BMS COLLEGE OF ENGINEERING, BENGALURU-19

(Autonomous Institute, Affiliated to VTU)

BACHELOR OF ENGINEERING

DEPARTMENT
OF
COMPUTER SCIENCE AND ENGINEERING
(IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

SCHEME & SYLLABUS

III - VIII SEMESTERS

(Academic Year: 2024-25)

INSTITUTE VISION

Promoting Prosperity of mankind by augmenting Human Resource Capital through Quality Technical Education & Training.

INSTITUTE MISSION

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

DEPARTMENT VISION

To be a model center for education and training in the frontier areas of computing in IoT, Cybersecurity and Blockchain for solving societal problems.

DEPARTMENT MISSION

- Strengthen learning environment that facilitates quality education in the field of IoT, Cybersecurity and Blockchain.
- To foster professional ethics and values with concern for environment and society to provide sustainable solutions.
- Imbibe passion for research, entrepreneurship, higher studies or professional growth through life-long learning.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

PEO1: Develop a solid foundation and mastery of computer engineering skills to excel professionally in industry or academia.

PEO2: Pursue higher education, engage in research, or partake in an entrepreneurial path.

PEO3: Design practical computing systems, showcasing teamwork, and a commitment to ongoing learning, while embodying ethical standards in a globally competent world.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: Expertise in applying Software Engineering practices to provide efficient software solutions.

PSO2: Design and develop IoT applications and systems, integrating various hardware and software components to create functional IoT solutions.

PSO3: Proficiency in implementing security measures for information, systems, and networks using best practices of Cyber Security including Blockchain technology.

PROGRAMME OUTCOMES (POs)

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

PO4: Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

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.

PO7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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.

BMS COLLEGE OF ENGINEERING, BANGALORE-19
(Autonomous College under VTU Belagavi)
DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Department of CSE
(IoT and Cybersecurity including Blockchain)
160 Credit Scheme
Batch Admitted 2022 onwards

Typical Credit Distribution *(along with suggested range of credits)*

Curricular Component/ Semester	I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course (BS)	8	8	3	3			1		23
Engineering Science Course (ES)	9	9	3	3					24
Professional Core Course (PC)			15	14	13	13	5		60
Professional Elective Course (PE)					3	3	3	3	12
Open Elective Course (OE)						3	3	3	9
Project/ Mini-Project (PW)					2	2	7		11
Internship (Re/Ru/In)								6	6
Humanities and Social Sciences, Management Course (HS)	1	1			1		1		4
Ability Enhancement Course /SDC	2	2	1	1	3	1			10
UHV Courses				1					1
Non-Credit Mandatory Course	-	-	NC	NC	NC	NC	-	-	
Total Credits	20	20	22	22	22	22	20	12	160

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester-III

No.	Course Type	Code	Course Title	Credits			Total Credits	Total Hours
				L	T	P		
1	BS	23MA3BSSDM	Statistics & Discrete Mathematics	2	1	0	3	4
2	ES	23DC3ESCOA	Computer Organization & Architecture	3	0	0	3	3
3	PC	23DC3PCDSC	Data Structures	3	0	1	4	5
4	PC	23DC3PCDBM	Database Management Systems	3	0	1	4	5
5	PC	23IC3PCOOP	Object Oriented Programming with C++	3	0	0	3	3
6	PC	23IC3PCEDS	Embedded Systems	3	0	1	4	5
7	AE	23DC3AEFWD	Full Stack Web Development	0	0	1	1	2
		23DC3AELCE	Latex and Canva Essentials					
		23IC3AEPMG	Project Management with Git					
8	NCMC	23NCMC3NS1	National Service Scheme	0	0	0	0	1
		23NCMC3YG1	YOGA					
		23NCMC3PE1	Physical Education (Sports and Athletics)					
	TOTAL			17	1	4	22	28

BS-3, ES-3, PC-15, AE-1

Semester-IV

No.	Course Type	Code	Course Title	Credits			Total Credits	Total Hours
				L	T	P		
1	BS	23MA4BSLAO	Linear Algebra and Optimization	2	1	0	3	4
2	ES	23DC4ESTOC	Theory of Computation	3	0	0	3	3
3	PC	23DC4PCOPS	Operating Systems	3	0	0	3	3
4	PC	23DC4PCDAA	Design and Analysis of Algorithms	3	0	1	4	5
5	PC	23IC4PCIOT	Internet Of Things	3	0	0	3	3
6	PC	23IC4PCCNW	Cromputer Netwoks	3	0	1	4	5
7	AE	23IC4AEHID	Hardware Interface Design	0	0	1	1	2
		23IC4AEMAD	Mobile Application Development					
		23IC4AEDOP	DevOps					
8	UHV	23MA4AEUHV	Universal Human Values	0	1	0	1	2
9	NCMC	23NCMC4NS2	NSS	0	0	0	0	1
		23NCMC4YG2	YOGA					
		23NCMC4PE2	Physical Edu. (Sports and Athletics)					
	TOTAL			17	2	3	22	28

BS-3, ES-3, PC-14, AE-1 & UHV-1

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester-V

	Course Type	Code	Course Title	Credits			Total Credits	Total Hours
				L	T	P		
1	PC	23IC5PCCSY	Cyber Security	3	0	1	4	5
2	PC	23IC5PCMLG	Machine Learning	3	0	1	4	5
3	PC	23IC5PCCRP	Cryptography	3	1	0	4	5
4	PC	23IC5PCUSP	Unix Shell Programming	0	1	0	1	2
5	AE	23DC5AERMI	Research Methodologies and IPR	3	0	0	3	3
6	PE	23IC5PEBDA	Big Data Analytics	3	0	0	3	3
		23CS5PEPSI	Product, Services and IT Service Management					
		23IC5PEACN	Advanced Computer Network					
7	PW	23IC5PWSEC	Mini Project in Security	0	0	2	2	4
8	HS	23DC5HSEVS	Environmental Studies	1	0	0	1	1
9	NCMC	23NCMC5NS3	NSS	0	0	0	P/NP	1
		23NCMC5YG3	YOGA					
		23NCMC5PE3	Physical Edu. (Sports and Athletics)					
			Details of 40 AICTE Activity Points					
	TOTAL			16	2	4	22	29

PC-13, PE -3, PW-2, HS-1, AE-3

Semester-VI

	Course Type	Code	Course Title	Credits			Total Credits	Total Hours
				L	T	P		
1	PC	23IC6PCEHG	Ethical Hacking	3	0	1	4	5
2	PC	23IC6PCCCS	Cloud Computing and Security	2	1	0	3	4
3	PC	23IC6PCBCT	Blockchain Technology	3	0	1	4	5
4	PC	23DC6PCSEA	Software Engineering and Agile Methodologies	2	0	0	2	2
5	PE	23IC6PESNA	Social Network Analysis	3	0	0	3	3
		23IC6PEDLN	Deep Learning					
		23IC6PEACR	Advanced Cryptography					
6	OE	23IC6OECSY	Open Elective-1 Cyber Security	3	0	0	3	3
7	PW	23IC6PWPP1	Major Project Phase-1	0	0	2	2	4
8	AE	23IC6AEWEB	Web 3 Development	0	0	1	1	2
		23IC6AEDVZ	Data visualization					
9	NCMC	23NCMC6NS4	NSS	0	0	0	P/NP	1
		23NCMC6YG4	YOGA					
		23NCMC6PE4	Physical Edu. (Sports and Athletics)					
			Details of 60 AICTE Activity Points Earned					
	TOTAL			16	1	5	22	29

PC-13, PE-3,OE-3,PW-2,AE-1

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester-VII

	Course Type	Code	Course Title	Credits			Total Credits	Total Hours
				L	T	P		
1	BS	23IC7BSCBS/23IC8BSCBS	Cyber BioSecurity	0	1	0	1	2
2	PC	23DC7PCEPM/23DC8PCEPM	Entrepreneurship and Project Management	2	0	0	2	2
3	PC	23IC7PCDFC/23IC8PCDFC	Digital Forensics and Cyber Law	3	0	0	3	3
4	PE	23IC7PEMWA/23IC8PEMWA	Malware Analysis	3	0	0	3	3
		23IC7PEOOM/23IC8PEOOM	Object Oriented Modelling and Design					
		23IC7PEAAI/23IC8PEAAI	Adversarial AI Attacks					
		23IC7PENPX/23IC8PENPX	NPTEL Courses					
5	OE	23IC7OEIOT/23IC7OEIOT	Open Elective -2 Introduction to IoT	3	0	0	3	3
6	PW	23IC7PWPP2	Major Project Phase-2	0	0	7	7	14
7	HS	25MA7HSIKL/25MA8HSIKL	Indian Knowledge Systems	1	0	0	1	1
			Details of 80 AICTE Activity Points Earned					
TOTAL				12	1	7	20	28

PC-5, PE-3,OE-3, PW-7, HS-1, BS-1

Semester-VII

	Course Type	Code	Course Title	Credits			Total Credits	Total Hours
				L	T	P		
		NPTEL Courses						
4	PE	23IC7PENP1	Advanced Distributed Systems	3	0	0	3	3
		23IC7PENP2/23IC8PENP2	Privacy and Security in Online Social Media					
		23IC7PENP3	Carbon Accounting and Sustainable Designs in PLM					
		23DC7PENP4/23DC8PENP4	Introduction to Industry 4.0 and IIoT					
		23DC7PENP5/23DC8PENP5	Introduction to Large Language Models (LLMs)					

PC-5, PE-3,OE-3, PW-7, HS-1, BS-1

Semester-VIII

	Course Type	Code	Course Title	Credits			Total Credits	Total Hours
				L	T	P		
1	PE	23IC7PECPS/23IC8PECPS	Cyber Physical Systems	3	0	0	3	3
		23IC7PEWMC/23IC8PEWMC	Wireless and Mobile Communication					
		23IC7PEITA/23IC8PEITA	IoT Analytics					
2	OE	23IC7OEEHG/23IC8OEEHG	Open Elective -3 Ethical Hacking	3	0	0	3	3
3	INT	23IC7SRINT/23IC8SRINT	Internship (16 -20 weeks)	0	0	6	6	12
			Details of 100 AICTE Activity Points Earned					
	TOTAL			6	0	6	12	18

PE-3, OE-3, INT-6

Internship shall be carried out at an Industry, NGO, MSME, Innovation center, Incubation center, Start-up, center of Excellence (CoE), Study Centre established in the parent institute and /or at reputed research organizations/institutes.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

3RD

SEMESTER

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**3**				
Course Title:	**Statistics and Discrete Mathematics**				
Course Code:	**23MA3BSSDM**				
L-T-P:	**2-1-0**	**Total Credits:**	**3**	**Contact hours**	**39**

Prerequisites: Basic concepts of Permutations, Combinations, probability, statistics, G.C.D., L.C.D., divisors and primes.

Course Objectives: The goal of the course is to

- Appreciate the importance of Discrete Mathematics and statistics in computer and allied engineering science.
- Acquire the knowledge of Discrete Mathematics and Statistics applied 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; that teachers can use to accelerate the attainment of the various course outcomes.

- Lecture method (L) does not mean only traditional lecture method, but different types of teaching methods may be adopted to develop the outcomes.
- Show Video/animation films to explain the functioning of various concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- Ask HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' analytical skills, and develops 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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Unit No.	Topics	Hours
1	**GRAPH THEORY:** **Basic concepts:** Types of graphs, order and size of a graph, in-degree and out-degree, connected and disconnected graphs, Eulerian graphs, Hamiltonian graphs, sub-graphs, and Isomorphic graphs. Matrix representation of graphs: adjacency matrix, incidence matrix. Trees: spanning tree, minimal spanning tree: Kruskal's algorithm and shortest path-Dijkstra's algorithm	8
2	**PROBABILITY DISTRIBUTIONS:** **Theoretical distributions: Discrete and continuous random variables:** Discrete distributions: Poisson distribution, Geometric distributions. Continuous distributions: Exponential, Gaussian, Uniform Distribution and Gamma distributions	8
3	**JOINT PROBABILITY AND MARKOV CHAIN:** **Joint Probability Distributions:** Discrete and continuous joint random variables, Mathematical expectations, Covariance, and Correlation. **Markov Chain**: Probability vector, stochastic matrix, fixed point vector, regular stochastic matrix. Higher transition probabilities, stationary distribution of regular Markov chain.	8
4	**STATISTICAL INFERENCE:** Introduction, procedure for testing of hypothesis, level of significance. **Large sample:** Test of significance for single mean and difference between two means. Small sample: Test of significance for single mean, the difference between two means, paired t-test, ratio of variances (F-distribution) and Chi-Square goodness of fit.	8
5	**COMBINATORICS:** Introduction, Binomial and multinomial theorems, Catalan numbers, the principle of inclusion and exclusion, Derangements, Rook Polynomials.	8

Prescribed Text Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Graph Theory and Combinatorics	D. S. Chandrasekharaiah	4th	PrismEngineering Education Series	2011-12

Reference Text Book:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Discrete Mathematics	Kolman, Busby Ross	5th	Prentice Hall	2004

2	Graph Theory with Applications to Engineering and Computer Science	Narsingh Deo	Eastern Economy	PHI Learning Pvt., Ltd	
3	Mathematics for Machine Learning	Marc Peter Deisennorth, A. Aldo Faisal, Cheng Soon Ong		Cambridge University Press	2020

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/(DiscreteMathematics)
3. https://nptel.ac.in/courses/111106086/(Combinatorics)

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
23MA3BSSDM	CO 1	Apply the concept of Discrete Mathematics and Statistics in Computer and Allied Engineering Science.	1	3
	CO 2	Demonstrate the Importance of Discrete Mathematics and Statistics using Modern IT Tools.	1 & 5	3

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	
SEE	End Exam	100		50	

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**III**		
Course Title:	**Computer Organization and Architecture**		
Course Code:	**23DC3ESCOA**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
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, Stored program concept.	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 Systems	Thomas Rauber, Gudula Runger	2nd Edition	Springer	2013

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

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	2022	hhttps://onlinecourses.nptel.ac.in/noc22_cs88/preview

Course Outcomes

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

CO1	To apply the concepts of basic functional units to demonstrate the working of computational system.
CO2	To analyze 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 analyzing performance issues.

CO-PO mapping

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

Proposed Assessment Plan (for 50 marks of CIE)

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

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**III**		
Course Title:	**Data Structures**		
Course Code:	**23DC3PCDSC**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hours
1	**Introduction To Data Structure:** Data Management concepts, Data types – primitive and non-primitive, Types of Data Structures- Linear & Non-Linear Data Structures. Structures and 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
2	**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, maintaining directory of names, Manipulation of polynomials (addition), representing sparse matrices.	8
3	**Stacks:** Operations, array representations of stacks, stack applications - infix to postfix conversion, postfix expression evaluation, and function call tracing, recursion. **Queues:** Introduction, Basic concept, linear queue operations, circular queue, priority queues, double ended queues. Applications of Queues. Stack and queue implementation using linked lists	8
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	**Balanced Trees:** AVL Trees, Splay trees, Red- Black Trees – Definitions, Rotation and other basic operations.	8

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Data Structures using C	Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J. Augenstein	Fifth	Pearson Education	2007
2.	Data Structures - A Pseudocode Approach with C	Richard F. Gilberg Behrouz A. Forouzan	First	Cengage Learning	2005

E-Book						
Sl. No	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1.	Data Structures using C	E. Balaguruswamy		McGraw Hill	2013	https://dokumen.pub/data-structures-using-c-9781259029547-1259029549.html
2.	Data structures and program design in C	Robert L. Kruse, Clovis L. Tondo, Bruce P. Leung	Second	Prentice Hal	1997	https://cdn.preterhuman.net/texts/math/Data_Structure_And_Algorithms/Data%20Structures%20and%20Program%20Design%20in%20C++%20-%20Robert%20L.%20Kruse.pdf

MOOC Courses				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1	Data Structures	Coursera	2023	https://www.coursera.org /learn/data-structures
2	Data Structures and Algorithms	NPTEL	2023	https://nptel.ac.in/ courses/106102064/

Course Outcomes

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

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

CO-PO mapping

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

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	2	20
QUIZ/AAT	1	5
Lab Component	CIE+ Two Lab Tests	25
Total		**50**

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

Laboratory Plan

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 - Handwrite the Program - Pasting of the printout of the Output or Handwriting of the Output (Output should be written for all the cases).
3. Students have to practice following list of programs and additional programming exercises will also be given in lab. Students will be made to solve coding challenges on programming platforms like LeetCode and HackerRank.

Lab Program	Unit#	Program Details
1	2	Write a program 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.
2	2	Write a program 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.
3	2	Write a program to Implement Singly Linked List with following operations a) Sort the linked list. b) Reverse the linked list. c) Concatenation of two linked lists
4	2	Write a program to Implement doubly linked 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
5	3	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
6	3	Write a program 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)
7	3	Write a program 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
8	3	Write a program 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
9	3	Write a program to implement Stack & Queues using Linked Representation
10	4	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.
11	4	Write a program a. To construct a binary search tree b. To implement iterative inorder traversal c. To delete a given element
12	5	Write a program to construct an AVL tree of integers

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**III**		
Course Title:	**Database Management Systems**		
Course Code:	**23DC3PCDBM**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hours
1	**Introduction to Database Systems:** 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	**Entity Relation 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 Databases:** Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and Dealing with Constraint Violations, Functional Dependencies	8
3	**Relation 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. **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	**Transaction Processing Concepts:** Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Transaction Support in SQL, Two-Phase Locking Techniques for Concurrency Control.	8
5	**Storage Systems:** Overview of Physical Storage Media, Storage Interfaces, Magnetic Disks, Flash Memory, RAID, Disk-Block Access, Database Backup and Recovery from Catastrophic Failures **Indexing:** Basic Concepts, Ordered Indices, B+-Tree Index Files, B+-Tree Extensions, Hash Indices, Multiple-Key Access, Creation of Indices, Write-Optimized Index Structures, Bitmap Indices, Indexing of Spatial and Temporal Data Query processing & operations	8

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Fundamentals of Database Systems	Elmasri and Navathe	7th Edition	Pearson	2016
2.	Database System Concepts	Silberschatz, H Korth and S Sudarshan	7th Edition	McGrawHill	2019

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Database Management Systems	Ramakrishnan and Gehrke	3rd Edition	McGrawHill	2014
2.	Database Systems: Design, Implementation, and Management	Peter Rob and Carlos Coronel	8th Edition	CENGAGE Learning	2009

E-Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year	URL
1.	An Introduction to Relational Database Theory	Hugh Darwen	3 rd Edition	Ventus Publishing ApS	2012	https://www.e-booksdirectory.com/details.php?ebook=3093
2.	Database System The Complete Book	Hector GarciaMolina, JeffreyD. Ullman, Jennifer Widom	2nd Edition	Pearson Education	2009	https://people.inf.elte.hu/miiqaai/elektroModulatorDva.pdf

MOOC Course

Sl. No.	Course name	Course offered by	Year	URL
1.	Database Management Systems	SWAYAM	2023	https://onlinecourses.swayam2.ac.in/cec23_cs10/preview
2.	Database Management Essentials	Coursera	2023	https://www.coursera.org/learn/database-management

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Course Outcomes

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

CO1	**Apply** the concepts of database management systems for various applications.
CO2	**Analyze** the given database concepts to its correctness.
CO3	Design **and demonstrate** conceptual models, query and optimization.
CO4	Ability to **conduct** experiments to **demonstrate** the various SQL query processing

CO-PO mapping

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

Proposed Assessment Plan (for 50 marks of CIE)

Tool	Remarks	Marks
Internals	2	25
QUIZ	1	5
Lab Component	CIE + Lab Test	25
Total		**50**

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

Laboratory Plan

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. Students have to practice following SQL queries and additional exercises will also be given in the lab.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Lab Program	Program Details
1	Sailor Database
2	Supplier Database
3	Salesman Database
4	Movie Database
5	Employee Database

PROGRAM 1: SAILOR DATABASE

Create tables for the following schema:
SAILOR (sid: integer, sname: string, rating: integer, age: real)
BOAT (bid: integer, bname:string, color:string)
RESERVES (sid: integer, bid: integer, day: date)
Queries:
1) Add the required constraints on the created tables.
2) Populate the relations with at least 5 tuples each.
3) Select names and ages of all sailors. Rename same as 'Sailor Name'
4) Find all sailors with a rating above 7
5) Find the sid of sailors who have reserved a red boat
6) Find the colors of boats reserved by 'Shyam'
7) Delete all boats which have never been reserved.

PROGRAM 2: SUPPLIER DATABASE

Create tables for the following schema:
SUPPLIER (sid: integer, name: string, address: string)
PART (pid: integer, name: string, color: string)
CATALOG (sid: integer, pid: integer, cost: real)

Queries:
1) Add the required constraints on the created tables.
2) Populate the relations with at least 5 tuples each.
3) Select the ID and names of all the suppliers.
4) Select the most costly part available in the catalog.
5) Find the name's of parts for which there is some supplier.
6) Find the sids of suppliers who supply a red part and a green part.
7) Delete all parts of a given ID.

PROGRAM 3: SALESMAN DATABASE

Create tables for the following schema:
SALESMAN (Salesman_id:integer, Name:string, City:string, Commission:integer)

CUSTOMER (Customer_id:integer, Cust_Name:string, City:string)
ORDERS (Ord_No:integer, Purchase_Amt:real, Ord_Date:date, Customer_id:integer, Salesman_id:integer)
Queries:
1) Add the required constraints on the created tables.
2) Populate the relations with at least 5 tuples each.
3) Select the ID and names of all the customers.
4) Select the salesman with the highest commission.

