genetically modified organisms, Application of genetic engineering, Genetic Algorithm and its variations	**3**
3	**Evolutionary Algorithms** Learning from Biology, Natural way for optimization, Dissecting an Evolutionary algorithm- Fitness function, Selection, Mutation and Replacement	**3**
4	Bio-inspired Algorithms: Introduction, Particle Swarm Optimization (PSO), Ant Colony Optimization (ACO)	**3**
5	**Bioinformatics** Components of Bioinformatics, Objectives ofBioinformatics, some important tools of Bioinformatics, Types of Data that are analyzed in Bioinformatics research, Data integration and analyses, Applications and research **Implementation of Bio-Nano Science** Nano Biomolecules and its various types; Principles andApplication of Biosensor	**3**

Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Biology for Engineers	Dr. Sohini Singh and Dr. Tanu Allen,		Vayu Education of India	2014

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1	"Biology for Engineers"	Arthur T. Johnson	-----	CRC Press	2011	https://books.google.co.in/books?id=PyU2CK6CeoAC&printsec=frontcover&source=gbs_atb&redir_esc=y#v=onepage&q&f=false

MOOC Course				
Sl. No.	Course name	Course Offered By	Year	URL
1.	Biology Everywhere Specialization	Coursera	----	https://www.coursera.org/specializations/biology-everywhere

Course Outcomes ***At the end of the course the student will be able to***	
CO1	Apply the biological concepts from an engineering perspective
CO2	Analyze various optimization algorithms.

CO-PO-PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3														
CO2		2													

Type of assessment	Remarks	Marks
Test 1	Multiple Choice Questions	25
Test 2	Multiple Choice Questions	25
Test 3	Multiple Choice Questions	25
Total		50

Assessment Plan (for 50 marks of CIE best 2 test marks out of three test)

BMS COLLEGE OF ENGINEERING, BANGALORE-19

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Semester	**5**		
Course Title:	**Indian Literature**		
Course Code:	**22CS5NCINL**		
L-T-P:		**Total Credits:**	**ZERO PASS/FAIL**

A Introduction

- Student should make videos with relevant content reflecting the Indian Literature that has to be the summary of any Novel of prominent authors who have won National Award.
- The novel can be chosen from any language but the video should be made in English language only.
- The video created by student should be at least five minutes. This video has to be uploaded by respective student on YouTube. Rules and Regulations of YouTube should be followed by the student to upload video.
- Student should produce YouTube link with screen shot of the video for clearing this mandatory course
- Plagiarism check of the video link submitted by student will be taken care so students do not copy someone's video.

B Course Outcomes

CO1	Instill values and develop human concern in students through exposure to literary texts.
CO2	Create literary sensibility and emotional response to the literary texts and implant sense of appreciation of literary text.

C CO-PO-PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						1		1	1	2		1			
CO2						1			1			1			

D Assessment Plan

CATEGORY	MARKS (RANGE)	Society Awareness Views
L1	90 (90-100)	Video created is creative, innovative and reflects the character in the novel to emotionally connect to the viewers. Also demonstrates the richness of Indian Literature by innovative use of language employed by the writers. The language and context used by the author is employed in the video. The narration and pictures shown in the video is very clear.
L2	80 (80-89)	Video created reflects the character in the Indian literature chosen and emotionally connect to the viewers, but not creative or innovative. The language and context used by the author is employed in the video. The narration and pictures shown in the video are clear.
L3	70 (70-79)	Video created reflects the character in the Indian literature chosen, but does not reflects the character in the novel to emotionally connect to the viewers, and not creative or innovative. The language and context used by the author is not completely employed in the video. The narration and pictures shown in the video are clear.
L4	60 (60-69)	The video created is reflecting the character but not emotionally connecting to the viewer, there is no creative content included in enacting the character in the novel. The language and context used by the author is partially used in the video. The video is of good quality.
L5	50 (50-59)	The video created is reflecting the character but not emotionally connecting to the viewer, there is no creative content included in enacting the character in the novel. The language and context used by the author is partially used in the video. The video is of good quality.
L6	40 (40-49)	The video created is reflecting the character, but not emotionally connecting to the viewer, there is no creative content included in enacting the character in the novel. The language and context used by the author is partially used in the video. The video quality is not up-to the mark.

E SEE Exam

Student should produce YouTube link with screen shot of the video for Passing this mandatory.