5) List all the orders placed in descending order of their purchase amount.
6) Select customers who have salesmen in their cities.
7) Delete all orders placed before Jan 2018.

PROGRAM 4: MOVIE DATABASE

Consider the schema for Movie Database:

ACTOR(Act_id, Act_Name, Act_Gender)
DIRECTOR(Dir_id, Dir_Name, Dir_Phone)
MOVIES(Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id)
MOVIE_CAST(Act_id, Mov_id, Role)
RATING(Mov_id, Rev_Stars)

Queries:

1. List the titles of all movies directed by 'Hitchcock'.
2. Find the movie names where one or more actors acted in two or more movies.
3. List all actors who acted in a movie before 2000 and also in a movie after 2015 (use JOIN
4. operation).
5. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.
6. Update rating of all movies directed by 'Steven Spielberg' to 5.

PROGRAM 5: EMPLOYEE DATABASE

Create the following Tables:

LOCATION	
Location_ID	**Regional_Group**
122	NEW YORK
123	DALLAS
124	CHICAGO
167	BOSTON

DEPARTMENT		
Department_ID	**Name**	**Location_ID**
10	ACCOUNTING	122
20	RESEARCH	124
30	SALES	123
40	OPERATIONS	167

JOB	
Job_ID	**Function**
667	CLERK
668	STAFF
669	ANALYST
670	SALESPERSON
671	MANAGER
672	PRESIDENT

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

EMPLOYEE									
EMPLOYEE_ID	**LAST_NAME**	**FIRST_NAME**	**MIDDLE_NAME**	**JOB_ID**	**MANAGER_ID**	**HIREDATE**	**SALARY**	**COMM**	**DEPARTMENT_ID**
7839	MEGAN	JOHN	S	672	NULL	12-DEC-14	5500	NULL	30
7369	SMITH	JOHN	Q	667	7521	17-DEC-18	800	NULL	20
7499	ALLEN	KEVIN	J	670	7507	20-FEB-17	1600	300	30
7505	DOYLE	JEAN	K	671	7839	04-APR-15	2850	NULL	30
7506	DENNIS	LYNN	S	671	7839	15-MAY-15	2750	NULL	30
7507	BAKER	LESLIE	D	671	7839	10-JUN-15	2200	NULL	40
7521	WARK	CYNTHIA	D	670	7505	22-FEB-15	1250	500	30

Queries based on the above tables:

Order By Clause:

1. List out the employee id, last name in ascending order based on the employee id.
2. List out the employee id, name in descending order based on salary column

Group By & Having Clause:

3. How many employees who are working in different departments wise in the organization
4. List out the department wise maximum salary, minimum salary, average salary of the employees
5. List out the job wise maximum salary, minimum salary, average salaries of the employees.
6. List out the no.of employees joined in every month in ascending order.
7. How many employees joined in 1985?
8. How many employees joined in March 1985.
9. Which is the department id, having greater than or equal to 3 employees joined in April1985.

Sub-Queries

10. Display the employee who got the maximum salary.
11. Display the employees who are working in Sales department
12. Display the employees who are working as “Clerk”.
13. Display the employees who are working in “New York”
14. Find out the number of employees working in the “Sales” department.
15. Delete the employees who are working in the accounting department.
16. Display the second highest salary drawing employee details.

Subquery operators: (ALL, ANY, SOME, EXISTS)

17. List out the employees who earn more than every employee in department 30.
18. List out the employees who earn more than the lowest salary in department 30.
19. Find out which department does not have any employees.

Simple join

20. List our employees with their department names
21. Display employees with their designations (jobs)
22. How many employees are working in the sales department?

Non – Equi Join:

23. Display employee details with salary grades.
24. List out the no. of employees on grade wise.

Self-Join:

25. Display the employee details with their manager names.
26. Display the employee details who earn more than their manager's salaries.

Outer Join:

27. Display employee details with all departments.
28. Display all employees in sales or operation departments.

Set Operators:

29. List out the distinct jobs in Sales and Accounting Departments.
30. List out the ALL jobs in Sales and Accounting Departments.
31. List out the common jobs in Research and Accounting Departments in ascending order.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**III**		
Course Title:	**Object Oriented Programming with C++**		
Course Code:	**23IC3PCOOP**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
1	**Introduction:** Overview to Object Oriented Programming, Benefits and applications of Object-Oriented Programming. **Beginning with C++:** Program structure, cin and cout objects, namespace, identifiers, variables, constants, operators, reference types, typecasting, control structures. **Objects and Classes:** Basics of object and class in C++, private and public members, specifying a class, C++ program with a class, arrays within a class, memory allocation to objects, Array of objects.	8
2	**Functions in C++:** Functions, Inline Function, function overloading, Default arguments, Friend functions, static data and function members, Objects as function arguments, returning objects, constant member functions and objects, this pointer. **Constructors and Destructors:** Constructors and its types – Default constructors, Parameterized constructors, multiple constructors in a class, Constructors with default arguments, dynamic initialization of objects, Copy constructor, Dynamic constructors, Destructors.	8
3	**Operator overloading and Type conversion:** Defining Operator overloading, Overloading Unary operators, Binary Operators using friend functions and Member functions, Overloading Special operators , Comma operator, new and delete operators, Rules for overloading operators, Type conversion. **Inheritance:** Concept of Inheritance, types of inheritance - single, multiple, multilevel, hierarchical, hybrid, protected members, overriding, virtual base class.	8
4	**Polymorphism:** Pointers, Pointers to Objects, pointers to members and member functions, Pointers to derived classes, virtual and pure virtual functions. **I/O and File Management:** Concept of streams, C++ stream classes, Unformatted and formatted I/O, manipulators, C++ File stream classes, File management functions, File modes, Binary and Random Files.	8
5	**Templates**: Introduction to templates, function templates and class templates. **Introduction to exception**: try-catch throw, multiple catch, catch all, rethrowing exception, User defined exceptions. Introduction to Standard Template Library: Components of STL - Containers, Algorithms, Iterators, Application of Container classes	8

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Prescribed Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Object Oriented Programming with C++	E Balaguruswamy	6th Edition	Tata McGraw Hill	2013
2.	C++ - The Complete Reference	Herbert Schildt	4th Edition	Tata McGraw Hill	2015
Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	C++ Primer	Stanley B Lippman, Josee Lajoie, Barbara E Moo	6th Edition	Addison Wesley Professional	-
2.	Object-Oriented Programming in C++	Robert Lafore	4th Edition	Pearson Education.	-

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Programming in C++	NPTEL	2021	https://onlinecourses.nptel.ac.in/noc21_cs02/preview
2.	IITBombayX: Object-Oriented Programming	edX	2022	https://www.edx.org/course/object-oriented-programming-2

Course Outcomes

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

CO1	Apply the object-oriented concepts to find the solution for a given problem.
CO2	Analyse the given application for correctness/functionalities.
CO3	Develop C++ programs / applications for a given requirement.

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**		
CO2		**3**												**1**	
CO3			**3**		**1**					**1**			**3**		

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Proposed Assessment Plan (for 50 marks of CIE)

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

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as an internal choice.

Bloom's Level	Percentage of Questions to be Covered
Remember / Understand	**30%**
Apply / Analyse	**40%**
Create / Evaluate	**30%**

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**III**		
Course Title:	**Embedded Systems**		
Course Code:	**23IC3PCEDS**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hours
1	**Introduction to Internet of Things** - Introduction, Definition & Characteristics of IoT, Physical Design of IoT- Things in IoT, IoT Protocols Logical Design of IoT-IoT Functional Blocks, IoT Communication Models, IoT Communication APIs **IoT Enabling Technologies**- Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems IoT Levels & Deployment Templates- IoT Level-1, IoT Level-2 IoT Level-3, IoT Level-4, IoT Level-5, IoT Level-6	8
2	**Arduino Programming** Introduction to Arduino – Types of Arduino – Arduino Toolchain – Arduino Programming Structure – Sketches – Input/Output from Pins Using Sketches. Introduction to Sensors and Actuators- Classification and Selection Criteria.	8
3	**Prototype development with Arduino** Integration of Sensors and Actuators with Arduino. Setting Up Arduino- for integrating various sensors and controlling Relay, controlling Servo Motor, playing Sound, using an Alphanumeric LCD .	8
4	**Prototype development with Raspberry Pi** Raspberry Pi- Board details, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python, Other IoT devices.	8
5	**IoT Applications**- Case studies - Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle	8

Prescribed Text Book

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Internet of Things: A HandsOn Approach	Arshdeep Bahga, Vijay Madisetti	1 st	Orient Blackswan Private Limited	2015
2.	Internet of Things	Srinivasa K G, Siddesh G.M., Hanumantha Raju R.	1st	Cengage Learning India Pvt. Ltd.	2017
3.	Internet of Things: Architecture and Design Principles	Raj Kamal	1 st	McGraw Hill Education	2017

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

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

Course Outcomes

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

CO1	Apply various sensors and actuators for designing IoT applications using arduino programming.
CO2	Analyze the various IoT architectural components.
CO3	Design IOT systems using the Arduino development board and Raspberry Pi by interfacing sensors, communication modules and actuators.

CO-PO mapping

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Proposed Assessment Plan (for 50 marks of CIE)

Tool	Remarks	Marks
Internals	---	20
AAT	---	05
Lab		25
Total		**50**

Proposed AAT Plan (for 30 marks reduced to 5 marks)

Presentation (5)	Communication skills (5)	Domain Knowledge(5)	info on sensor and actuators(5)	Q&A (5)	Report (5)	Total (30)

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

Internet of Things Lab - Plan of Activities

Evaluation: 25 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	Digital and Analog output interfacing with Arduino Board
2	Interfacing Push button ,potentiometer with Arduino Board
3	Design and implement the turning ON/OFF of light based on surrounding light intensity using LDR.
4	Design and implement Fire alarm system using flame sensor and buzzer
5	Design and implement smart irrigation system using Soil Moisture sensor and Servo Motor
6	To design and implement an obstacle detection system using ultrasonic sensors and LCD.

7	Design and implement Color recognizing system using color sensor and RGB LED.
8	Interface motion sensor with Arduino Uno board
9	Study of Connectivity and Configuration of Raspberry Pi with basic peripherals, Understanding GPIO and its use in programs.
10	Write a program on Raspberry Pi to implement a sensor.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester :	**III**		
Course Title:	**Full Stack Web Development**		
Course Code:	**23DC3AEFWD**		
L-T-P:	**0-0-1**	**Total Credits:**	1

A. Introduction:

1. This course focuses on developing comprehensive skills in Full Stack Web Application Development. Students will learn to develop both front-end and back-end components of web applications, integrate with databases and external services, and apply best practices in web development.
2. Under this project work, student should develop Advanced Web based Application using technologies such as PHP, Python, Node JS, React, Angular.
3. Students can form a group with minimum of two and maximum of four.
4. Teacher allotted for project work to students should teach full stack technologies like Node JS, React, etc., during Class/Lab hours as per the allotment.
5. 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

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

CO1	Apply full-stack web development technologies to solve real-world problems.
CO2	Design and develop user-centric web applications focused on social and environmental issues.
CO3	Integrate front-end and back-end components effectively with databases and external services.
CO4	Demonstrate teamwork and problem-solving skills in project development.

C. CO-PO-PSO mapping

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

D. Assessment Plan (for 50 marks of CIE)

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Rubrics for Project Evaluation:

Criteria	Excellent	Good (3 Marks)	Satisfactory (2 Marks)	Needs Improvement (0-1 Marks)
Problem Identification & Relevance (10)	**(10 Marks)** Clearly articulates a significant social/environmental issue with insightful, innovative solutions.	**(7 Marks)** Recognizes a pertinent issue and offers practical solutions.	**(5 Marks)** Identifies a basic issue with standard solutions.	**(0-2 Marks)** Fails to identify a relevant issue or solution.
Technical Implementation (10)	**(10 Marks)** Exemplary implementation of full-stack technologies, showcasing efficiency, scalability, and technical excellence.	**(7 Marks)** Reliable and proficient technical performance, meeting key objectives.	**(5 Marks)** Basic implementation incorporating essential features and functionalities.	**(0-4 Marks)** Inadequate or incomplete technical implementation.
User Experience & Interface (10)	**(10 Marks)** Exceptional UI/UX design, prioritizing intuitiveness and user-friendliness, with a professional standard of execution.	**(7 Marks)** Competent UI design focused on usability and functionality.	**(5 Marks)** Basic UI design encompassing essential functions and user needs.	**(0-4 Marks)** Poor or non-functional user interface, lacking in user-centricity.
Group Participation (5)	**(5 marks)** Exhibits active engagement, exceptional collaboration, and effective teamwork throughout the project lifecycle.	**(4 marks)** Consistent participation and constructive collaboration within the group.	**(2 marks)** Minimal but noticeable participation and occasional contributions.	**(0 marks)** Lack of active participation and collaboration in the group.
Presentation (5)	**(5 marks)** Professional, engaging presentation with outstanding visuals and comprehensive content, demonstrating exceptional delivery skills.	**(4 marks)** Well-structured presentation with clear content and effective delivery.	**(2 marks)** Basic presentation with some structure and varying delivery quality.	**(1 marks)** Disorganized presentation lacking in coherence and adequate content.
Report & Documentation (10)	**(10 marks)** Comprehensive report covering all project aspects with meticulous documentation, including methodology, design, and future scope.	**(7 marks)** Well-structured report with detailed coverage of project implementation.	**(5 marks)** Basic report with limited content, covering essential project details.	**(2-4 marks)** Poorly structured and incomplete report, lacking essential details.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Project Topics for Website Development:

Sl. No.	Week	Activity	Content deliverables by the assigned teacher	Technologies/Skills to be Covered
1	1st	Formation of groups. Note: Student groups of size 2 or 3 or 4	Introduction to Full Stack Technologies & Issue Identification	• Overview of full stack development tools and frameworks. • Overview of web development (HTML, CSS, JavaScript), • Introduction to full stack frameworks (MEAN, MERN), Identifying social/environmental issues for web solutions.
2	2nd	Project topic selection by each Group. Presentation: Student and Project topic introduction by each group	Conceptualizing a Web Application	• Identifying problems and understanding social and environmental issues. • Brainstorming and planning a web application focused on a chosen social/environmental issue. • Tools for wireframing and prototyping (Figma, Sketch),
3	3rd	Design Layout of the Web Pages	Basic Front-end and Back-end Development	• Define layouts based on project scope and objectives. • Learning the basics of front-end (HTML, CSS, JavaScript) and back-end (Node.js, Python) development. • Front-end: HTML5, CSS3, JavaScript basics. • Back-end: Introduction to Node.js, Express.js, RESTful API development
4	4th , 5th , and 6th	Front end and back-end implementation	Data Management and Integration	• Techniques for managing and integrating data in web applications. • Database technologies (MongoDB, SQL), Integrating databases with back-end (Mongoose for MongoDB), Basic CRUD operations.
5	7th 8th and 9th	Design and Development of connecting among different web pages	Advanced Front-end & Back-end Technologies Project Development and Mid-term Review	• Delving into advanced front-end technologies (React, Angular) and back-end technologies (databases, server management). • Front-end: React.js/Angular for dynamic UI development. • Back-end: Advanced Node.js, Authentication (JWT, OAuth), Server-side rendering.
6				Development of the project with guidance and a mid-term review to assess progress.
7	10th	Presentation by each group	Integrating Feedback & Refining Applications	• Applying feedback from the mid-term review and refining the application for better performance and impact.

				• Implementing feedback, Optimization for performance, Security best practices (HTTPS, data validation), User testing and UX improvements.
8	11th	Complete Project Work Demonstration by each group	Final Project Presentations and Submissions	Students present their completed projects and submit their final work for assessment.
	12th	Project Report Preparation		

Text Book :

Supplementary texts and resources

1. **Full-Stack Development: Using Type Script, React, Node.js ,** Frank Zammetti ,2020 (1st **Modern** Edition) ,Apress
2. Beginning MERN Stack , Build and Deploy a Full Stack MongoDB, Express, React, Node.js App, Greg Lim ,2021

Tutorial Link:

1. https://www.springboard.com/resources/learning-paths/web-development-python-django/
2. https://www.coursera.org/learn/introduction-to-web-development-with-html-css-javacript
3. https://www.boardinfinity.com/micro-learning/full-stack-development-course-with-certification
4. https://www.udemy.com/course/next-js-the-complete-developers-guide/
5. https://www.udemy.com/course/nextjs-build-full-stack-apps-with-nextjs-using-redux/
6. https://www.udemy.com/course/beginning-javascript/

SEE Exam (50 Marks)

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**III**		
Course Title:	**LaTeX and Canva Essentials**		
Course Code:	**23DC3AELCE**	**Total Contact Hours: 24**	
L-T-P:	**0-0-1**	**Total Credits:**	**1**

Week	Lab Programme	Hours
1	Introduction & Installation • Overview of LaTeX for Data Science reports. • Install TeX Live/MiKTeX & Overleaf. Hands-on: Compile "Hello, Data Science" document. Exercise: Typeset the formula $E = mc^2$ inline and display.	2
2	Document Classes & Structure • article/report for Data Science papers; preamble, packages, TOC. Hands-on: Skeleton report with abstract & TOC. Exercise: Insert the linear regression equation $\hat{y} = \beta_0 + \beta_1 x$.	2
3	Text Formatting & Typography • Custom macros for vectors/matrices; font sizing for tables. Hands-on: Style a multi-section methods section. Exercise: Typeset the gradient vector $\nabla f(x) = [\partial f/\partial x_i]$.	2
4	Lists, Floats & Environments • itemize/enumerate, floating code snippets & tables. Hands-on: Nested lists for DS workflow; include a CSV table. Exercise: Table of activation function $\sigma(z)=1/(1+e^{-z})$.	2
5	Tables & Math • longtable for DataFrames; amsmath for aligned equations. Hands-on: Confusion matrix and metrics alignment. Exercise: Typeset MSE = $(1/n)\sum(y_i - \hat{y}_i)^2$.	2
6	Graphics & TikZ • Include matplotlib plots as PDF; basic TikZ for pipelines. Hands-on: Embed a normal-distribution plot. Exercise: Draw an ETL pipeline diagram in TikZ.	2
7	Cross-referencing & Hyperlinks • label/ref, hyperref for code and figures. Hands-on: Link to GitHub and reference Figure 1. Exercise: Reference the ROC curve formula TPR=TP/(TP+FN).	2
8	Bibliographies & Citations • BibLaTeX for DS papers, IEEE/ACM styles. Hands-on: Compile a .bib file of key DS refs. Exercise: Cite "Scikit-learn: Machine Learning in Python."	2
9	Custom Layouts & Styles • Custom class for DS reports; headers/footers. Hands-on: Template with institute logo. Exercise: Box the K-means update rule $\mu_k = (1/\lvert S_k \rvert)\sum_{x_i \in S_k} x_i$.	2
10	Beamer Presentations, Version Control & Collaboration & Journal & Thesis Formatting (Case Study) • DS-themed Beamer; overlays for stepwise reveal. • IEEE DS templates & Springer journals. • GitHub workflows for LaTeX + Jupyter.	2

	Hands-on: 5-slide DS project overview. Exercise: Reveal the SVD $A=U\Sigma V^T$ step by step.	
11	Scientific Posters & Visual Storytelling • Principles of effective scientific poster design. • Layouts: Grid systems, whitespace, balance. • Fonts, contrast, color palettes for readability. • Structuring a poster: Introduction, Methods, Results, Conclusion. • Using Canva for A0/A1 formats with academic-style templates. Hands-on Activity: • Design a **poster** for a **Data Science project** using Canva. • Use charts, icons, timelines to summarize a pipeline (e.g., "EDA → Model → Accuracy"). Exercise: • Students must convert a 500-word abstract into a **one-page visual poster**.	2
12	Scientific Social Media Graphics & Infographics • Communicating research to the public. • Twitter/Instagram science visuals: Size, tone, and simplicity. • Science memes, data infographics, visual abstracts. • Branding with logos, colors, and consistency. Hands-on Activity: • Create an **Instagram-style science graphic** explaining a concept like **Gradient Descent** or **Overfitting vs. Underfitting**. Exercise: • Make a 3-slide mini carousel to visually explain a core ML concept using Canva (e.g., bias-variance tradeoff)	2

Prescribed Textbooks

Sl No	Title	Authors	Edition	Publisher	Year
1	The LaTeX Companion	Frank Mittelbach, Michel Goossens, et al.	3rd	Addison–Wesley Professional	2021
2	LaTeX: A Document Preparation System	Leslie Lamport	2nd	Addison–Wesley	1994
3	The Canva Workbook: Teach Yourself How to Use Canva to Create Amazing Designs	Diana Adriana	1st	Independent	2022

Reference Books

Sl No	Title	Authors	Edition	Publisher / Source	Year
1	The Chicago Manual of Style	University of Chicago Press Staff	17th	University of Chicago	2017
2	Writing Science: How to Write Papers That Get Cited and Proposals That Get Funded	Joshua Schimel	1st	Oxford University Press	2012
3	The Elements of Style	William Strunk Jr., E.B. White	4th	Pearson	2019

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

E-book						
Sl No	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1	Learn LaTeX in 30 Mins	Overleaf	1st Edition	Overleaf	2022	https://www.overleaf.com /learn/latex/Learn_LaTeX_in_30_minutes
2	LATEX for Beginners	Workbook	1st Edition	LaTeX	2024	https://shorturl.at/ZUzZJ

MOOC Course				
Sl No	**Course Name**	**Offered By**	**Year**	**URL**
1	Write Smarter with Overleaf and LaTeX	Coursera	2025	https://www.coursera.org/learn/overleafandlatex
2	LaTeX & XFig - typesetting software	NPTEL	2025	https://onlinecourses.swayam2.ac.in/aic20_sp17/preview

Course Outcomes

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

CO1	Apply principles of visual design to create professional academic and research communication materials using Canva, including posters, presentations, and collaborative assets.
CO2	Demonstrate the ability to structure and compile LaTeX documents for technical reports.
CO3	Design and format complex tables, figures, mathematical expressions, and code listings in LaTeX and also implement bibliography and citation management using BibTeX/BibLaTeX.

CO-PO Mapping

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Lab Component	1 Lab Test	40
AAT	1	10
Total		50

Project Assessment:

Objective: Assess students' ability to create a concise data science report in LaTeX, testing skills from the 12-week Technical Writing Syllabus.

Task: In a 2-hour controlled environment with TeX Live/MiKTeX or Overleaf, students will produce a professional article using provided content (Word document with text, dataset, plot PDF, and references). The report must include:

- Title page, abstract, and table of contents.
- Two sections (e.g., Introduction, Methods).
- Mathematical expressions (e.g., $\hat{y} = \beta_0 + \beta_1 x$, MSE = $(1/n)\sum(y_i - \hat{y}_i)^2$).
- A table (e.g., dataset summary or confusion matrix).
- An embedded plot (provided PDF, e.g., normal distribution).
- A simple TikZ diagram (e.g., ETL pipeline, based on the provided description).
- Cross-references to figures, tables, and equations.
- IEEE-style bibliography with two references (provided).

Content Provision: Students receive one of five pre-prepared project titles (e.g., Logistic Regression, K-Means Clustering) with comparable content in a Word document, including text, equations, table data, a plot PDF, and references, to focus on LaTeX typesetting, not content creation.

Evaluation Rubric:

The project is evaluated out of 50 marks across five criteria, with each criterion weighted to reflect its importance in technical writing and LaTeX proficiency. The total score is scaled to 40 marks (Score × 0.8) for final grading.

Criterion	Description	Excellent (8–10)	Good (5–7)	Poor (0–4)
Document Structure & Formatting (10 marks)	Correct use of document class (article), preamble, TOC, abstract, and section layout. Consistent typography.	Well-organized structure with clear sections, flawless TOC, and consistent formatting.	Minor errors in structure or formatting; TOC present but incomplete.	Missing sections, no TOC, or significant formatting errors.
Mathematical Typesetting (10 marks)	Accurate typesetting of equations (e.g., $\hat{y} = \beta_0 + \beta_1 x$, MSE = $(1/n)\sum(y_i - \hat{y}_i)^2$) using	Equations are correct, well-aligned, and professionally presented.	Minor errors in notation or alignment; equations mostly clear.	Incorrect or missing equations; poor alignment or syntax errors.

	amsmath, aligned properly.			
Tables & Graphics (10 marks)	Inclusion of a table (e.g., confusion matrix) and an embedded plot. Simple TikZ diagram included.	Table and plot are clear, correctly formatted, and relevant. TikZ diagram is precise.	Table or plot has minor issues; TikZ diagram is basic but functional.	Missing or poorly formatted table/plot; TikZ diagram absent or incorrect.
Cross-referencing & Bibliography (10 marks)	Use of label/ref for figures, tables, and equations. IEEE-style bibliography with at least two references.	Flawless cross-referencing; bibliography correctly formatted with relevant references.	Minor errors in cross-referencing or bibliography formatting.	Missing or incorrect cross-references; bibliography incomplete or incorrectly styled.
Technical Writing & Professionalism (10 marks)	The report is error-free, professionally written, and compiled without LaTeX errors.	The report is polished, clear, and error-free with professional writing.	Minor writing or compilation errors; report is mostly clear.	Significant errors in writing or compilation; unprofessional presentation.

Scaling and Submission

The project is scored out of 50 marks, with each criterion contributing 10 marks. The final score is scaled to 40 marks using the formula: Final Score = Project Score × 0.8. Students must submit the LaTeX source code (.tex file) and a compiled PDF at the end of the 2-hour exam session. The exam environment will provide access to necessary tools (TeX Live/MiKTeX or Overleaf) and any required assets (e.g., plot PDFs).

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**III**		
Course Title:	**Project Management with Git**		
Course Code:	**23IC3AEPMG**		
L-T-P:	**0-0-1**	**Total Credits:**	1

A. Introduction:

1. This course introduces students to essential concepts of project management using Git for version control. Students will learn effective collaboration, version control best practices, project lifecycle management, and integration with modern development workflows.
2. Students will form groups of 2 to 4 members to carry out a small collaborative project utilizing Git.
3. Faculty will instruct students on Git concepts during lab sessions, guiding project selection, execution, and evaluation..

B Course Outcomes

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

CO1	Apply Git version control techniques effectively in managing software development projects.
CO2	Design efficient branching, merging, and conflict-resolution strategies using Git.
CO3	Implement collaborative workflows (GitHub, GitLab, or Bitbucket) effectively in team-based projects.
CO4	Demonstrate teamwork, effective communication, and documentation using Git repositories.

C. CO-PO-PSO mapping

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

D. Assessment Plan (for 50 marks of CIE)

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Rubrics for Project Evaluation:

Criteria	Excellent (Max Marks)	Good (Mid Marks)	Satisfactory (Low Marks)	Needs Improvement
Problem Identification & Relevance (5)	Clearly identifies a suitable software project, fully relevant for version control application. (5 Marks)	Identifies a suitable project but with minor relevance issues. (4 Marks)	Basic project identified, minimal relevance. (2 Marks)	Poor or irrelevant selection. (0-1 Marks)
Technical Implementation with Git (15)	Exemplary usage of branching, merging, resolving conflicts, and commits clearly demonstrating version control best practices. (15 Marks)	Good demonstration of Git fundamentals, minor improvement possible. (10 Marks)	Basic Git usage with functional but suboptimal repository management. (6 Marks)	Poor or incorrect usage of Git tools. (0-5 Marks)
Collaborative Workflow & Communication (10)	Exemplary implementation of collaboration strategies; continuous integration and clear communication through commit messages/issues/PRs. (10 Marks)	Reliable collaboration with minor communication gaps. (7 Marks)	Basic collaboration, minimal communication and integration. (5 Marks)	Poor teamwork, limited collaboration, unclear communication. (0-4 Marks)
Group Participation (5)	Active, consistent contributions from all members, strong teamwork. (5 Marks)	Consistent contributions, occasional uneven participation. (4 Marks)	Basic contributions from some members. (2 Marks)	Limited or no contributions, poor teamwork. (0-1 Marks)
Presentation (5)	Professional, detailed demonstration of Git usage, excellent clarity. (5 Marks)	Structured presentation with clear but less detailed demonstration. (4 Marks)	Basic demonstration with limited clarity. (2 Marks)	Poor presentation, unclear Git demonstration. (0-1 Marks)
Report & Documentation (10)	Comprehensive, clear documentation covering Git repository structure, branching strategies, commits, and collaboration clearly. (10 Marks)	Good documentation covering most Git practices, minor details missing. (7 Marks)	Basic documentation with essential details. (5 Marks)	Poor or incomplete documentation. (0-4 Marks)

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

E. Tutorial Plan *(if applicable)*

F. Laboratory Plan *(if applicable)*

Project Topics for Website Development:

Week	Activity	Detailed Content Deliverables	Technologies & Skills Covered	Expected Outcome
1	Introduction to Git & Group Formation	- Overview of version control systems (VCS) - Introduction to Git - Git installation & setup (CLI, GUI) - Creating GitHub/GitLab/Bitbucket accounts - Group formation (2-4 students per group)	- Git basics - Git installation & configuration - Repository setup (remote/local) - GitHub/GitLab account creation	- Groups formed - Git installed - Remote repositories created
2	Project Identification & Repository Initialization	- Selecting a suitable software project/topic for version control usage - Creating & cloning a repository - Writing and committing a clear project description (README.md)	- Repository initialization (git init) - Cloning (git clone) - Basic Git commands (add, commit, push, pull)	- Repository initialized & README.md created and committed
3	Branching & Commit Management	- Branch creation and management (feature/bug-fix branches) - Switching between branches - Commit best practices (atomic commits, commit messages)	- Git branches (branch, checkout) - Commit handling (git commit, git status, .gitignore)	- Multiple branches created - Commits made clearly with messages
4	Merging Branches & Resolving Conflicts	- Branch merging strategies - Simulating merge conflicts - Resolving merge conflicts clearly and correctly	- Merge and conflict resolution (git merge, resolving conflict markers) - Branch management techniques	- Successful branch merges - Conflicts resolved effectively
5	Collaborative Workflow & Pull Requests	- Collaborative workflow setup (fork, clone, push, pull) - Creating, managing, reviewing, and merging Pull Requests (PRs) - Conducting code reviews - Using GitHub/GitLab issues for communication	- Pull Requests management - Code reviews - Issues & collaboration tools on GitHub/GitLab	- Collaborative workflow in place - PRs reviewed and merged
6	Advanced Git Features & Mid-term Review	- Advanced Git commands and techniques (stash, revert, reset, tagging) - Mid-term project review	- Git stash, revert, reset - Tagging versions (git tag)	- Mid-term evaluation completed - Advanced Git

		(repository structure, branch management, commit quality) - Peer feedback sessions		features demonstrated
7	Project Refinement & Repository Optimization	- Incorporate mid-term feedback - Clean repository structure (remove unnecessary files, organize branches) - Implement Git best practices (clean commit history, proper branching strategy)	- Repository cleanup - Commit history optimization - Advanced branching strategies	- Optimized, clean repository structure ready for final presentation
8	Project Presentation, Demonstration & Submission	- Final project demonstration showcasing effective use of Git - Submission of complete Git repository (remote link) - Submission of documentation/report clearly detailing Git workflow and repository management	- Final presentation - Project demonstration - Comprehensive project documentation	- Final presentations delivered - Projects and documentation submitted

Text Book :

Supplementary texts and resources

1. **Pro Git (2nd Edition)**, Scott Chacon, Ben Straub, Apress, 2014.
2. **Version Control with Git (2nd Edition)**, Jon Loeliger, Matthew McCullough, O'Reilly Media, 2012.
3. **Git Pocket Guide: A Working Introduction**, Richard E. Silverman, O'Reilly Media, 2013.
4. **Git for Teams: A User-Centered Approach to Creating Efficient Workflows in Git**, Emma Jane Hogbin Westby, O'Reilly Media, 2015.
5. **Mastering Git: Attain Expert-level proficiency with Git**, Jakub Narębski, Packt Publishing, 2016.

Online Resources :

- Atlassian Git Tutorial : https://www.atlassian.com/git/tutorials
- Git Official Documentation
- Learn Git Branching (Interactive Tutorial) : https://learngitbranching.js.org/
- Pro Git Book - Free Online Version
- GitHub : https://docs.github.com/en

G. SEE Exam (50 Marks)

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

4TH

SEMESTER

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Course Title	Linear Algebra and Optimization	Course Code	23MA4BSLAO
Credits	03	L – T – P	2-1-0
Contact hours	40		

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; that 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.
- Encourage collaborative (Group Learning) Learning in the class.
- Ask HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
- Adopt Problem-Based Learning (PBL), which fosters students' Analytical skills, and develops thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- 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	Hours
1	**CONTINUOUS OPTIMIZATION – 1** Function of several variables, partial differentiation, local and global optima, convex sets and functions separating hyperplanes, application of Hessian matrix in optimization, gradients of vector-valued functions, gradients of matrices, useful identities for computing gradients.	**7**
2	**CONTINUOUS OPTIMIZATION-2** Optimization using gradient descent/ascent and NR method. Sequential search 3-point search and Fibonacci search. Constrained Optimization, Method of Lagrange multipliers, KKT optimality conditions..	**7**
3	**INNER PRODUCT SPACES** Inner products, inner product spaces, length and orthogonality, orthogonal sets and Bases, projections, Gram-Schmidt orthogonalization process, QR-factorization, least squares problem and least square error. Curve fitting – Principle of least squares, fitting a straight line and fitting a parabola.	**7**

4	**EIGENVALUES AND EIGENVECTORS** Introduction, Polynomials of Matrices, Cayley-Hamilton Theorem, eigen spaces of a linear transformation, Characteristic and Minimal Polynomials of Block Matrices, Jordan Canonical form.	**7**
5	**MATRIX DECOMPOSITION AND THEIR APPLICATIONS** Diagonalization, Orthogonal diagonalization of real symmetric matrices, quadratic forms and its classifications, rank and signature of real quadratic forms, Singular value decomposition. Dimensional reduction – PCA	**7**

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
23MA4BSLIA	**CO 1**	Apply the concepts of linear algebra in Computer and Allied Engineering Sciences.	1	3
	CO 2	Demonstrate the applications of computer science and Allied Engineering Science using modern ICT tools.	1 & 5	3

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	
SEE	End Exam	100		50	

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 and 5 and two questions each from Units 3 and 4.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Prescribed Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Linear Algebra and its applications	David C. Lay, Steven R. Lay, Judi J Mc. Donald	6th Edition	Pearson Education	2021
2.	Linear Algebra and its Applications	Gilbert Strang	4th edition	Brooks Cole	2005
3.	Linear Algebra: An Introduction	Richard Bronson & Gabriel B. Costa	2nd edition	Academic press	

Reference Books:

1. Schaum's outline series -Theory and problems of linear algebra, Seymour Lipschutz, Marc Lipson, 6th edition, 2017, McGraw-Hill Education.
2. Linear Algebra and Optimization for Machine Learning, Charu C. Aggarwal, Springer, 2020
3. Linear Algebra, Stephen H. Friedberg, Arnold J. Insel and Lawrence E. Spence, Pearson, 2019, Fifth Edition.
4. Mathematics for Machine learning, Marc Peter Deisennroth, A. Aldo Faisal, Cheng Soon Ong, 2020, Cambridge University Press.
5. Linear Algebra, Kenneth Hoffman, Ray Kunze, 2nd edition, Pearson.

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/

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as an internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester :	**IV**		
Course Title:	**Theory of Computation**		
Course Code:	**23DC4ESTOC**		
L-T-P:	**3-0-0**	**Total Credits:**	3

Unit No.	Topics	Hours
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. NP Problems solvable in Polynomial Time, Satisfiability Problem	**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 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	3rd Edition	Pearson	2007

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to Languages and Automata Theory	John C Martin	3rd Edition	Tata McGraw- Hill	2007
2.	An Introduction to formal Languages and Automata	Peter Linz	5th Edition	Narosa Publishing House	2012

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

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	IITB	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 mapping

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

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	2	40
QUIZ/AAT	2	10
Total		**50**

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as an internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**IV**		
Course Title:	**Operating Systems**		
Course Code:	**23DC4PCOPS**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
1	**Introduction to Operating Systems:** What operating systems do, Operating System operations, Process management, Memory management, Storage management, Protection and security **System Structures:** Operating System Services, System calls, Operating System design and implementation, Operating System structure, System Boot.	8
2	**Processes:** Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication. **Threads:** Overview, Multi-core Programming, Multithreading Models, Implicit Threading, Threading Issues. **Process Synchronization**-Background, The Critical section problem, Synchronization hardware, Mutex Locks, Semaphores, Classical problems of synchronization.	8
3	**CPU Scheduling**- Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple-Processor scheduling. **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, Paging, Structure of page table, Segmentation. **Virtual Memory Management-** Background, Demand paging, Page replacement, Thrashing.	8
5	**Virtual Machines:** Overview, Benefits and features, Building Blocks, Types of Virtual Machines and their implementations, Virtualization and Operating System Components, Protection Rings Case Study: VMWare	8

Prescribed Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Operating System Concepts	Abraham Silberschatz, Peter Baer Galvin , Greg Gagne	9th Edition	John Wiley & Sons	2018
2.	Modern operating systems	Andrew Tanenbaum	4th Edition	Pearson Education	2009
Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Operating System: Internals and Design Principles	William Stallings	8th Edition	Prentice Hall	2014
2.	Schaum's Outline of Operating Systems	J. Archer Harris	Kindle Edition	McGraw-Hill	2001

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1.	Operating Systems Course Notes	Dr. John T.Bell	-	University of Illinois Chicago	2006 & 2013	https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/index.html
2.	Operating System Concepts	Abraham Silberschatz, Peter Baer Galvin , Greg Gagne	9th Edition	John Wiley & Sons	2018	https://drive.uqu.edu.sa/_/mskhayat/files/MySubjects/2017SS%20Operating%20Systems/Abraham%20Silberschatz-Operating%20System%20Concepts%20(9th,2012_12).pdf

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Operating Systems	SWAYAM	2023	https://onlinecourses.nptel.ac.in/noc20_cs04/preview
2.	Introduction to Operating Systems	Coursera	2023	https://www.coursera.org/specializations/codio-introduction-operating-systems

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	Analyze various Operating system strategies and techniques
CO3	Demonstrate the different functionalities of Operating Systems.

CO-PO mapping

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

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	**No. of Assessments**	**Marks**
Internals	2	40
QUIZ/AAT	2	10
Total		**50**

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as an internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**IV**		
Course Title:	**Design and Analysis of Algorithms**		
Course Code:	**23DC4PCDAA**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hours
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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Fundamentals of Computer Algorithms	Ellis Horowitz,Satraj Sahni and Rajasekhara m	2ndEdition	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	Algorithms	Coursera	2023	https://www.coursera.org/course/algs4partI
2	Design and Analysis of Algorithms	NPTEL	2023	https://onlinecourses.nptel.ac.in/noc19_cs47/preview

Course Outcomes

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

CO1	Apply algorithmic design paradigms to basic computing problems.
CO2	Analyze the time complexity of different algorithms.
CO3	Design efficient algorithms using appropriate algorithm design techniques.
CO4	Conduct experiments to implement algorithms and provide valid conclusions.

CO-PO mapping

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	2	20
QUIZ/AAT	1	5
Lab Component	CIE+ One Lab Tests	25
Total		**50**

Laboratory Plan

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 - Hand Write the Program - Pasting of the printout of the Output or Handwriting of the Output (Output should be written for all the cases).

3. Students have to practice following a list of programs and additional programming exercises will also be given in the lab. Students will be made to solve coding challenges on platforms like LeetCode and HackerRank.

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

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as an internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**IV**		
Course Title:	**Internet of Things**		
Course Code:	**23IC4PCIOT**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
1	**IoT Network Architecture-** Drivers Behind New Network Architectures, **M2M:** Machine-to-Machine communication, The oneM2M IoT Standardized Architecture, IoTWF Standardized Architecture, A simplified IoT Architecture, Difference between IoT and M2M, The core IoT Functional Stack, IoT Data Management and Compute Stack, **Wireless sensor network in IoT:** Introduction, Characteristics of Wireless Sensor Network, Types of WSN and their architecture.	**8**
2	**IoT Protocols- Communication Protocols: Serial Communication -** UART, SPI, and I2C Protocols, Implementing Serial Communication with ESP 32-examples, **Wireless Communication -** Introduction to Wireless Modules -Wi-Fi, Bluetooth, BLE, Physical/Link Layer: IEEE 802.15.4 standard and ZigBee protocol, Low-Power Wide Area Networks (LPWAN)-LoRaWAN, NB-IoT, LTE	**8**
3	**IoT Protocols and IoT Platforms-**IP as the IoT Network Layer: The need for Optimization, Optimizing IP for IoT-From 6LoWPAN to 6Lo, 6TiSCH, RPL, Transport Layer, Application Layer: CoAP, MQTT, **Intel IoTivity**– Device discovery functionality	**8**
4	**IoT Cloud services and Infrastructure-** Amazon Web Services for IoT, Amazon EC2, Amazon AutoScaling, Amazon S3, Amazon RDS, Amazon DynamoDB, Amazon Kinesis, Amazon SQS, Amazon EMR, **SDN and NFV for IoT:** Software-defined Networking, Network Function Virtualization	**8**
5	**IoT Security-Security concepts in context to IoT Devices** Iot Security Challenges, IoT System Security Domains, Security Issues in IoT Systems and Privacy Preservation, IoT Security Requirements, Security Technologies, IoT System Security Controls, Best Practices for Securing IoT Devices	**8**

Prescribed Text Books

Book Title	Authors	Edition	Publisher	Year
IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things	David Hanes, Gonzalo Salgueiro	-	CISCO Press	2019
Internet Of Things - A Hands-On Approach	Arsheep Bahga, Vijay Madisetti	-	Universities Press	2015
Internet of Things	Surya Durbha, Jyoti Joglekar	-	OXFORD University Press	2021

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

ReferenceText Books				
Book Title	**Authors**	**Edition**	**Publisher**	**Year**
Introduction to IoT	Sudip Misra, Anandarup Mukherjee, Arijit Roy,		Cambridge University Press	2021
Internet of Things: Architecture and Design Principles	Raj Kamal	1st Edition	McGraw Hill Education	2017
The Internet of Risky Things	Sean Smith	1st Edition	O'Reilly Media	2017
Practical Internet of Things Security: Design a security framework for an Internet connected ecosystem	Brian Russell, Drew Van Duren	2nd Edition		2018

Course Outcomes

CO1	**Understand** the fundamental protocols, cloud and security issues in the Internet of things.
CO2	**Apply** various protocols, device discovery and cloud services in resource constraint networks for IoT applications
CO3	**Analyze** the various IoT architectural components.

CO PO Mapping

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

Tool	**Remarks**	**Marks**
Internals	Best 2 of 3	40
QUIZ		10
Total		**50**

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

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

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as an internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**IV**		
Course Title:	**Computer Networks**		
Course Code:	**23IC4PCCNW**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hours
1	**Introduction:** Data Communications, Networks, Network Types, **Network Models**: Protocol Layering, Reference Models: The OSI Reference Model, The TCP/IP Reference 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.	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.	8
4	**Transport Layer:** Transport Layer Protocols, User Datagram Protocol, Transmission Control Protocol.	8
5	**Application Layer**: Introduction, Standard Client Server Protocols, DNS—The Internet's Directory Service, SMTP, SNMP, FTP	8

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Data Communications and Networking	Behrouz A Forouzan	5th Edition	McGraw Hill	2013
2.	Computer Networks	Andrew S. Tanenbaum, David J. Wetherall	5th Edition	Pearson	2011

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Data and Computer Communication	William Stallings	8th Edition	Pearson Education	2008

2.	Computer Networks – A Systems Approach	Larry L. Peterson and Bruce S. Davie	4th Edition	Elsevier	2007

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1.	An Introduction to Computer Networks	Peter L Dordal	1st Edition	-	2020	https://intronetworks.cs.luc.edu/current/ComputerNetworks.pdf
2.	A Top-Down Approach: Computer Networking	James F Kurose & Keith W Ross	8th Edition	Pearson	2021	https://gaia.cs.umass.edu/kurose_ross/online_lectures.htm

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Computer Networking	Coursera	2023	https://www.coursera.org/learn/illinois-tech-computer-networking
2.	NOC: Computer Networks and Internet Protocol	NPTEL		https://nptel.ac.in/courses/106105183

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, and techniques in TCP/IP network architecture
CO3	Develop applications that demonstrate the functionalities of physical, Data Link, Network, Transport or Application layer

CO-PO mapping

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Proposed Assessment Plan (for 50 marks of CIE)

Tool	Remarks	Marks
Internals	Best two out of three tests	20
QUIZ	ONE	5
Lab Component	1	25
AAT	NIL	
Total		**50**

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as an internal choice.

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
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 PCs communicate among a VLAN
12		To construct a WLAN and make the nodes communicate wirelessly
13	2	Write a program for error detecting code using CRC-CCITT (16-bits).
14	3	Write a program for congestion control using Leaky bucket algorithm.
15	4	Using TCP/IP sockets, write a clientserver 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 clientserver 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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**IV**		
Course Title:	**Hardware Interface Design**		
Course Code:	**23IC4AEHID**		
L-T-P:	**0-0-1**	**Total Credits:**	**1**

A Introduction:

Familiarization with the concept following concepts of IOT for Arduino / Raspberry Pi and necessary software installation.

- Bluetooth (HC05) and LED with ESP32.Write interfacing to Control LED (On/Off) using Bluetooth Serial Controller App.
- Design an Interface circuit for Ultrasonic Sensor (HC-SR04) with ESP32. Write a program to measure the distance and display it on an LCD.
- Design and implement a Fire alert system using GSM.
- Design an Interface for DHT11 (Temperature and Humidity) Sensor with ESP32. Write a Program to display temperature and humidity on the Blynk App.
- Design an Interface for DHT11 (Temperature and Humidity) Sensor with ESP32. Write a Program to display temperature and humidity using the FireBase server.
- Program to upload and retrieve temperature and humidity data from thingspeak cloud platform.
- To install MySQL database for any board and perform basic SQL queries.

B Course Outcomes:

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

CO1	Apply knowledge of Embedded Systems for real world problem
CO2	Design and develop a sustainable model
CO3	Integrate hardware interface to communicate with devices and cloud
CO4	Prepare budget and demonstration of project

C CO-PO-PSO mapping

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

D Assessment Plan (for 50 marks of CIE)

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

E Rubrics for Project Evaluation:

Sl No	Criteria	Excellent	Good	Satisfactory
1	Creativity, Originality and Planning	**(10 marks)** Project is creative, original and well planned (3)	**(8 marks)** Project is moderately creative, original and planned (1.5)	**(6 marks)** Project is not creative, neither original nor planned (1)
2	Hardware circuit Design	**(10 marks)** All modules are designed appropriately in accordance with the requirements. (3)	**(8 marks)** All modules are designed moderately in accordance with the requirements. (1.5)	**(6 marks)** Very basic design. All modules are designed inappropriately in accordance with the requirements. (1)
3	Implementation	**(10 marks)** Ideal implementation of modules for all set objectives. (4)	**(8 marks)** Appropriate implementation of modules for most of the set objectives. (2)	**(6 marks)** Concerned about implementation of modules for a few set objectives. (1)
4	Report	**(8 marks)** Comprehensive report covering all project aspects with meticulous documentation, including methodology, design, budget and future scope.	**(6 marks)** Well-structured report with detailed coverage of project implementation.	**(4 marks)** Basic report with limited content, covering essential project details.
5	Presentation	**(8 marks)** Professional, engaging presentation with outstanding visuals and comprehensive content, demonstrating exceptional delivery skills.	**(4 marks)** Well-structured presentation with clear content and effective delivery.	**(2 marks)** Basic presentation with some structure and varying delivery quality.

6	Participation in Discussions	**(4 marks)** Answer questions/queries professionally. Good delivery	**(2marks)** Participated in discussions; on some occasions (0.75)	**(1marks)** Listened mainly; Rarely spoke up,

F Tutorial Plan *(if applicable)*

G Laboratory Plan *(if applicable)*

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 ESP32
2	2nd	Project topic selection by each Group. Presentation: Student and Project topic introduction by each group	Verify feasibility and give suggestions
3	3rd to 6th	Conduct experiments	Experiments on integrating the board to Cloud, GSM, Wifi and Bluetooth
4	7th to 9th	Design and implement the project	Guide and give suggestions
5	10th	Presentation by each group	Integrating Feedback & Refining Applications
6	11th	Complete Project Work Demonstration by each group	Final Project Presentations and Submissions
7	12th	Project Report Preparation	

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**IV**		
Course Title:	**Mobile Application Development**		
Course Code:	**23IC4AEMAD**	**Total Contact hours**	**30**
L-T-P:	**0-0-1**	**Total Credits:**	**1**

Introduction:

- 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.
- 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.
- Teacher allotted for project work to students should teach students technologies like Dart, React, Flutter 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.

Reference Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days	Jake Knapp, John Zeratsky, Braden Kowitz	1st	Simon & Schuster	2016
2	Learning React Native Building Native Mobile Apps with JavaScrip	Bonnie Eisenman	2nd	O'Reilly Media	2017

Tutorial Links:

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

Course Outcomes (COs):

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

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			**3**		**3**								**1**	**3**	
CO3								**2**	**3**	**3**					

Assessment Plan for CIE:

Tool	Remarks	Marks
Internals	---	---
Quiz	---	---
Lab Component	CIE through Reviews	50
Alternate Assessment Tool (AAT)	----	--
Total		**50**

Weekly Activities and Delivery:

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 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	

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Rubrics for Project Evaluation:

Criteria	Excellent	Good	Satisfactory	Needs Improvement	Unsatisfactory	Points
UI/UX Design	(16-14) Designs are exceptionally creative and user-friendly, with attention to detail. All elements are consistent and align with the app's purpose.	(13-11) Designs are well thought out and user- friendly but may lack some creativity or attention to detail.	(10) Designs meet the basic requirements but may be inconsistent or lack user-friendliness.	(9-6) Designs are incomplete or not user-friendly, with significant inconsistencies or errors.	(5-0) Little to no effort shown in designs, or designs are entirely missing or unusable.	_/16
Wireframing and Prototyping	(18-14) Wireframes and prototypes are comprehensive, detailed, and clearly demonstrate all functionalities and connections.	(13-11) Wireframes and prototypes are mostly complete with some details missing or unclear.	(10) Basic wireframes and prototypes are provided, but many details are missing or unclear.	(9-6) Wireframes and prototypes are incomplete or poorly executed.	(5-0) Little to no effort shown in wireframes and prototypes, or they are entirely missing.	_/18
Mobile App Implementation	(36-30) The mobile app is fully implemented with excellent functionality, user experience, and code quality.	(29-26) The mobile app is mostly implemented with good functionality and user experience, but there may be some issues with code quality.	(25-20) The mobile app is partially implemented with basic functionality and user experience, and there may be significant issues with code quality.	(19-12) The mobile app is poorly implemented, with numerous issues in functionality, user experience, and code quality.	(11-0) Little to no effort shown in the mobile app implementation, or it is entirely non-functional.	_/36

Teamwork and Collaboration	(10) Everyone works well together, actively contributes, and communicates effectively.	(9-8) The team generally works well together with some good contributions and communication	(7-5) The team works together, but contributions and communication are inconsistent.	(4-2) The team struggles to work together, with few contributions and poor communication.	(1-0) The team does not work well together, with no contributions or communication.	_/10
Presentation	(10) The presentation is clear, engaging, and well-organized, with great use of visuals.	(9-8) The presentation is mostly clear, with good organization and some use of visuals.	(7-5) The presentation is okay but could be more organized, and visuals are used minimally.	(4-2) The presentation is unclear, disorganized, and lacks effective use of visuals.	(1-0) The presentation is completely unclear, disorganized, and does not use visuals.	_/10
Report & Documentation	(10) The report is comprehensive, well-structured, and covers all aspects of the project thoroughly.	(9-8) The report covers most of the project aspects in detail and is generally well-organized.	(7-4) The report covers the basic aspects of the project but may lack detail and organization.	(3-2) The report does not adequately cover the project, with poor organization and lack of detail.	(1-0) The report fails to cover the project, lacks any clear structure, and is missing most required sections.	_/10
Total						**_/100**

Note: The project will be evaluated for 100 marks and reduced to 50 marks.

SEE Exam (50 Marks):
Projects carried out by students will be evaluated by External examiner along with internal faculty.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**IV**		
Course Title:	**DevOps**		
Course Code:	**23IC4AEDOP**	**Total Contact Hours:**	**30**
L-T-P:	**0-0-1**	**Total Credits:**	**1**

Guidelines:

1. **DevOps Implementation on Previous Projects:** Under this project work, students should apply DevOps principles and tools to previously developed full stack applications, data science applications, or machine learning applications. This includes setting up version control, continuous integration, continuous deployment, and containerization.

2. **Advanced Application Development:** Under this project work, students should extend their existing applications using technologies such as PHP, Python, Node.js, React, Angular, or any suitable front-end and back-end technologies, and integrate DevOps practices.

3. **Group Formation:** Students can form a group with a minimum of two and a maximum of four members to collaborate on the DevOps implementation project.

4. **Teacher Guidance:** The teacher allotted for project work should teach students various DevOps tools such as Git, GitHub, Docker, Jenkins, GitHub Actions, etc., during class/lab hours as per the allotment. The teacher should guide the students in choosing the appropriate DevOps strategies and tools, assist them in applying these tools to their projects, and evaluate the progress and final outcomes of the assigned students.

Reference Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	A Beginners guide to DevOps Basics	Swatee Chand	1st	Edureka	2022
2	The DevOPS Handbook: How to Create World	Gene Kim, Jez Humble, Patrick Debois, John Allspaw, John Willis	2nd	It Revolution Press	2021

Tutorial Links:

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

Course Outcomes (COs):

CO1	Implement version control systems and manage code repositories effectively, along with containerization using Docker.
CO2	Design and implement CI/CD pipelines for automated testing, integration, and deployment.
CO3	Participate effectively in team projects, deliver clear presentations, and create well- structured reports.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

CO-PO-PSO mapping:

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

Assessment Plan for CIE:

Tool	Remarks	Marks
Internals	---	---
Quiz	---	---
Lab Component	CIE through Reviews	50
Alternate Assessment Tool (AAT)	----	--
Total		50

Laboratory Plan:

Sl. No.	Week	Activity	Content Deliverables by the Assigned Teacher	Technologies/Skills to be Covered
1	1st	Formation of groups. Note: Student groups of size 2 or 3 or 4	Introduction to DevOps and Project Setup	Overview of DevOps principles and tools, Introduction to version control using Git
2	2nd	Project topic selection by each Group. Presentation: Student and Project topic introduction by each group	Version Control and Repository Setup	Creating and managing repositories on GitHub, Branching and merging strategies, Basic Git commands
3	3rd	Initial project setup	Containerization Basics	Introduction to Docker, Writing Dockerfiles, Building and running Docker containers
4	4th , 5th and 6th	Frontend and backend development	Advanced Docker Techniques	Multi-stage builds, Docker Compose for multi-container applications, Managing data volumes and networks
5	7th , 8th and 9th	CI/CD Pipeline Setup	Continuous Integration and Deployment	Setting up CI/CD pipelines using GitHub Actions or Jenkins, Automated testing and deployment, Integrating with Docker

6	$_{10}$th	Presentation by each group	Mid-term Review and Feedback	Review of CI/CD pipeline implementations, Providing feedback for improvement, Troubleshooting CI/CD issues
7	$_{11}$th	Complete project work demonstration	Continuous Deployment Strategies	Deploying applications to free cloud hosting providers (Heroku, Netlify, etc.), Rollback strategies, Monitoring deployments
8	$_{12}$th	Project report preparation	Final Project Presentations and Submissions	Comprehensive report on DevOps implementation, Demonstrating CI/CD pipelines, Containerization and deployment strategies, Best practices for DevOps

Rubrics for Project Evaluation:

Criteria	Excellent	Good	Satisfactory	Needs Improvement	Points
Version Control	(14-12) Advanced use of version control with clear commit messages, proper code review, and effective collaboration.	(11-10) Effective use of version control with regular commits, proper branching, and merging strategies.	(9-5) Basic version control implemented with some commits and branches.	(8-0) Little or no use of version control.	_/14
Containerization using Docker	(14-12) Advanced use of Docker with multi-stage builds, efficient use of Dockerfile instructions, optimized image sizes, and automated container management.	(11-10) Effective use of Docker with well-structured Dockerfiles, proper use of volumes and networks, and container orchestration using Docker Compose or similar tools.	(9-5) Basic use of Docker with functional Dockerfiles, containerized application components, and use of Docker Hub for image storage.	(8-0) Little or no use of Docker for containerization.	_/14
Continuous Integration	(24-20) Advanced continuous integration setup with automated testing, code quality checks, and immediate feedback on failures.	(19-15) Consistent implementatio n of continuous integration with automated builds and test execution.	(14-7) Basic setup for continuous integration, but builds may fail occasionally.	(6-0) No implementation of continuous integration.	_/24
	(20) Advanced automated	(19-15)	(14-9)	(8-0)	

Deployment Automation	deployment with zero-downtime deployment, canary releases, and blue/green deployment.	Automated deployment for multiple environments with rollback capability.	Basic automated deployment for specific environments.	Manual deployment process.	_/20

Group Participation	(10) Active engagement, strong collaboration, and effective teamwork demonstrated throughout the project.	(9-7) Regular participation, constructive contributions, and collaboration within the group.	(6-4) Minimal participation with occasional contribution to group activities.	(3-0) Lack of active participation and collaboration within the group.	_/10
Presentation	(8) Professional presentation with engaging delivery, effective visuals, and comprehensive content.	(7-6) Well- structured presentation with clear content and adequate delivery.	(5-3) Basic presentation with limited structure and inconsistent delivery.	(2-0) Incoherent and disorganized presentation with inadequate content.	_/8
Report & Documentation (10 marks)	(10) Comprehensive and well- documented report covering all aspects of the project, including methodology, design, implementation, and future scope.	(9-6) Well-structured report/documentation covering project details and implementation.	(5-3) Basic report/documentation with limited content and organization.	(2-0) Poorly structured and incomplete report/documentation.	_/10
Total					**_/100**

Note: CIE will be conducted for 100 marks and reduced to 50 marks

SEE Exam (50 Marks):
Projects carried out by students will be evaluated by External examiner along with internal faculty

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**IV**		
Course Title:	**Universal Human Values**		
Course Code:	**22MA3HSUHV/ 22MA4HSUHV**	**Total Contact Hours:**	**15**
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 – 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

UNIT – 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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

UNIT – 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

UNIT – 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.

UNIT – 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)

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

5TH SEMESTER

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**V**		
Course Title:	**Cyber Security**		
Course Code:	**23IC5PCCSY**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hours
1	**Introduction to Cyber Security:** Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, CIA Triad, Assets and Threat, motive of attackers, Cybercriminals, Classification of Cybercrimes, How Criminals plan the attacks, Social Engineering, Cyberstalking, Botnets, Attack vector, Software attacks, hardware attacks, IP spoofing, Methods of defense, Security Models.	8
2	**Cyber crime**: **Mobile and Wireless Devices**- Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.	8
3	**Tools and Methods Used in Cyber crime:** Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. **Phishing and Identity Theft:** Introduction, Phishing, Identity Theft (ID Theft).	8
4	**Understanding Computer Forensics:** Introduction, Historical Background of Cyber Forensics, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, **Setting up a Computer Forensics Laboratory:** Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective.	8
5	**Cybersecurity- Organizational Implications:** Introduction, Cost of Cybercrimes and IPR issues, Web Threats for organizations, Security and Privacy implications from Cloud Computing, Social Media marketing, Social Computing and the Associated Challenges for Organizations, Organizational guidelines, Incident Handling. **Cybersecurity Standards and Frameworks:** DFARS, ISO 22301, HIPAA, NIST CSF **Cybercrime and Cyberterrorism:** Intellectual Property in the Cyberspace, The Ethical Dimension of Cybercrimes, The Psychology, Mindset and Skills of Hackers and Cybercriminal, Sociology of Cybercriminals, Information warfare.	8

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Prescribed Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives	Sunit Belapure and Nina Godbole	1st	WILEY INDIA, .	2013
2.	Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives	B. B. Gupta, D. P. Agrawal, Haoxiang Wang	1st	CBS PUBLISHERS & DISTRIBUTORS PVT. LTD	2018

Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Cyber SecurityEssentials,	James Graham, Richard Howard and Ryan Otson,	1st	CRC Press.	2010
2.	Introduction to Cyber Security	Chwan-Hwa(john) Wu,J.David Irwin.	1st	CRC Press.	2013

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1.	CyBOK: The Cyber Security Body of Knowledge	Awais Rashid,Howard Chivers ,George Danezis, Emil Lupu, Andrew Martin -	1st	University of Bristol	2019	https://www.cybok.org/ knowledgebase/
2.	Cybersecurity: The Beginner's Guide	Dr. Erdal Ozkaya	1st	Packt Publishing Ltd.	2019	https://www.jre-training.com/WebSecurity/ Cybersecurity.pdf
3.	CyberSecurity for beginners	Heimdal Security team	-	heimdalsecurity	2011	https://heimdalsecurity.com/ pdf/cyber_security_for_ beginners_ebook.pdf

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Cyber Security	Swayam	2020	https://onlinecourses.swayam2.ac.in/cec20_cs15/preview
2.	Cyber Security and Privacy NPTEL	Swayam	2023	https://onlinecourses.nptel.ac.in /noc23_cs127/preview
3.	Introduction to Cyber Security	Swayam		https://onlinecourses.swayam2.ac.in/nou19_cs08/preview

Course Outcomes

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

CO1	Apply the concepts of cyber security, and cyber-crime.
CO2	Analyze threats and risks within the context of cyber security.
CO3	Design applications for cybercrime using appropriate cyber security methods.
CO4	Conduct experiments to implement cyber attacks and its countermeasures.

CO-PO mapping:

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

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	**No. of Assessments**	**Marks**
Internals	2	20
QUIZ	1	05
Lab	CIE + 1 Test	25
Total		**50**

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

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

LAB EXPERIMENTS	
Experiment No.	**Name of the Experiment**
1	Installing and Configuring Kali Linux. Write a step-by-step guide to install Kali Linux on a virtual machine or a physical machine. This guide should cover the entire installation process, from downloading the ISO image to completing the installation and setting up the environment
2	Configure a firewall using iptables on a Linux system, write rules to filter traffic, and test its effectiveness against various network attacks.
3	Perform a network vulnerability scan using tools like Nessus or OpenVAS. Analyze the scan results to identify and prioritize vulnerabilities for remediation.
4	Develop and configure a simple Intrusion Detection System using Snort/WireShark to monitor network traffic and detect potential security breaches.
5	Capture and analyze network traffic for a simulated Advanced Persistent Threat (APT). Reconstruct the attack timeline using network forensic tools like Wireshark, NetworkMiner, Snort.
6	Simulate a Distributed Denial of Service (DDoS) attack in a controlled environment using LOIC/Slowloris, and analyze its impact on network performance.
7	Develop a custom keylogger in Python to capture keyboard inputs, and discuss ethical implications and countermeasures to detect such tools.
8	Analyze a malware sample in a controlled environment using Cuckoo Sandbox/ WireShark, identify its behavior, and suggest mitigation strategies.
9	Write a script to automate the process of scanning for IoT devices on a network using Shodan, identify vulnerabilities, and suggest security enhancements.

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**V**		
Course Title:	**Machine Learning**		
Course Code:	**23IC5PCMLG**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hours
1	**Machine Learning Landscape:** Introduction, Types of Machine Learning, Challenges of Machine Learning, Testing and Validating. **Supervised Learning** **Decision Tree Learning:** Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, Issues in Decision tree learning, CART Training algorithm	8
2	**Support Vector Machines:** Linear SVM, Nonlinear SVM, SVM Regression, Under the Hood. **Instance Based Learning:** Introduction, k-Nearest Neighbor learning	8
3	**Probabilistic Learning** Bayesian Learning: Bayes Theorem and Concept Learning, Maximum Likelihood, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes Classifier, Bayesian Belief Network, EM Algorithm.	8
4	**Ensemble Learning and Random Forests:** Voting Classifiers, Bagging and Pasting, Random Patches and Random Subspaces, Random Forests, Boosting, Stacking	8
5	**Unsupervised Learning Techniques** Clustering – Kmeans, DBSCAN, Other Clustering Algorithms, Gaussian Mixtures – Anomaly Detection, Selecting Clustering, Bayesian Gaussian Mixture Models, Other algorithms for anomaly and novelty detection **Reinforcement Learning:** Markov Decision Process, Introduction, Learning Task, Q Learning	8

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Machine Learning	Tom M. Mitchell	1st	McGraw Hill Education	2013
2	Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow	Aurelien Geron	2nd	O'Reilly	2020

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to Machine Learning with Python	Andreas C Muller & Sarah Guido	First	Shroff Publishers	2019
2.	Thoughtful Machine learning	Mathew Kirk	First	Shroff Publishers	2019

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1.	The Elements of Statistical Learning	Trevor Hastie, Robert Tibshirani, Jerome H. Friedman	2nd	Springer	2009	https://web.stanford.edu/~hastie/Papers/ESLII.pdf
2.	Machine Learning in Action	Peter Harrington	1st	Manning	2017	http://www2.ift.ulaval.ca/~chaib/IFT-4102-7025/public_html/Fichiers/Machine_Learning_in_Action.pdf

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Machine Learning	Coursera	--	https://www.coursera.org/learn/machine-learning
2.	Introduction to Machine learning	NPTEL	2016	https://swayam.gov.in/nd_noc20_cs29/preview

Course Outcomes

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

CO1	Apply different learning algorithms for various complex problems
CO2	Analyze the learning techniques for given dataset
CO3	Design a model using machine learning to solve a problem.
CO4	Conduct practical experiments to solve problems using appropriate machine learning techniques.

CO-PO mapping

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

Proposed Assessment Plan (for 50 marks of CIE)

Tool	**Remarks**	**Marks**
Internals	2	20
QUIZ	1	5
Lab Component	CIE + 1 Lab Test	25
Total		**50**

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Lab Program	Program Details
1	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
2	Develop a program to construct Support Vector Machine considering a Sample Dataset
3	Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions
4	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets
5	Write a program to construct a Bayesian network considering training data. Use this model to make predictions.
6	Apply EM algorithm to cluster a set of data stored in a .CSV file. Compare the results of k-Means algorithm and EM algorithm.
7	Implement Boosting ensemble method on a given dataset.
8	Write a program to construct random forest for sample training data. Display model accuracy using various metrics
9	Implement tic tac toe using reinforcement learning
10	Consider a sample application. Deploy machine learning model as a web service and make them available for the users to predict a given instance.

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

Bloom's Level	Percentage of Questions to be Covered
Remember / Understand	**35%**
Apply / Analyze	**45%**
Create / Evaluate	**20%**

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**V**		
Course Title:	**Cryptography**		
Course Code:	**23IC5PCCGY**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-1-0**	**Total Credits:**	**4**

Unit No.	Topics	Hours
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 (2n) 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**: Introduction Secure hash algorithm, SHA- 512	8
5	**Message Integrity and Message Authentication:** Message authentication, Digital Signature, RSA digital signature. **Key Management:** KERBEROS , Diffie-Hellman Key Agreement, X.509	8

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Cryptography and Network Security	Behrouz A. Forouzan and Debdeep Mukhopadhyay	2nd	Tata McGraw Hill	2013
2.	Cryptography and Network Security Principles and practice	William Stallings	5th	Pearson Education Asia	2013

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Cryptography: Theory and Practice	Stinson. D.	3rd	Chapman & Hall/CRC	2012

2.	Cryptography and Network Security	Atul Kahate	3rd	Tata McGraw-Hill Publishing	2008

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1.	Cryptography and Network Security. Principles and Practice	William Stallings	3rd	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	2022	https://onlinecourses.nptel.ac.in/noc22_cs90/preview
2.	Cryptography 1	Coursera	2019	https://www.coursera.org/course/crypto

Course Outcomes

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

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 mapping

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	2	40
AAT	1 (Usage of CrypTool)	10
Total		**50**

Proposed Tutorial Plan

Tutorial #	Topic
1	**Introduction to CrypTool and Installation**
2	**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	**Use CrypTool to generate the plaintext for the following decoded message:** KIRIAGANOTGFPUOPNUCDPOFIHLVQZDCOMWNKDOUPMIDFCRDFLZ BNPZZSNBNBQGZMIMCROCKCTITMDFAWWXAHCAIGEBCPASKRNB

AAT Plan:

Students are supposed to implement any of the encryption /decryption algorithm with change of various parameters and show the various possible attacks on the ciphers. Also, demonstration of how they can be overcome using suitable methods. Example: Implementation of RSA Digital Signature, Elgamal Digital Signature, Diffie Hellman Signature, 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 or Tool usage introduction
5	7th	Presentation on Front-end Design of the application or Tool features demonstration
6	8th , 9th , 10th	Design and Development of the actual algorithm and testing it for various test cases. Demonstration of the tool used and the task involved.
7	11th	Complete code demonstration or complete demonstration of the task using the tool
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

SEE Exam Question paper format
In all five units, two questions are to be asked for 20 marks each as internal choice.

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 CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**V**		
Course Title:	**Unix Shell Programming**		
Course Code:	**23IC5PCUSP**	**Total Contact Hours:**	**25 hours**
L-T-P:	**0-2-0**	**Total Credits:**	**2**

Unit No.	Topics	Hours
1	**Overview of UNIX**: Introduction to UNIX Operating System, Architecture, Kernel and Shell, Features, Internal and External Commands, Basic Commands: cal, date, echo, bc, script, passwd, PATH, who, uname, pwd, cd, mkdir, rmdir. Command Structure, Shell Script and Shell Programming, UNIX Server.	**5**
2	**File System:** Introduction to File system, File creations and its related commands cat, cp, rm, mv, more, file, ls, wc, pg, cmp, comm, diff. Zipping & unzipping files, gzip, tar, zip.	**5**
3	**File Attributes:** Listing File attributes, listing directory attributes, File ownership, File Permissions, chmod: changing file permissions, Directory permissions, changing file ownership. **Process:** Process basics, process status, Process creation, Internal and External commands. **Network commands:** Ping, traceroute, tracepath, ifconfig, hostname, netstat, curl, wget.	**5**
4	**Shell Programming:** Shell as an interpreter, shell variables, environment variables, Keywords, Assignment Statements, read , echo ,Shell scripts and execution methods, exit Status of a Command.	**5**
5	Branching Control Structures, Loop-Control Structure, Continue and break Statements, Expressions, Command Substitution, Command Line Arguments and Functions.	**5**

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	The UNIX Programming Environment	Brain W Kernighan, Rob Pike	1st	Pearson Education	2015
2	Unix Concepts and Applications	Sumitabha Das	4th	TMH	2006

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	UNIX & Shell Programming	M.G. Venkatesh Murthy	2nd	Pearson Education	2007
2.	UNIX and Shell Programming	Behrouz A. Forouzan, Richard F. Gilberg	1st	Cengage Learning Ind	2003

MOOC Course

Sl. No.	Course name	Course Offered By	Year	URL
1.	Unix and Shell Programming for Beginners	Udemy	2022	https://www.udemy.com/course/shellprogramming
2.	Hands-on Introduction to Linux Commands and Shell Scripting	Coursera	2023	https://www.coursera.org/le arn/hands-on-introductionto-linux-commands-andshell-scripting

Course Outcomes:

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

CO1	Apply basic concepts of UNIX Architecture, File system and basic commands to Shell Programming.
CO2	Analyse Linux Commands and shell environments.
CO3	Develop scripts to automate the tasks for specific requirements.

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			**3**	**1**				**1**	**1**	**1**					

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	1	40
Quiz	1	10
Lab Component	---	---
AAT	---	---
Total		**50**

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**V**		
Course Title:	**Research Methodologies and IPR**		
Course Code:	**23DC5AERMI**	**Total Hours : 40 hours**	
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
1	**Research Methodology: An Introduction** - Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research methods vs Methodology, Research and scientific method, Research Process, Criteria of Good Research. **Define the Research Problem** - What is research problem, Selecting the problem, Necessity of Defining the problem, Technique involved in Defining a Problem **Research Design** - Meaning of Research Design, Need for Research Design, Features of Good Design, Important concepts Relating to Research Design, Different Research Design.	**8**
2	**Design of Sample Surveys** - Introduction, Sample Design, Sampling and Non-Sampling Errors, Sample Survey vs Census Survey, Types of Sampling Designs **Chi-Square Tests** - Test of Difference of more than Two proportions, Test of Independence of Attributes, Test of Goodness of Fit **Analysis of Variance** - The ANOVA technique, The Basic principle of ANOVA, One way ANOVA, Two way ANOVA, Latin-square Design.	**8**
3	**Nature of Intellectual property IPRs**- Invention and Creativity - Importance and Protection of Intellectual Property Rights (IPRs) – procedure for grant of patents and patenting under PCT-types of patents-technological research and innovation-international cooperation on IP.	**8**
4	**A brief summary of Patents-Copyrights-Trademarks** patent rights-licensing and transfer of technology-patent databases-case studies on IPR-Geographical indications-new developments in IPR-protection of IPR rights.	**8**
5	**Interpretation and Report Writing** - Meaning of Interpretation, Techniques of Interpretation, Precautions in Interpretation, Significance of Report Writing, Different steps in Writing Report, Layout of the Research Report, Types of Reports, Oral presentation, Mechanics of writing a research Report, Precautions of Writing Research Report.	**8**

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Research Methodology: Methods and Techniques	C R Kothari, Gaurav Garg	Multicolor(Fourth)	New Age International Publishers	2019
2	An introduction to Research Methodology	Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K	Fourth	RBSA Publishers	2002

3	Handbook of Intellectual property law and practise	Subbaram NR	First	S Viswanathan Printers and Publishing Private Limited	1998

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	**Understanding Research Methods**	Coursera	2024	https://www.coursera.org/learn/research-methods
2.	Fundamentals of Research Methodology	Udemy	2024	https://www.udemy.com/course/fundamentals-of-research-methodology/

Course Outcomes

CO1	Apply appropriate research techniques to conduct studies and present findings.
CO2	Apply ethical principles in conducting research and intellectual property rights, ensuring the integrity and credibility of scientific inquiry.
CO3	Analyze various research problems and their solutions critically.

CO-PO mapping

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

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	**No. of Assessments**	**Marks**
Internals	**Best of 2**	**40**
QUIZ/AAT	**2**	**10**
Total		**50**

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**V**		
Course Title:	**Big Data Analytics**		
Course Code:	**23IC5PEBDA**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
1	**Introduction to Big Data and Analytics:** Types of Digital Data, Definition of Big data and Analytics, Characteristics of Big Data, Domain Specific Examples of Big Data, Analytics Flow for Big Data, Big Data Stack, Mapping Analytics Flow to Big Data Stack, Case Study: Weather Data Analysis	8
2	**CAP theorem, NoSQL:** Types of NoSQL databases, MongoDB– Terms used in RDBMS and MongoDB, MongoDB Query Language: CRUD (Create, Read, Update and Delete) operations, Finding documents based on search criteria, Dealing with Null values , Count, Limit, Sort Skip, Aggregate Functions	8
3	**Cassandra** –Features of Cassandra, Keyspaces, CRUD, Collection, Counters, Time to Live (TTL)operations, Practice Examples. Hadoop: Introducing Hadoop, RDBMS versus Hadoop, Distributed Computing Challenges	8
4	**Hadoop Overview, Big Data Storage:** HDFS, Batch Analysis: Hadoop and MapReduce, Wordcount Demonstration, Hadoop- MapReduce Examples. **Usecase Study- Recommendation Systems:** Introduction, A Model for Recommendation Systems, Collaborative Filtering System and Content Based Recommendations.	8
5	**Scala:** The Basics, Control Structures and functions, Working with arrays, Maps and Tuples Introduction to Data Analysis with Spark: Introduction to Apache Spark, A unified Spark, Users of Spark, Storage layers for Spark. Programming with RDDs: RDD Basics, Creating RDDs, RDD Operations, Passing functions to Spark, Common Transformations and Actions. **Spark SQL:** Linking with Spark SQL, Using Spark SQL in Applications, Loading and Saving Data, JDBC/ODBC Server, User-defined functions, Spark SQL Performance.	8

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Big Data Science & Analytics – A Hands-on Approach	Arshdeep Bahga, Vijay Madisetti	1st	VPT	2019
2.	Big Data and Analytics Seema Acharya,	Seema Acharya, Subjashini Chellappan	1st	Wiley	2010
3.	Scala for the Impatient	Cay S. Horstmann	2nd	Pearson	2016

4.	Learning Spark Lightning-Fast Big Data Analysis	Andy Konwinski, Holden Karau, MateiZaharia, Patrick Wendell	1 st	O'Reilly	2015

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	A Textbook on Big Data Analytics	Dr. V. Harsha Shastri Mrs. V Sreeprada Mr. T. Udhayakumar Dr. K. R. Ananth	1st	Notion Press	2023
2.	Big Data Analytics, Introduction to Hadoop, Spark, and MachineLearning	Raj Kamal Preeti Saxena	1st	McGraw Hill	2019
3.	Hadoop Operations	Eric Sammer	1st	O'Reilly	2012

MOOC Course

Sl. No.	Course name	Course Offered By	Year	URL
1.	Hadoop Starter Kit	Udemy	2023	Free Hadoop Tutorial - Hadoop Starter Kit | Udemy
2.	NPTEL IIT Patna 2023	NPTEL IIT Patna	2023	https://nptel.ac.in/courses/10610418 ,

Course Outcomes

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

CO1	Apply the concepts of NoSQL, Hadoop, Spark for a given task.
CO2	Analyze data analytic techniques for a given problem.
CO3	Design and develop solutions for given requirement using data analytics mechanisms.

CO-PO mapping:

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	2	40
AAT	1	10
Total		**50**

AAT Plan:

1. Demonstration and installation of HADOOP single node cluster
2. Students should be able to install Cassandra and Spark.
3. Execution of programs and submission of reports.

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.	4 th	Presentation: Student team and topic introduction by each group
4.	5th, 6th Design	Design and workflow
5.	7 th	Phase 1 - presentation
6.	8 th, 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

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**V**		
Course Title:	**Product, services and IT Service Management**		
Course Code:	**23CS5PEPSI**		
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
1	**Overview of Products and IT Services**: Introduction to industrial revolutions from 1.0 to 5.0, overview of products, services, and their underlying components, IT Infrastructure, Data Center and Cloud computing, Application management (Development to maintenance)	**8**
2	**IT Service Management and delivery of IT Services:** Introduction to IT Service Management, the standards and frameworks in the industry and its evolution, concepts Value management, 4 Ps of IT service management, Principles and guidelines, IT Service management process and procedures overview	**8**
3	**IT Service Management best practices:** Application of IT service management best practices in IT Service delivery, **Portfolio, Program and Project Management while delivering IT Product and Services:** Introduction to Portfolio, Program and Project Management structure and its importance while delivering IT products and services. Methodologies and industry practices, Agile overview, Concepts of Scrum, Kanban and Lean, use of Agile mindset, principles and methods in IT products and service delivery	**8**
4	**Everything as a Service:** Different types of Cloud based computing models (IaaS, PaaS, SaaS), Role of service management in service-based cloud model, importance of service integration and management in multi supplier environment **DevOps and IT Service management:** Introduction to DevOps, management of deployment and releases, improve resilience and reliability of products and IT services, understanding service mindset	**8**
5	**Use of technology to manage services:** How technology enables management of services, tools for IT service management, IT operations management (event monitoring and integration), Toil reduction using automation, Artificial Intelligence infused IT service operations	**8**

Prescribed Textbooks:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	ITIL Foundation: ITIL 4 Edition (ITIL 4 Foundation)	Axelos	2nd	Axelos UK	2024
2	Mastering IT Infrastructure Management: Concepts, Techniques, and Applications	Nikhilesh Mishra	NA	Independently Published (by Amazon)	2023
3	Agile Essentials: From Concepts to Customer Delight	Rahul Shah	NA	Notion Press Media Pvt Ltd	2025

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Online Courses and Video Lectures

- https://www.udemy.com/course/agile-fundamentals-scrum-kanban-scrumban/?couponCode=CP130525
- https://www.udemy.com/course/certmike-comptia-it-fundamentals-itf/?couponCode=CP130525

Course Outcomes :
Students will be able to

CO 1	Apply the concepts of IT Service management in product and service lifecycle
CO 2	Analyse the underlying components (Infrastructure and Applications) of products and services
CO 3	Design the value co-creation process to improve the overall customer and user experience

CO-PO-PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	**3**														
CO 2		**3**													
CO 3			**3**												

Assessment Plan for CIE:

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

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**V**		
Course Title:	**Advanced Computer Network**		
Course Code:	**23IC5PEACN**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
1	**Networking**: Datagrams, virtual circuit switching, source routing, bridges and LAN switches, Internetwork, service model, global addresses, datagram forwarding in IP, subnetting and classless addressing, Address Translation (ARP), Host Configuration (DHCP), Error Reporting (ICMP), virtual networks and Tunnels, Distance Vector (RIP), Link State (OSPF), routing areas, inter-domain routing (BGP), IPv6.	**8**
2	**End-to-End Protocols:** Simple Demultiplexer (UDP), Reliable Byte Stream(TCP), End-to-End Issues, Segment Format, Connecting Establishment and Termination, Sliding Window Revisited, Triggering Transmission-Silly Window Syndrome, Nagle's Algorithm, Adaptive Retransmission-Karn/Partridge Algorithm, Jacobson Karels Algorithm, Record Boundaries, TCP Extensions.	**8**
3	**Congestion Control and Resource Allocation:** Issues in resource allocation – network model, taxonomy, evaluation criteria; Queuing discipline – FIFO, Fair Queuing; TCP congestion control – additive increase/multiplicative decrease, slow start, fast retransmit and fast Recovery, Congestion avoidance mechanisms– DECbit, Random Early Detection (RED), Source-based congestion control.	**8**
4	**Network Management:** The Infrastructure for Network Management, The Internet-Standard Management Framework, Structure of Management Information: SMI, Management Information Base: MIB, SNMP Protocol Operations and Transport Mappings, Security and Administration, ASN.1, Conclusion.	**8**
5	**Cellular Networks and LTE Technology:** The Cellular Concept – System Design Fundamentals: Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Long-Term Evolution (LTE) Introduction: Architectural Review of UMTS and GSM, The Need for LTE, From UMTS to LTE, From LTE to LTE-Advanced, System Architecture Evolution: High-Level Architecture of LTE, User Equipment	**8**

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Computer Networks: A System Approach	Larry Peterson and Bruce S Davis	5th Edition	Elsevier	2014
2	Data Communications and Networking	Behrouz A. Forouzan,	5th Edition	Tata McGraw Hill	2013

3	An Introduction to LTE	Christopher Cox	2nd Edition	Wiley	2014

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	High Speed Networks and Internet: Performance and Quality of Service	William Stallings	2nd	Pearson Education	2002
2.	Network Management Principles and Practice	Mani Subramanian	2nd	Pearson,	2010

E-Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year	URL
1.	An Introduction to Computer Networks	Peter L Dordal	Release 2.0.11	Loyola University	Jul 20, 2023	http://intronetworks.cs.luc.edu/current2/ComputerNetworks.pdf

MOOC Course

Sl. No.	Course name	Course Offered By	Year	URL
1.	Advanced Computer Networks	NPTEL/ SWAYAM	2023	https://onlinecourses.nptel.ac.in/noc23_cs35/preview
2.	Introduction to TCP/IP	Coursera	2024	https://www.coursera.org/learn/tcpip

Course Outcomes

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

CO1	Apply fundamental concepts in network and IP addressing in real-world scenario
CO2	Apply computer network concepts to solve protocol layer design issues.
CO3	Analyze the different IP addressing mechanisms, routing, congestion control, and management layers

CO-PO mapping:

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	2	40
QUIZ/AAT	2	10
Total		**50**

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Sem	**V**		
Course Title:	**Mini Project in Security**		
Course Code:	**23IC5PWSEC**	**Total Contact Hours: 40 hours**	
L-T-P:	**0-0-2**	**Total Credits:**	**2**

A. Guidelines

- **Implementation of Security Techniques**: Under this mini project, students should refer to **recent journal papers (IEEE, Springer, Elsevier, etc.)** focused on security domains such as cryptography, network security, cybersecurity, or secure software development. They are expected to implement the algorithms and technologies mentioned in the selected papers.
- **Group Formation**: Students can form a group with a minimum of two and a maximum of four members.
- **Instructor Guidance**: The instructor assigned to the mini project will guide the students on selecting a relevant domain and technical paper, and will assist them during lab hours in accordance with the timetable. The instructor will also oversee the project work and evaluate the students' progress.

B. Course Outcomes (Co):

CO1	Analyze security algorithms and techniques as presented in the selected technical paper.
CO2	Design and implement a mini project applying security practices to solve societal and engineering problems in the domain of cybersecurity.
CO3	Participate in team project, present, and create report.

C. CO-PO-PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1		**2**													
CO2			**3**		**3**								**2**		**3**
CO3								**1**	**2**	**1**					

Indicate strength of mapping (1/2/3) with justification

Tool	**Remarks**	**Marks**
Internals	-	-
QUIZ	-	-
Lab	**CIE through reviews**	**50**
Total		**50**

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

C. Rubrics for Mini Project Internal Evaluation

Criteria	Exemplary	Proficient	Partially Proficient	Points
Analysis of Security Techniques	(10) All techniques are analyzed thoroughly with respect to security requirements.	(6) Most techniques are analyzed adequately with respect to security requirements.	(4) Some techniques are not analyzed adequately with respect to security requirements.	_/10
Design of Security Modules	(10) All modules are designed appropriately with respect to security needs.	(6) Most modules are designed adequately with respect to security needs.	(4) Some modules are not designed adequately with respect to security needs.	_/10
Implementation	(10) Modules are implemented using appropriate features for all objectives.	(6) Modules are implemented for most objectives with appropriate features.	(4) Some modules are not implemented in accordance with the design.	_/10
Demonstration of Security Project	(10) Demonstrates project functionality with appropriate security features.	(6) Demonstrates functionality with most security features.	(4) Demonstrates functionality with few security features.	_/10
Report	(10) Clear and effective writing with adherence to style guidelines.	(6) Clear writing with minor errors.	(4) Unclear writing with multiple errors.	_/10
Total				_/50

D. Weekly Activities and Delivery

Week	Activity	Content Deliverables by Assigned Teacher	Lab experiments to implement by students
1st	Group formation (2-4 students)	Introduction to security domains and guidance on selecting technical papers.	1. Write a program that encrypts and decrypts a message using the Caesar cipher technique. Allow the user to input the shift value for encryption and decryption. 2. Develop a program to encrypt and decrypt text using the Vigenère cipher. The program should take a keyword and a plaintext message as inputs.
2nd	Topic selection by each group	Discuss the security techniques/algorithms from the selected paper.	3. Create a program to perform encryption and decryption using the AES algorithm. The program should allow the user to choose between 128-bit, 192-bit, or 256-bit keys.
3rd	Presentation: Topic introduction by each group	Verify the study of existing and proposed security techniques from the paper.	4. Implement a basic RSA algorithm to encrypt and decrypt messages. The program should include key generation, encryption, and decryption functions.

4th - 6th	25% of project work completion	Review the progress and provide feedback.	5. Write a program to generate a SHA-256 hash of a given message. This will demonstrate how to create a fixed-size hash from variable-length input data.
7th	Presentation: 25% working model	Evaluate and review the progress made so far.	6. Develop a program that implements HMAC using a cryptographic hash function like SHA-256. The program should take a message and a secret key as inputs and produce the HMAC.
8th - 9th	50% of project work completion	Continued review and guidance on project development.	7. Implement the Diffie-Hellman key exchange algorithm to demonstrate how two parties can securely share a secret key over a public channel.
10th	Discussion on results	Validate the results obtained and provide further guidance.	8. Create a program that uses RSA to sign a message digitally. The program should include functions for signing the message with a private key and verifying the signature with the corresponding public key.
11th	Complete project work	Final presentation and evaluation.	Complete project work
12th	Project report preparation	Provide feedback on report writing and final documentation.	Project report preparation

E. SEE Exam (50 Marks)

Evaluation of Projects will be carried out by an External examiner along with internal faculty.

Rubrics for Mini Project SEE Evaluation

Criteria	Exemplary	Proficient	Partially Proficient	Points
Problem Identification & Relevance	(10) The problem is identified with exceptional clarity and depth, demonstrating a comprehensive understanding of its context and implications.	(6) The problem is identified clearly and is generally well-defined, though minor details or nuances may be omitted.	(4) The problem is identified but lacks clarity or depth, making it difficult to fully understand its context or significance.	_/10
Demonstration of implementation	(20) The implementation is executed flawlessly, demonstrating deep technical expertise, innovation, and alignment with the project's security objectives.	(15) The implementation is functional and meets the project's security objectives with minor issues or areas for improvement	(10) The implementation is incomplete or contains significant flaws, with limited alignment to the project's security objectives	_/20
Security Analysis of implementation	(10) All techniques are analyzed thoroughly with respect to security requirements.	(6) Most techniques are analyzed adequately with respect to security requirements.	(4) Some techniques are not analyzed adequately with respect to security requirements.	_/10

Overall presentation/ Viva-voce	(10) The presentation is exceptionally clear, well-structured, and engaging, demonstrating thorough knowledge of the topic, confident communication, and the ability to answer questions comprehensively and accurately.	(6) The presentation is clear and reasonably structured, demonstrating good knowledge of the topic, with satisfactory communication and the ability to answer most questions adequately.	(4) The presentation lacks clarity or organization, demonstrates limited knowledge of the topic, and includes incomplete or unclear responses to questions.	_/10
Total				_/50

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**V**		
Course Title:	**Environmental Studies**		
Course Code:	**23DC5HSEVS**	**Total Contact Hours: 13 hours**	
L-T-P:	**1-0-0**	**Total Credits:**	**1**

Unit No.	Topics	Hours
1	**Introduction to Environment:** Definition, About Earth i.e Atmosphere, Hydrosphere, Lithosphere and Biosphere, Structure of Atmosphere, Internal structure of Earth, Ecology & Ecosystem, balanced ecosystem, types of ecosystem.	**2**
2	**Effect of Human activities on Environment:** i) Agriculture ii) Housing iii) Industries iv) Mining and v) Transportation activities. **Sustainability Standards**: ISO 14001, LEED, REACH, ISO 50001, UN's Sustainable Development Goals (SDGs).	**2**
3	**Natural Resources:** Definition, Water resources – its availability, quality, water borne & water induced diseases. Mineral resources, Forest resources, Energy resources – conventional & non - conventional energy resources, Hydroelectric, wind power, solar, Biogas. Fossil fuel-based energy resources- Coal, Oil & Gas, Nuclear power. Hydrogen as an alternate future source of energy.	**3**
4	**Environmental pollution:** Introduction and its types, Water pollution – definition, effects, control methods. Land pollution - definition, effects, Solid waste management. Noise pollution - definition, effects, control methods. **Current environmental issues & importance:** Population growth, effects & control, climatic changes, Global warming, Acid rain, ozone layer depletion & effects, Environmental protection, Role of government, legal aspects.	**3**
5	**Green Computing- Sustainable IT Practices and Metrics:** Introduction to Sustainable Information Systems, Environmental Impacts of IT- E-waste, Carbon footprint, Energy footprint, Water footprint. Green IT- Green Data Centers, Green Data Storage, Applying IT for Enhancing Environmental Sustainability, Green IT Standards and Eco-Labelling of IT.	**3**

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Environmental studies	Dr. Geetha Balakrishnan	Seventh	SUNSTAR	2016
2.	Harnessing Green IT Principles and Practices	San Murugesan, G.R. Gangadharan	First	John Wiley & Sons	2016

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Environmental studies	Benny Joseph	Second	Tata McGraw- Hill	2019

E-Book:

Sl. No.	**Book Title**	**Authors**	**Year**	**URL**
1.	Environmental studies	University Grants Commission (UGC)	2019	https://www.ugc.gov.in/oldpdf/modelcurriculum/env.pdf

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Environmental studies	Swayam	2019	https://onlinecourses.swayam2.ac.in/cec19_bt03/ preview
2	Sustainable Software Development	Microsoft	2022	https://learn.microsoft.com/en-us/training/modules/sustainable-software-engineering-overv

Course Outcomes

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

CO1	Apply the environmental concepts for conservation and protection of natural resources
CO2	Identify and establish relationships between social, economic and ethical values from environmental perspectives.
CO3	Analyze the impact of Computing solutions in the environmental context and realize the need for sustainable development

CO-PO-PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	**2**														
CO2		**2**	**3**		**3**				**1**						
CO3		**2**						**2**							**2**

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	1	25
QUIZ/AAT	2	25
Total		50

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

6TH SEMESTER

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VI**		
Course Title:	**Ethical Hacking**		
Course Code:	**23IC6PCEHG**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hours
1	**Introduction to Hacking:** Important Terminologies, Categories of Penetration Testing: Black Box, White Box, Grey Box, Types of Penetration test, Writing Reports, Structure of a Penetration Testing Report, Vulnerability Assessment Summary, Risk Assessment, Methodology. **Footprinting and Social Engineering:** Using Web Tools for Footprinting, Conducting Competitive Intelligence, Using Domain Name System Zone Transfers, Introduction to Social Engineering- The Art of Shoulder Surfing, Dumpster Diving, Piggybacking, Phishing	8
2	**Port Scanning:** Introduction to port scanning, Using Port-Scanning Tools- Nmap, Unicornscan, Nessus and OpenVAS, Conducting Ping Sweeps- Fping, Hping, Crafting IP Packets **Enumeration**: Introduction to Enumeration, Enumerating Windows Operating Systems- NetBIOS Basics, NetBIOS Enumeration Tools, Additional Enumeration Tools, Enumerating the NetWare Operating System, Enumerating the *nix Operating system.	8
3	**Hacking the Network** **Network Infrastructure:** Network Infrastructure Vulnerabilities, Choosing Tools, Scanning, Poking, and Prodding, Common Router, Switch, and Firewall Weaknesses, General Network Defenses. **Wireless LANs:** Understanding the Implications of Wireless, Choosing Your Tools, Wireless LAN Discovery, Wireless Network Attacks and Countermeasures- Rogue wireless devices, Countermeasures against rogue wireless devices, MAC spoofing, Countermeasures against MAC spoofing, Countermeasures against DoS attacks.	8
4	**Hacking Operating Systems** **Windows:** Windows Vulnerabilities, Choosing Tools, Information Gathering, Null Sessions, Share Permissions, Missing Patch Exploitation, Authenticated Scans. **Linux:** Linux Vulnerabilities, Choosing Tools, Information Gathering, Unneeded and Unsecured Services, .rhosts and hosts.equiv Files, NFS, File Permissions, Buffer Overflows, Physical Security, General Security Tests, Patching Linux	8
5	**Hacking Applications** **Communication and Messaging System**s: Messaging System Vulnerabilities, E- Mail Attacks, Instant Messaging, Voice over IP **Web Sites and Application**s: Choosing Your Web Application Tools, Web Vulnerabilities, Best Practices for Minimizing Web Security Risks **Databases and Storage Systems:** Databases, Best Practices for Minimizing Database Security Risks, Storage Systems, Best Practices for Minimizing Storage Security Risks	8

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Prescribed Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Ethical Hacking and Penetration Testing Guide	Rafay Baloch	First	Tata Mc Graw Hill Publishers	2014
2.	Hands-On Ethical Hacking and Network Defense	Michael T. Simpson, Kent Backman, and James E. Corley	2nd Edition	Delmar Cengage Learning	2010
3.	Hacking For Dummies	Kevin Beaver	3rd Edition	Wiley Publishing, Inc.	2010
Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1	Hacking Exposed Network Security Secrets & Solutions	Stuart McClure, Joel Scambray and Goerge Kurtz		Tata Mc Graw Hill Publishers	2010

Course Outcomes

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

CO1	Apply the concepts of ethical hacking and exposure to tools and methods.
CO2	Analyze the aspects of security, data gathering, foot-printing and system hacking.
CO3	Design plans to perform penetration testing for real-world scenarios.
CO4	Conduct experiments to implement cyber attacks and its countermeasures.

CO-PO mapping

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	2	20
QUIZ/AAT	1	5
Lab	CIE + 1 Test	25
Total		**50**

Ethical Hacking Lab Programs

1. Perform passive footprinting on a target network using tools like whois, Nslookup, and Google Hacking Database. Gather information about the network and its assets.

2. Create a script to automate the scanning of a network using Nmap, identify open ports, and classify potential vulnerabilities based on the scan results.

3. Simulate an SQL Injection attack on a vulnerable web application using SQLMap/BurpSuite, then implement defenses to prevent such attacks.

4. Implement a dictionary-based password cracking attack using John the Ripper and analyze the effectiveness of different password policies.

5. Perform a session hijacking attack using Wireshark to capture session tokens, then implement secure session management to prevent hijacking.

6. Simulate a phishing attack using the Social Engineering Toolkit (SET) and discuss how to detect and prevent social engineering attacks.

7. Perform penetration testing on a wireless network using Aircrack-ng/Wireshark, identify vulnerabilities, and implement WPA3 encryption for enhanced security.

8. Exploit common vulnerabilities in a web application using Burp Suite, including XSS and CSRF attacks, and implement secure coding practices to mitigate these issues.

9. Use Metasploit to exploit known vulnerabilities in a virtualized environment, including post- exploitation tasks such as privilege escalation and data extraction.

10. Create a simple ransomware in Python that encrypts files on a system, then develop a decryption tool and discuss the ethical and legal implications.

11. Simulate a MITM attack using Ettercap, intercept and modify communications, and implement HTTPS to secure the communication channel.

12. Organize a red team (attack) vs. blue team (defense) exercise, where the red team attempts to breach the system while the blue team defends it.

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VI**		
Course Title:	**Cloud Computing and Security**		
Course Code:	**23IC6PCCCS**	**Total Contact Hours: 40 hours**	
L-T-P:	**2-1-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
1	**Introduction to Cloud Computing:** Introduction, Characteristics of cloud computing, Cloud Models: Service Models, Deployment Models, Cloud Services Examples: IaaS, PaaS, Saas, Cloud based services and applications, Cloud Concepts and Technologies.	8
2	**Virtualization for Cloud:** Need for Virtualization, Pros and cons of Virtualization, Types of Virtualization, System VM, Virtual Machine monitor, Virtual Machine properties, Interpretation and binary translation, HLL VM, Hypervisors, Xen, KVM, VMWare, Live VM migration steps and performance effects .	8
3	**Cloud Platform Architecture over Virtualized Data Centers:** Cloud Computing service Models: Public, private and Hybrid clouds, Data Center Design and Interconnection networks, Architectural Design of Compute and storage clouds, Public Cloud Platforms: GAE, AWS and Azure, Inter-cloud Resource Management, Cloud Security and Trust Management.	8
4	**Inter-Cloud Resource Management:** Extended Cloud Computing services, Resource provisioning and platform deployment, Virtual Machine creation and Management, Global Exchange of Cloud resources. **Cloud Security and Trust Management:** Cloud security defense strategies, Distributed intrusion/ anomaly detection, data and software protection techniques, Reputation guided protection of data centers.	8
5	**Cloud Computing Software Security Fundamentals:** Relevant Cloud Security Design Principles, Secure Development Practices, Approaches to Cloud Software Requirements Engineering, Cloud Security Policy Implementation and Decomposition, NIST 33 Security Principles **Secure Cloud Software Testing:** Testing for Security Quality Assurance, Cloud Penetration Testing, Regression Testing, General Principle and Practices, Outsourcing. CSA STAR.	8

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Cloud Computing: A Hands- on Approach	Arshdeep Bagha, Vijay Madisetti	1st Edition	University Press	2014

2.	Cloud Security- A Comprehensive Guide to secure cloud computing	Ronald L. Krutz and Russell Dean Vines	1st Edition	Wiley	2010
3.	Distributed and cloud Computing from Parallel Processing to the Internet of Things	Kai Hwang, Geoffrey C. Fox, Jack J Dongarra	1st Edition	Morgan Kaufmann, Elsevier	2013
4.	Virtual Machines	James E Smith, Ravi Nair	1st Edition	Morgan Kaufmann Publishers	2006

Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1	Cloud Computing – Principles and Paradigms	Rajkumar Buyya, BrobergAndrzejGoscinski	1st Edition	WILEY: A JOHN WILEY & SONS, INC.,	2011

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1.	Cloud Computing	Dr. Kumar Saurabh	2 nd Edition	WILEY INDIA.	2012	https://www.amazon.in/Cl oud-Computing-2edKumar-Saurabhebook/dp/B01M02ECEH

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Cloud Application Security	Coursera	2021	https://www.mooc-list.com/course/cloud-application-security-coursera

Course Outcomes

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

CO1	Apply fundamental concepts of Cloud Computing
CO2	Analyze technological concepts of Cloud Computing.
CO3	Apply security standards, policies and compliance requirements to cloud applications.
CO4	Implement a resource scheduling algorithm for a given scenario using a suitable simulator.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

CO-PO mapping:

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

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	2	40
AAT	1	10
Total		**50**

Tutorial Plan:

Tutorial	Unit	Topic
1	I	Demonstration of SaaS application(Demonstrate CRM application suitable platform)
2	III	Demonstration of PaaS application (Create a Trailblazer app on sales force trailhead platform)
3	II	a. Create a virtual machine using VMWare Workstation PRO12 (VMware PlayStation) b. Install Python on created a virtual machine and run a simple program.
4	II	Installation of CloudSim Simulator
5	II	Demonstration and program implementation on CloudSim Simulator
6	V	Demonstration of Dockers and Kubernetes(Industry Connect)
7	III	Complete Introduction to Cloud Course on AWS Educate Learner Dashboard Page (awseducate.com)
8	IV	Complete Getting Started with Security on AWS Educate Learner Dashboard Page (awseducate.com)
9	II	Complete Getting Started with Compute on AWS Educate Getting Started with Compute (instructure.com)

10	V	Complete Getting Started with Serverless on AWS Educate Learner Dashboard Page (awseducate.com)
11	III, IV, V	Create an application for data analysis (Use any front end tool and NoSQL Database as backend), Dockize the same and host it on a chosen cloud (AWS, Google cloud etc)
12	III, IV, V	Create an application for data analysis (Use any front end tool and NoSQL Database as backend), Dockize the same and host it on a chosen cloud (AWS, Google cloud etc)

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VI**		
Course Title:	**Blockchain Technology**		
Course Code:	**23IC6PCBCT**		
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hours
1	**Blockchain Essentials:** The history of Blockchain and Bitcoin, The Growth of Blockchain Technology, Blockchain- Definition, Architecture, Generic elements of a Blockchain, Benefits, Features and Limitations, Types of Blockchain, Consensus. **Decentralization:** Decentralization using Blockchain, Decentralized Applications **Cryptographic Constructs in Blockchain:** Cryptographic primitives- Hash function, ECC Digital Signature, Zero Knowledge proof, Different types of digital signatures. **Applications of Cryptographic Hash Functions:** Merkel Trees, Patricia Trees, Distributed Hash Table.	**8**
2	**Consensus Algorithms:** Introducing the Consensus Problem, Analysis and Design, Classification, Algorithms, Choosing an Algorithm. **Transactions**: Transaction Life Cycle, Genesis block, Mining **Bitcoin:** Overview, Cryptographic Keys, Bitcoin Network, Wallets, Bitcoin Payments, Innovation in Bitcoin, Alternative coins- Introduction, Theoretical Foundations- Alternative Proof of Work.	**8**
3	**Ethereum** : An Overview, Ethereum Network, Components of Ethereum Ecosystem, Ethereum Virtual Machines **Smart Contracts:** History, Definition, Deploying Smart Contracts. **Solidity**: Variables, Data types, Control Structures, Events, Inheritance, Libraries, Functions, Error Handling. **Smart Contract Security**: Reentrancy, Arithmetic Over/Underflows	**8**
4	**Decentralized Applications (DApps):** What Is a DApp, A Basic DApp Example, Further Decentralizing the Auction DApp, Storing the Auction DApp on Swarm, The Ethereum Name Service (ENS), From App to DApp.	**8**
5	**Hyperledger:** Architecture, Projects under Hyperledger, Hyperledger Fabric, Hyperledger Sawtooth. **Tokenization:** Tokenization on a blockchain, Types of tokens, Process of Tokenization, Token offerings	**8**

Prescribed Text Book:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Mastering Blockchain	Imran Bashir	3rd	Packt	2020
2	Mastering Ethereum Building Smart Contracts and DApps	Andreas M. Antonopoulos and Dr. Gavin Wood	First Edition	O'Reilly	2018

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

MOOC Course:

Sl. No.	Course Name	Course Offered by	URL
1	Blockchain Specialization Course 1: Blockchain Basics Course 2: Smart contracts Course 3: Decentralized Applications Course 4: Blockchain Platforms	Coursera	https://www.coursera.org/specializations/blockchain
2.	Blockchain architecture, Design and Use cases	NPTEL	https://nptel.ac.in/courses/106/105/106105184/

Course Outcomes (Co):

CO1	Apply the principles of Blockchain and Cryptocurrency for a given application.
CO2	Analyze the various protocols and mining techniques in Blockchain.
CO3	Design Blockchain based solution for a given scenario.
CO4	Conduct practical experiments to solve problems using Blockchain technology.

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**												**1**		
CO2		**1**													
CO3			**3**		**2**									**2**	**3**
CO4				**2**	**3**				**1**	**1**					**3**

Proposed Assessment Plan (for 50 marks of CIE)

Tool	Remarks	Marks
Internals	**2**	**20**
Quiz	**1**	**05**
Lab	**CIE + 1 Test**	**25**
Total		**50**

SEE Exam Question paper format:

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

SEE Exam Question paper format
In all five units, two questions are to be asked for 20 marks each as internal choice.

Laboratory Plan

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 - Handwrite the Program - and Output.

3. Students have to practice following list of programs and additional programming exercises will also be given in the lab.

Program No	Program Details
1	Write a basic Solidity smart contract to understand the fundamentals of the language.
2	Implement a Solidity contract that uses arrays and control structures (if-else, loops).
3	Write a Solidity contract using different types of functions (view, pure, fallback) and function modifiers.
4	Implement a Solidity contract using mappings and structs to create a simple record-keeping system.
5	Install MetaMask, connect to an Ethereum testnet, and interact with a deployed smart contract.
6	Set up Truffle and Ganache, compile and deploy a Solidity contract on a local blockchain.
7	Implement a Merkle tree and basic blockchain focusing on state alteration and block creation.
8	Create and deploy an ERC20 token on Ethereum.
9	Implement a basic peer-to-peer blockchain network in Python.
10	Implement a blockchain with a mining process in Python, simulating the Proof-of-Work consensus algorithm
11	Install Hyperledger Fabric and Composer, then deploy and test a sample blockchain application.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VI**		
Course Title:	**Software Engineering & Agile Methodologies**		
Course Code:	**23DC6PCSEA**	**Total Contact Hours:**	**30 hours**
L-T-P:	**2-0-0**	**Total Credits:**	**2**

Unit No.	Topics	Hours
1	**Introduction** - Overview of Software Development Projects, Emergence of Software Engineering, Software Metrics **Software Life Cycle Models** - Basic Concepts, Waterfall Model and its Extensions, Rapid Application Development, Agile Development Models: Essential Ideas Behind Agile Models, Agile vs. Other Models, Spiral Model, Comparison of Different Life Cycle Models	6
2	**Requirements Analysis and Specification** - Requirements Gathering and Analysis, Software Requirements Specification (SRS) **Case Study - IEEE SRS** **Software Design** - Overview of the Design Process, Characteristics of Good Software Design: Cohesion and Coupling, Approaches to Software Design **Function-Oriented Software Design** - Overview of SA/SD Methodology, Structured Analysis: Developing the DFD Model of a System, Structured Design and Detailed Design	6
3	**Software Project Management** - Project Planning, Metrics for Project Size Estimation, Project Estimation Techniques: Empirical Estimation Techniques, COCOMO (A Heuristic Estimation Technique), Scheduling and Team Structures	6
4	**Understanding Agile** - What is Agile?, The Agile Manifesto and Principles, Why Agile Works Better than Traditional Models **Kanban and Lean** - Introduction to Kanban Method, Lean Principles in Agile **Jira Fundamentals -** Overview of Jira: Project Boards, Enrich Issues, Kanban Boards, Scrum Projects, Quick Search and Basic Search, JQL (Jira Query Language), Filters, Epics, Dashboards	6
5	**Understanding XP** - The XP Life cycle, The XP Team, XP Concepts, **Software Configuration Management** - Configuration Management Process, Version Control Systems, Change Management and Control	6

Prescribed Text Book:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Fundamentals of Software Engineering	Rajib Mall	5th	PHI Learning	2018
2.	Agile Foundations: Principles, Practices, and Frameworks	Peter Measey	1st	BCS Learning & Development Limited	2015
3	Atlassian Jira Service Desk A Complete Guide	Gerardus Blokdyk	1st	5STARCooks	2020

4	The Art of Agile Development	James Shore & Shane Warden	2nd	O'Reily	2007

Reference Book:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Essential Scrum: A Practical Guide to the Most Popular Agile Process,	Kenneth Rubin	-	Pearson	2017
2.	Hands-On Agile Software Development with JIRA: Design and manage software projects using the Agile methodology	David Harned	-	Packt	2018

MOOC Course

Sl. No.	Course name	Course Offered By	Year	URL
1.	Agile Software Development Framework	IIT-K	2024	https://ict.iitk.ac.in/courses/agile-software-development-framework-scrum/

Course Outcomes

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

CO1	**Apply** the principles of software engineering frameworks and processes.
CO2	**Analyse** agile practices and software engineering techniques to manage and develop software projects using agile tools.
CO3	**Design** different software development models and agile practices to select the most effective approach for specific project requirements.

CO-PO 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**		
CO2	**3**				**1**						**3**		**3**		
CO3		**3**											**3**		

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	2	40
QUIZ/AAT	2	10
Total		**50**

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VI**		
Course Title:	**Social Network Analysis**		
Course Code:	**23IC6PESNA**	**Total Contact Hours:**	**40 hours**
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
1	**Introduction:** The Social Networks Perspective, Historical and Theoretical Foundations, Fundamental Concepts in Network Analysis, Distinctive Features. **Social Network Data:** What are Network Data? Boundary Specification and Sampling, Types of Networks, Network Data, Measurement and Collection. **Graph Theory and Social Networks:** Graphs: Basic Definitions, Paths and Connectivity, Distance and Breadth-First Search.	**8**
2	**Strong and Weak Ties:** Triadic Closure, The Strength of Weak Ties, Tie Strength and Network Structure in Large-Scale Data, Tie Strength, Social Media, and Passive Engagement, Closure, Structural Holes, and Social Capital. **Networks in Their Surrounding Contexts:** Homophily, Mechanisms Underlying Homophily: Selection and Social Influence, Affiliation.	**8**
3	**Positive and Negative Relationships:** Structural Balance, Characterizing the Structure of Balanced Networks. **Information Networks and the World Wide Web:** The Structure of the web: The World Wide Web, Information Networks, Hypertext, and Associative Memory, The Web as a Directed Graph, The Bow-Tie Structure of the Web.	**8**
4	**Link Analysis and Web Search:** Searching the Web: The Problem of Ranking, Link Analysis using Hubs and Authorities, PageRank. **Cascading Behavior in Networks:** Diffusion in Networks, Modelling Diffusion through a Network, Cascades and Clusters, Diffusion, Thresholds, and the Role of Weak Ties.	**8**
5	**The Small-World Phenomenon:** Six Degrees of Separation, Structure and Randomness, Decentralized Search, Modeling the Process of Decentralized Search, Core-Periphery Structures and Difficulties in Decentralized Search.	**8**

Prescribed Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Social Network Analysis: Methods and Applications.	Stanley Wasserman, Katherine Faust		Cambridge University Press	2012
2.	Networks, Crowds, and Markets: Reasoning about a Highly Connected World	David Easley, Jon Kleinberg.		Cambridge University Press	2010
Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**

1.	Social Network Analysis	John Scott	3rd Edition	SAGE publications Ltd.,	2012
2.	Understanding-Social-Networks-Theories-Concepts-and findings	Charles Kadushin		Oxford university press	2012

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1.	Social Network Analysis theory and applications.	Dr. John T.Bell	-	University of Illinois Chicago	2006 & 2013	https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/index.html

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Social Network Analysis	NPTEL	2024	https://onlinecourses.nptel.ac.in/noc24_cs90/preview

Course Outcomes

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

CO1	
CO2	
CO3	

CO-PO mapping

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

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	**No. of Assessments**	**Marks**
Internals	2	40
QUIZ/AAT	2	10
Total		**50**

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VI**		
Course Title:	**Deep Learning**		
Course Code:	**23IC6PEDLN**	**Total Contact Hours:**	**40 hours**
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
1	**Introduction to Artificial Neural Networks:** From Biological to Artificial Neurons: Biological Neurons, Logical Computations with Neurons, The Perceptron, The Multilayer Perceptron and Backpropagation, Regression and Classification MLPs, Implementing MLPs with Keras, Fine-tuning Neural Network Parameters. **Introduction to Deep Learning:** Deep Feedforward Networks, Gradient-based Learning, and Efficient Computation.	**8**
2	**Convolution Neural Networks (CNN):** The Architecture of the Visual Cortex, Convolutional Layer, Pooling Layer, CNN Architectures- LeNet-5, AlexNet, GoogLeNet, VGGNet, ResNet, Xception, Pre-trained Models for Transfer Learning, Classification and Localization.	**8**
3	**Training Deep Neural Networks:** Vanishing/Exploding Gradients, Reusing Pretrained Layers, Faster Optimizers, Avoiding Overfitting Through Regularization. **Recurrent Neural Networks (RNN):** Recurrent Neurons and Layers, Training RNNs, forecasting a Time Series, Handling Long Sequences-LSTM.	**8**
4	**Representation Learning using Autoencoders:** Stacked Autoencoders, Convolutional Autoencoders, Recurrent Autoencoders, Denoising Autoencoders, Sparse Autoencoders, Applications of Autoencoders, Transfer Learning, and Domain Adaptation. **Generative Adversarial Networks (GANs):** Difficulties of training GANs, Deep Convolutional GANs, Progressive Growing of GANs, StyleGANs.	**8**
5	**Deep Generative Models:** Boltzmann Machines, Restricted Boltzmann Machines, Deep Belief Networks, Deep Boltzmann Machines, Boltzmann Machines for Real-Valued Data. **Applications:** Computer Vision, Speech Recognition, Natural Language Processing.	**8**

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Deep Learning	Ian Goodfellow, Yoshua Bengio, Aaron Courville	1st	MIT Press	2016
2.	Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow	Aurelien Geron	2nd	O'Reilly	2020

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Deep Learning with Tensor Flow and Keras 3rd Edition	Amita Kapoor, Antonio Gulli, Sujit Pal	3rd	Packt	2022
2.	Learning Deep Learning: Theory and Practice of Neural Networks, Computer Vision, NLP, and Transformers using TensorFlow	Magnus Ekman	1st	Addison-Wesley Professional	2021

E-Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year	URL
1.	Deep Learning	Ian Goodfellow	First	MIT Press	2016	https://www.deeplearningbook.org/
2.	The Little Book of Deep Learning	François Fleuret	-	University of Geneva, Switzerland	2024	https://fleuret.org/public/lbdl.pdf

MOOC Course

Sl. No.	Course name	Course Offered By	Year	URL
1.	Deep Learning for Object Detection	Coursera	2024	https://www.mooc-list.com/course/deep-learning-object-detection-coursera
2.	Deep Learning	NPTEL	2024	https://onlinecourses.nptel.ac.in/noc24_ee04/preview

Course Outcomes

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

CO1	Apply the fundamentals of deep learning algorithms for various complex problems
CO2	Analyze appropriate deep learning concepts based on the characteristics of the problem and the data.
CO3	Design and develop a model using deep learning to solve a problem.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

CO-PO-PSO mapping

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

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	**2**	**40**
AAT	**1**	**10**
Total		**50**

AAT Plan:

Students should form a group of 3 or 4 to implement and analyze suitable deep learning techniques for a given real- world problem.

Rubrics:

Criteria	Exemplary	Proficient	Partially Proficient	Points
Implementation of the deep learning techniques using appropriate tools	(5-4) Implementation of the deep learning techniques has been done accurately.	(3-2) Implementation of the deep learning techniques has been done appropriately.	(1) Implementation of the deep learning techniques has been done.	___ /4
Testing for various cases	(1) The implemented model works for any given valid input.	(0.75) The implemented model works for almost all valid inputs.	(0.5) The implemented model works for any valid inputs.	___ /1

Application/Relevance	(1) The designed technique has several applications and is relevant in the domain.	(0.75) The designed technique has few applications and is relevant in the domain.	(0.5) The designed technique has few applications and is not very relevant in the domain.	___ /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

SEE Exam Question paper format
In all five units, two questions are to be asked for 20 marks each as internal choice.

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester	**VI**		
Course Title:	**Advanced Cryptography**		
Course Code:	**23IC6PEACY**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-1-0**	**Total Credits:**	**4**

Unit No.	Topics	Hours
1	**Transport-Level Security:** Web Security Considerations, Transport Layer Security, HTTPS, Secure Shell (SSH) **Wireless Network Security:** Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security	8
2	**Electronic Mail Security** Internet Mail Architecture, Email Formats, Small Threats and Comprehensive Email Security, S/MIME, Pretty Good Privacy (PGP), DNSSEC, DNS-Based Authentication of Named Entities (DANE), Sender Policy Framework, DomainKeys Identified Mail, Domain-Based Message Authentication, Reporting, and Conformance, **IP Security** IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange, Cryptographic Suites, Key Terms, Review Questions, and Problems	8
3	**Zero-Knowledge Protocols** Introduction to Zero-Knowledge Protocols, The main scenario of a ZKP - the digital cave, Non-interactive ZKPs, Schnorr's interactive ZKP, An introduction to zk-SNARKs - spooky moon math, ZK-SNARKs in Zcash cryptocurrency, One-round ZKP, ZK13 - A ZKP for authentication and key exchange,	8
4	**Homomorphic Encryption and the Crypto Search Engine,** Crypto Search Engine, Introduction to CSE – homomorphism, Partial homomorphism in RSA, Analysis of homomorphic encryption and its implications, Math and logic behind search engines, Introduction to trees – graph theory, Huffman code, Index, Hash and Boolean logic, CSE explained, The innovation in CSE, Computational analysis on CSE, Example of computational brute-force cracking, Applications of CSE.	8
5	**Q-Mechanics and Q-Cryptography,** Introduction to Q-Mechanics and Q-Cryptography, An imaginary experiment to understand the elements of Q-Mechanics, Q-Cryptography, Quantum key distribution - BB84, Quantum computing, Shor's algorithm, Quantum Fourier Transform, Post-Q-Cryptography,	8

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Cryptography and Network Security Principles and practice	William Stallings	7th	Pearson Education Asia	2017
2.	Cryptography Algorithms	Massimo Bertaccini	1st	Packt Publishing	2022

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Cryptography and Network Security	Behrouz A. Forouzan and Debdeep Mukhopadhyay	2nd	Tata McGraw Hill	2013
2.	Introduction to Modern Cryptography	Jonathan Katz and Yehuda Lindell	3rd	Chapman & Hall/CRC	2021
3.	Cryptography: Theory and Practice	Stinson. D.	3rd	Chapman & Hall/CRC	2012
4.	**Cryptography and Network Security**	Atul Kahate	3rd	Tata McGraw-Hill Publishing	2008

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1.	Cryptography and Network Security. Principles and Practice	William Stallings	3rd	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	2022	https://onlinecourses.nptel.ac.in/noc22_cs90/preview

Course Outcomes

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

CO1	Apply advanced cryptographic techniques to protect data in various communication networks.
CO2	Analyze different security protocols and cryptographic methods to understand their effectiveness and limitations in ensuring data security.
CO3	Implement and demonstrate the use of advanced cryptographic techniques.

CO-PO mapping

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	2	40
AAT	1	10
Total		**50**

Alternate Assessment Tool 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, 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.	4 th	Presentation: Student team and topic introduction by each group
4.	5th, 6th Design	the workflow along with Front-end Design
5.	7 th	Presentation on Front-end Design of the application
6.	8 th, 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

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VI**		
Course Title:	**Major Project Phase-1**		
Course Code:	**23IC6PWPP1**		
L-T-P:	**0-0-2**	**Total Credits:**	**2**

Guidelines:

1. Students should form teams to carry out the project. The size of the teams can comprise of a minimum of three students and maximum of four students.
2. Teams are free to choose their Internal Guide or will be assigned an Internal Guide by the Department Coordinator.
3. Teams can carry out their project in-house or in a reputed organization (which has to be approved by the Internal Guide). Students taking up industry projects can do so with the condition that they are allowed to demonstrate their project work on the college campus.
4. Identification of a problem which is feasible and innovative based on the current state of art technology and having relevance and social impact, considering the boundaries of societal, environmental and ethical issues.
5. The project should address any one or more than one of the Seventeen Sustainable Development Goals (SDG) given by United Nations. The project should belong to the category of either "Community Oriented Project" or "Multidisciplinary Project" or both.
6. Survey of literature related to the identified problem to make a feasibility study and identify the project requirements. Prepare and submit a synopsis of your project to your respective Guides.
7. Based on the literature review, preparation of review paper and publishing it.
8. Evolve a high-level design/system level architecture and identify the various implementable modules with their input/output needs.
9. Preparation and submission of Project Phase1 technical report.

- In-house project teams should meet their Guides weekly and update about the progress of the projects, whereas the industry project students should meet their Guides once in fifteen days.
- CIE evaluation: Carried out twice in a semester by an internal panel comprising of Internal Guide and at least three other faculty members of the department.
- SEE evaluation: Conducted at the end of the sixth semester by both internal guide and an external examiner from other institutions. Evaluation is based on the team presentation, project report and publication.

Note: CIE and SEE will be evaluated for 100 Marks and will be reduced to 50 Marks.

Course Outcomes (COs):

CO1	Identify a real-life/engineering problem, utilize prior knowledge, and conduct extensive investigation across diverse sources, in addressing the challenges associated with the problem.
CO2	Competence in applying the software engineering principles in planning, formulating an innovative design/ approach and computing the requirements.
CO3	Plan, monitor, and manage project schedule, resources, and work assignments to ensure timely completion.
CO4	Perform professionally—as a team member, accepting responsibility, taking initiative, and providing leadership necessary to ensure project success.

CO5	Use formal and informal communications with team members and guide, make presentations and prepare technical document.
CO6	Provide sustainable solution within the context of legal framework addressing the societal and environmental concerns and upholding ethical issues.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3										3			
CO2		2	2		2							2	2		
CO3											2				
CO4									1						
CO5										1					
CO6						1	1	1							2

Assessment Plan for CIE:

Tool	Remarks	Marks
Evaluation by Guide	--	**48**
Evaluation by Panel	--	**50**
Peer Evaluation	--	**2**
Total		**50**

Rubrics for Project Evaluation

Criteria	Exemplary	Proficient	Partially Proficient	Points
Problem Formulation (CO1)	Proposed an engineering problem that is relevant to current scenario, innovative, sustainable and practically achievable. Justification for the choice of problem selected. Has identified the functional and non-functional requirement.[15]	Proposed an engineering problem that is relevant to current scenario and practically achievable. Justification for the choice of problem selected. Has identified the functional and non-functional requirement. [6-14]	Proposed a fair engineering problem and practically achievable. Justification for the choice of problem selected. Has identified the functional and non-functional requirement.[1-5]	__/15
Planning (CO3)	Project schedule: Progress, milestones and deliverables with realistic estimates of the time (Gant chart).	Project schedule: Progress, milestones and deliverables (Gant chart). Identify resources: (hardware and software)	Project schedule: Progress, milestones and deliverables are not	__/15

	Identify resources: (hardware and software) required to accomplish the development effort. Cost estimates of hardware and software. [15]	required to accomplish the development effort. Cost estimates of hardware and software. [6-14]	planned accordingly. Identify resources: (hardware and software) required to accomplish the development effort. Cost estimates of hardware and software.[1-5]	
Literature Survey (CO1)	Exhaustive/substantial Literature Survey done. Reviewed credible/quality literatures. Clearly summarized the ideas of sources by a thorough review of academic literature. Publication of Literature Review paper. [25]	Reviewed credible/quality literatures. Clearly summarized the ideas of sources by a thorough review of academic literature. Publication of Literature Review paper.[15-24]	Reviewed few literatures. Fair summarization of the ideas of sources. Publication of Literature Review paper not done.[1-14]	__/25
High Level Design (CO2)	Design is as per problem formulation. Architectural design/ System design: Identifying the sub-systems. Abstract specification of the sub-systems, Interface design. Carefully chosen a methodology or approach that is well-suited to the formulated problem. [15]	Design is as per problem formulation. Architectural design/ System design: Identifying the sub-systems. Abstract specification of the sub-systems, Interface design. [6-14]	Design does not target the problem formulation optimally. Architectural design/ System design: Identifying the sub-systems. Abstract specification of the sub-systems, Interface design.[1-5]	__/15
Report (CO5)	Clear and Effective writing and adherence to appropriate report format. All figures, graphs, charts, and drawings are accurate, consistent with the text, and of good quality. They enhance understanding of the text. All are labelled correctly.[10]	Writing that is clear and effective for most part and minor errors in adherence to appropriate report format. All figures, graphs, charts, and drawings are accurate, consistent with the text, and of good quality. They enhance understanding of the text. All are labelled correctly.[6-9]	Unclear and ineffective writing and multiple errors in adherence to appropriate report format. All figures, graphs, charts, and drawings are accurate, consistent with the text, and of good quality. They enhance understanding of the text. All are labelled correctly.[1-5]	__/10

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Oral communication (CO5)	Clear and effective communication. Presentation includes appropriate contents and is clearly organized. Presentation highlights key ideas and closes with a strong conclusion. Answer questions/queries professionally. [10]	Communication is clear. Presentation includes appropriate contents and is clearly organized. Presentation highlights key ideas. Answer questions/queries professionally.[6-9]	Unclear communication. Presentation includes appropriate contents. Presentation highlights key ideas. [1-5]	___/10
Group Participation (CO4)	Did a full share of the work or more and volunteers to help others. Provided many good ideas; inspired others; clearly communicated ideas and needs. Completed assigned work ahead of time.[4]	Did almost as much work as others. Participated in discussions; on some occasions, made suggestions. Completed assigned work on time.[2-3]	Did less work than others. Listened mainly; Rarely spoke up, and ideas were off the mark. Needed much reminding; submission was late. [1]	___/4
Ethics (CO6)	Upholds the standards of honesty and integrity. Addressed the societal and environmental issues and responsibilities.[4]	Upholds the standards of honesty and integrity. Addressed few societal and environmental issues [3]	Upholds the standards of honesty and integrity.[1-2]	___/4
Peer Review (CO4)	To be evaluated by other team members			___/2
Total				__/100

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester :	**VI**		
Course Title:	**Web 3 Development**		
Course Code:	**23IC6AEWEB**	**Total contact hours : 30**	
L-T-P:	**0-0-1**	**Total Credits:**	**1**

Introduction:

- This course introduces students to the principles and technologies of Web 3.0, focusing on decentralized applications (dApps), blockchain, smart contracts, and the integration of cryptographic methods.
- Students will develop hands-on experience by working on projects that utilize Web 3.0 technologies to build decentralized applications. Students can form groups of two to four for project work.
- The instructor will guide students in choosing relevant topics and throughout the project development process.

Course Outcomes

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

CO1	Apply web 3 development technologies to solve real-world problems.
CO2	Develop decentralized applications using blockchain technology.
CO3	Design and implement smart contracts for various use cases.
CO4	Demonstrate teamwork and prepare documentation.

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								3		
CO2			3		3	3	2	2				2	2		3
CO3			3		3			2					2		3
CO4									2	2					

Assessment Plan (for 50 marks of CIE)

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Rubrics for Project Evaluation:

Criteria	Excellent	Good	Satisfactory	Needs Improvement
Problem Identification & Relevance (10)	(10 Marks) Clearly identifies significant decentralized application opportunities with innovative solutions with concern to ethical issues.	(7 Marks) Recognizes relevant decentralized issues with practical solutions.	(5 Marks) Identifies basic issues with standard solutions.	(0-2 Marks) Fails to identify a relevant issue or solution.
Technical Implementation (10)	(10-8Marks) Exemplary implementation of Web 3.0 technologies showcasing efficiency, scalability, and technical excellence for sustainable real-world applications.	(7 Marks) Reliable and proficient technical performance meeting key objectives.	(5 Marks) Basic implementation incorporating essential features and functionalities.	(0-4 Marks) Inadequate or incomplete technical implementation.
User Experience & Interface (10)	(10 Marks) Exceptional UI/UX design with emphasis on user-centric decentralized features and seamless interaction.	(7 Marks) Competent UI design focused on usability and functionality.	(5 Marks) Basic UI design with essential decentralized features.	(0-4 Marks) Poor or non-functional user interface lacking in user-centricity.
Group Participation (5)	(5 marks) Active engagement with exceptional collaboration and effective teamwork throughout the project lifecycle.	(4 marks) Consistent participation and constructive collaboration within the group.	(2 marks) Minimal but noticeable participation and occasional contributions.	(0 marks) Lack of active participation and collaboration in the group.
Presentation (5)	(5 marks) Professional, engaging presentation with outstanding visuals and comprehensive content demonstrating exceptional delivery skills.	(4 marks) Well-structured presentation with clear content and effective delivery.	(2 marks) Basic presentation with some structure and varying delivery quality.	(1 mark) Disorganized presentation lacking in coherence and adequate content.
Report & Documentation (10)	(10 marks) Comprehensive report covering all project aspects with meticulous documentation including methodology, design, and future scope.	(7 marks) Well-structured report with detailed coverage of project implementation.	(5 marks) Basic report with limited content covering essential project details.	(2-4 marks) Poorly structured and incomplete report lacking essential details.

Laboratory Plan:

Week	Activity	Content Deliverables by Assigned Teacher	Technologies/Skills to be Covered
1st	Formation of groups.	Introduction to Web 3 Technologies & Issue Identification	Overview of Web 3.0 and Blockchain technologies. Identifying issues for decentralized applications.

2nd	Project topic selection by each group. Presentation: Student and project topic introduction by each group.	Conceptualizing a Decentralized Application	Identifying problems and understanding decentralized needs. Tools for wireframing and prototyping (Figma, Sketch).
3rd	Design Layout of the Web Pages	Basic Front-end and Back-end Development for Decentralized Apps	Defining layouts based on project scope and objectives. Learning the basics of blockchain integration and decentralized web development. Front-end: HTML5, CSS3, JavaScript basics. Back-end: Introduction to Solidity, Ethereum, IPFS.
4th, 5th, and 6th	Front end and back-end implementation	Smart Contracts Development and Blockchain Integration	Techniques for creating smart contracts and integrating them into applications. Understanding blockchain networks like Ethereum, Polkadot.
7th, 8th, and 9th	Design and Development of dApps	Advanced Decentralized Technologies	Advanced front-end technologies for dApps, server management, and peer-to-peer networking.
10th	Presentation by each group	Integrating Feedback & Refining Applications	Applying feedback from the mid-term review and refining the application for better performance and impact. Implementing feedback, optimization for performance, and security best practices.
11th	Complete Project Work Demonstration by each group	Final Project Presentations and Submissions	Students present their completed projects and submit their final work for assessment.
12th	Project Report Preparation		

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Fundamentals of Software Engineering	Rajib Mall	5th	PHI Learning	2018
2.	Agile Foundations: Principles, Practices, and Frameworks	Peter Measey		BCS Learning & Development Limited	2015
3	Atlassian Jira Service Desk A Complete Guide	Gerardus Blokdyk			2020
4	The Art of Agile Development	James Shore & Shane Warden	2nd	O'Reily	2007

Text Book :

1. **Learn Ethereum - Second Edition A practical guide to help developers set up and run decentralized applications with Ethereum 2.0,** Xun (Brian) Wu, Zhihong Zou, Dongying Song, PACKT PUB, 2023
2. **Mastering Blockchain - T**hird Edition, Imran Bashir, 2020 , Packt Publishing ,ISBN: 9781839213199

Tutorial Link:

1. The Road to Web3 : https://www.web3.university/tracks/road-to-web3
2. How To Create Your First Smart Contract : https://www.web3.university/tracks/create-a-smart-contract
3. **Learn Blockchain, Solidity, and Full Stack Web3 Development with JavaScript : https://www.youtube.com/watch?v=gyMwXuJrbJQ&t=17441s**
3. How To Build A Blockchain App with Ethereum, Web3.js & Solidity Smart Contracts : https://www.dappuniversity.com/articles/how-to-build-a-blockchain-app
4. Getting Started with Web3 Development : https://www.udemy.com/course/getting-started-with-ethereum-solidity-development/?couponCode=SKILLS4SALEB

C. SEE Exam (50 Marks)

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VI**		
Course Title:	**Data Visualization using Tools**		
Course Code:	**23IC6AEDVZ**	**Total Contact Hours: 20 hours**	
L-T-P:	**0-0-1**	**Total Credits:**	**1**

About the course: The course is designed to enhance programming and computation skills of students by exploring various features and extensive libraries of python programming language that are necessary for data science applications.

The students should work with a given dataset and create effective visualizations. The course will be executed in two cycles.
During Cycle 1, the students would be able to implement the key visualization techniques using Python tools like Matplotlib, Seaborn etc.
In Cycle 2, students will be exposed to industry-standard software tools like Tableau, Google Data Studio etc. to create compelling and interactive visualization of various types of data.
CIE 10 Marks, Lab Test 30 Marks and Report 10 Marks

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Python Data Science Handbook	Jake Vander Plas	Second Edition	O'Reilly	2017
2.	Pro Tableau: A Step by Step Guide	Seema Acharya , Subhashini Chellappan	Second Edition	Apress	2016

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Data Analysis and Visualization Using Python: Analyze Data to Create Visualizations for BI Systems,	Sossama Embarak		Apress	2018
2.	Python Data Visualization Cookbook	Igor Milovanović , Dimitry Foures , Giuseppe Vettigl	Second Edition	O'Reilly	2015

E-Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year	URL
1.	Data Visualization with Python and JavaScript	Kyran Dale	-	O'Reilly	2016	https://github.com/jllovet/dataviz-with-py-and-js

2.	Jumpstart Tableau: A Step-by-Step Guide to Better Data Visualization	Arshad Khan	-	Apress	2016	https://link.springer.com/book/10.1007/978-1-4842-1934-8

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	1 Data Science	**Coursera**	2023	https://www.coursera.org/professional-certificates/ibm-data-science
2.	Data Visualization with Tableau	**Coursera**	2023	https://www.coursera.org/specializations/data-visualization

Laboratory Plan *(if applicable)*

Lab-cycle-1

1. Using the sales_data.csv, create the visualization report for the following using Matplotlib:
   a. Get total profit of all months and show line plot with the following Style properties
   Generated line plot must include following Style properties: –
   - Line Style dotted and Line-color should be green
   - Show annotation
   - Add a square marker.
   - Add ticks for both X and Y axis

   b. Read Bathing soap facewash of all months and display it using the Subplot

2. Using the sales_data.csv, create the visualization report for the following using Matplotlib:
   a. Get total profit of all months and show line plot with the following Style properties
   Generated line plot must include following Style properties: –
   - Line Style dashed and Line-color should be green
   - Show legend at the lower right location

   Add ticks for both X and Y axis
   - Line width should be 2

   b. Read toothpaste sales data of each month and show it using a bar plot
3. Using the sales_data.csv, create the visualization report for the following using Matplotlib:
   a. Calculate total sale data for last year for each product and show it using a Pie chart
   - **Print the total sale inside each part**
   - **Explode the highest sale**
   - **Set the start angle=60**

   b. Read face cream and facewash product sales data and show it using the horizontal bar chart
4. Write a Python programming for the following:
   a. to display a horizontal bar chart of the sale of book. Use different color for each bar.
   Sample data:
   Programming languages: Fict, Tech, Moti, Business, Nutri, Dev
   Sale: 5.2,19.6, 8.7, 8, 7.7, 3.7
   - Add ticks for both axis
   - Show legend at the upper right corner

b. Write a Python program to create a stacked bar plot.
Note: Use bottom to stack the women bars on top of the men bars.
Sample Data:
Means (men) = (22, 30, 35, 35, 26)
Means (women) = (25, 32, 30, 35, 29)
- Add labels and ticks
- Use annotation

5. Write a Python programming for the following:
   a. To create a pie chart with a title of the pass percentage of subjects.
   Sample data:
   Subjects: DSC, OOP, OPS, COA, MAT, Java
   Pass percentage (%): 40, 25.6, 8.8, 30, 7.7, 60.7
   - Print percentage inside the chart
   - Use explode property

   b. Using the sales_data.csv, read the total profit of each month and show it using the histogram to see the most common profit ranges

6. Using the dataset planets.csv, create the visualization report for the following using Seaborn:
   a. Get the distance covered year-wise and show scatter plot with the following properties
   - Add "mass" as additional features
   - Use different markers
   - Control the range of marker areas with sizes

   b. Read the orbital_period of each year and show it using the histogram.
7. Using the dataset planets.csv, create the visualization report for the following using Seaborn:
   a. Get the distance covered year-wise and show scatter plot with the following properties
   - Add "mass" and "method" as additional features
   - Change the default color palette
   - Display the complete legend

   b. Read the distance for each method and show it using the bar chart.
8. Using the dataset titanic.csv, create the visualization report for the following using Seaborn:
   a. Demonstrate the use of "displot"
   b. Plot the distribution using Kernel density estimation.
   c. Use lineplot for any two suitable features
   d. Generate scatter plot with different color palette
9. Using the dataset titanic.csv, create the visualization report for the following using Seaborn:
   a. Demonstrate the subplots (2x1) on scatter plots
   b. Demonstrate the use of violin plot
   c. Get different line plots for survival of passengers class wise.
   d. Create visualization for strip plot without jitter
10. Using the dataset titanic.csv, create the visualization report for the following using Seaborn:
   a. Create a visualization using categorical plot and re-order the axis contents
   b. Demonstrate the use of violin plot
   c. Demonstrate the subplots (1x3) on line plots
   d. Generate scatter plot with different color palette

Lab-cycle-2

I. Create the visualization using Tableau for the "Corriander_seed_2021.csv" dataset.
   a. Demonstrate the use of filters (General, wildcard, condition and limits)
   b. Demonstrate the group creation, removing and renaming a group.
   c. Demonstrate the creation of constant set
   d. Create the visualization by using quick table calculation
   e. Customize the data using any three number functions

II. Create the visualization using Tableau for the "Corriander_seed_2021.csv" dataset.
   a. Demonstrate the use of cascading filter, calculation filter and data source filter.
   b. Demonstrate creating Hierarchies
   c. Demonstrate the creation of computed sets
   d. Create a visualization using a calculated field
   e. Customize the data using any three string functions

III. Create the visualization using Tableau for the "Corriander_seed_2021.csv" dataset.
   a. Demonstrate the use of cascading filter, calculation filter and data source filter.
   b. Demonstrate the group creation, removing and renaming a group.
   c. Create a visualization using a calculated field
   d. Customize the data using any three number functions
   e. Demonstrate the creation of constant set

IV. Create the visualization using Tableau for the "supermarket_sales.csv" dataset.
   a. Demonstrate the use of filters (General, wildcard, condition and limits)
   b. Demonstrate the group creation, removing and renaming a group.
   c. Demonstrate the creation of constant set
   d. Create a visualization using a calculated field
   e. Customize the data using any three string functions

V. Create the visualization using Tableau for the "supermarket_sales.csv" dataset.
   a. Demonstrate the use of cascading filter, calculation filter and data source filter.
   b. Demonstrate creating Hierarchies
   c. Demonstrate the creation of computed sets
   d. Create the visualization by using quick table calculation
   e. Customize the data using any three number function

VI. Create the visualization using Tableau for the "supermarket_sales.csv" dataset.
   a. Demonstrate the use of filters (General, wildcard, condition and limits)
   b. Demonstrate creating Hierarchies
   c. Create the visualization by using quick table calculation
   d. Demonstrate the creation of constant set
   e. Customize the data using any three string functions

VII. Create the visualization using Tableau for the "supermarket_sales.csv" dataset.
   a. Demonstrate the use of cascading filter, calculation filter and data source filter.
   b. Demonstrate the group creation, removing and renaming a group.
   c. Demonstrate the creation of constant set
   d. Create a visualization using a calculated field
   e. Customize the data using any three number functions

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Course Outcomes

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

CO1	Apply data transformations such as Joins, filtering, sorting, aggregation etc., for visualization using industry-standard software tools.
CO2	Design and create effective data visualizations using Python.
CO3	Identify opportunities for application of data visualization in various domains and communicate the results for documentation and interpretation.

CO-PO mapping:

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

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	**-**	**-**
QUIZ/AAT	**-**	**-**
Lab Component	**CIE + 1 Lab Test**	**50**
Total		**50**

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

7TH

Semester

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VII**		
Course Title:	**Cyber BioSecurity**		
Course Code:	**23IC7BSCBS**	**Total Contact Hours: 30 hours**	
L-T-P:	**0-1-0**	**Total Credits:**	**1**

Unit No.	Topics	Hours
1	**Introduction:** Introduction to biology, Fundamental similarities and differences, Aspects of biology as an independent Scientific Discipline, Need to study biology, Observations that lead to important Discoveries in Biology. Origin and Intent for the New Field of Cyber Biosecurity. **Mission-Aware Differences in Cyber Biosecurity and Bio Cybersecurity Policies**: Prevention, Detection, and Elimination	3
2	**How to Protect Biotechnology and Biosecurity from Adversarial AI Attacks? A Global Governance Perspective:** Introduction, Technical Considerations, Global Governance and Legal Discussion, International Legal Debates, Policy Recommendations. **Artificial Intelligence and the Weaponization of Genetic Data:** Introduction and Background, Identifiability, Exposure of Medical Information, Bioweapons Utilizing Genetic Data.	3
3	**Revisiting the Digital Biosecurity Landscape:** Introduction, The Landscape of Digital Biosecurity: From Data to Systems. **Biocrime,theInternet-of-Ingestible-ThingsandCyber-Biosecurity:** Introduction,Looking Through the Crime Science Lens, The Rational Choice Perspective, The Routine Activities Theory, Bio-malware: A Future Biotechnology Crime	3
4	**Cybersecurity Across the DNA-Digital Boundary: DNA Samples to Genomic Data:** Introduction, DNA as a Malicious Information Carrier, Cyber-Physical Security and the Molecular-to-Digital Hardware Interface, Data Integrity in DNA Processing.	3
5	**Safeguarding the Guardians to Safeguard the Bio-economy and Mitigate Social Injustices:** Introduction, Conceptual Framework, Predatory Goods and Services Leading to Inside Threats, In a World of Converging Digitalization, Addiction, and Stress, Concentration of Power Leading to Inside Threats, Consequences of Diminished Humanity: Inequalities of Autonomy, Outcome, and Process.	3

TEXT BOOKS:

Prescribed Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Cyber Biosecurity:ANew Field toDeal withEmerging Threats	Dov Greenbaum	First	Springer	2023

2.	Biology for Engineers	Dr. Annamma Odaneth	First	AICTE	2023

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Biosecurity in the age of synthetic biology	Leyma Perez De Haro	First	CRC Press	2024

E-Books

Sl. No.	Book Title	Publisher	Year	URL
1.	Biosecurity in the Making: The Threats, the Aspects and the Challenge of Readiness	CRC Press	2024	https://www.routledge.com/Biosecurity-in-the-Making-The-Threats-the-Aspects-and-the-Challenge-of-Readiness/EKambouris/p/book/9781032277332

MOOC Course

Sl. No.	Course name	Course Offered By	Year	URL
1	Cyber Biosecurity	Cyber Risk GmbH	2023	https://www.cyberbiosecurity.ch/Cyberbiosecurity_Training.html

Course Outcomes

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

CO1	Apply cybersecurity principles to protect bioinformatics infrastructure.
CO2	Analyze vulnerabilities in bio-laboratories, genomics data, and biomanufacturing systems to propose effective cybersecurity and biosecurity controls.

CO-PO-PSO mapping

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	2	25
QUIZ/AAT	1	25
Total		50

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VII**		
Course Title:	**Entrepreneurship & Project Management**		
Course Code:	**23DC7PCEPM**	**Total Contact Hours: 26**	
L-T-P:	**2-0-0**	**Total Credits:**	**2**

Unit No.	Topics	Hour
1	**The Entrepreneurial mind-set:** The nature of entrepreneurship, How Entrepreneurs Think, Entrepreneur background and characteristics. Sustainable Entrepreneurship, Generation of new entry opportunity, Entry strategy for new entry exploitation, Risk reduction for new entry exploitation.	5
2	**Creativity and the business idea**: Sources of New Ideas, Methods of Generating Ideas, Creative Problem Solving. **Innovation:** Innovation, Opportunity recognition, Product planning and development process, Ethics: Factors that Shape Trust in Business and Innovation Ecommerce and business start-up, international v/s domestic entrepreneurship, Legal issues in setting up the organization.	5
3	**Project Management:** Project management systems, project life cycle, Difference among Projects, Routine Activities and Programs, responsibilities and qualities of a project manager, project management team-composition, functions and responsibilities, co-ordination procedures.	5
4	**Project Planning:** Work Breakdown Structure, Types of Work Breakdown Structure, Planning Framework and Its Importance. **Project Formulations and Planning:** Private commercial criteria for project choice, feasibility, marketing feasibility, Financing for Projects and financial feasibility, Preparation of techno-economic feasibility report.	5
5	**Project appraisal:** time value of money, project appraisal techniques: Non discounting criteria, discounting criteria, appraisal and selection in practice, payback period, accounting rate of return, net present value, internal rate of return, benefit cost ratio, social cost benefit analysis, effective rate of protection, risk analysis: measures of risk, sensitivity analysis, simulation analysis, decision tree analysis.	6

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Entrepreneurship	Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd	10th	McGrawHill Education	2017
2	Effective Project Management	James P Clements, Jack Gido	4th	South Western	2009

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Project Management: The Managerial Process	Gray, Clifford F., Larson, Eric W., and Desai, Gautam V	**8th edition**	McGraw Hill Education	January 2020
2.	Project Management and Appraisal	Kharua, Sitangshu	7th edition	Oxford Press University	2011

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Project management	SWAYAM/ NPTEL	2025	https://nptel.ac.in/courses/110107081
2.	Entrepreneurship Management	SWAYAM/ NPTEL	2024	https://onlinecourses.swayam2.ac.in/cec24_mg28/preview

Course Outcomes

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

CO1	**Apply entrepreneurial thinking and innovation techniques** to identify, evaluate, and develop viable business ideas, using methods such as creative problem solving, opportunity recognition, and product planning and development.
CO2	**Apply techniques for feasibility analysis** covering marketing, financial, and technical aspects to evaluate the viability of entrepreneurial ventures or proposed projects.
CO3	**Analyze the differences between projects, programs, and routine activities** to identify suitable management approaches and optimize resource allocation and task coordination.

CO-PO mapping

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

SEE Exam Question paper format:

In all five units, two questions are to be asked for 20 marks each as internal choice..

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester	**VII**		
Course Title:	**Digital Forensics and Cyber Law**		
Course Code:	**23IC7PCDFC**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
1	An overview of digital forensics, Principles of Digital Forensics, Challenging Aspects of Digital Evidence, Preparing for digital investigations, Preparing a Digital Forensics Investigation, Procedures for private-sector high tech investigation, Understanding Data Recovery Workstations and Software, Language of Computer Crime Investigation, The Role of Computers in crime, Conducting an investigation.	8
2	Understanding Forensics Lab Accreditation Requirements, Determining the Physical Requirements for a Digital Forensics Lab, Selecting a Basic Forensic Workstation, Applying Forensic Science to Computers: Preparation, Survey, Documentation, Preservation, Examination and Analysis, Reconstruction, Reporting.	8
3	Network Forensics: Network Forensic Overview, Performing Live Acquisitions, Developing Standard Procedures for Network Forensics. E-mail Investigations: Exploring the Role of E-mail in Investigations, Exploring the Roles of the Client and Server in E-mail, Investigating E-mail Crimes and Violations, Understanding E-mail Servers, Using Specialized E-mail Forensics Tools.	8
4	Mobile Device Forensics: Understanding Mobile Device Forensics, Understanding Acquisition Procedures for Mobile Devices, Cloud Forensics: An Overview of Cloud Computing, Legal Challenges in Cloud Forensics, Technical Challenges in Cloud Forensics, Acquisitions in the Cloud, Conducting a Cloud Investigation, Tools for Cloud Forensics	8
5	Introduction to Security Policies and Cyber Laws: Need for An Information Security Policy, Information Security Standards – ISO, Introducing Various Security Policies and Their Review Process, Introduction to Indian Cyber Law, Objective and Scope of the IT Act, 2000, Intellectual Property Issues, Overview of Intellectual - Property - Related Legislation in India, Patent, Copyright, Law Related to Semiconductor Layout and Design, Software License.	8

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Guide to Computer Forensics and Investigations	Bill Nelson, Phillips, Frank, Christopher Steuart,	5th Edition	Cengage Learning,	2014

2.	Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet	Eoghan Casey	3rd Edition	Academic Press ©	2011
3.	Introduction to information security and cyber laws	Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla	–	Dreamtech Press	2015

Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1	Cybercrime and Digital Forensics: An Introduction	Holt, Thomas J., Adam M. Bossler, and Kathryn C. Seigfried-Spellar. Routledge	2nd edition	Routledge	2022
2.	Introductory Computer Forensics: A Hands-on Practical Approach	Lin, Xiaodong, Xiaodong Lin, and Lagerstrom-Fife	–	Springer International Publishing,	2018
3.	Principles of cybercrime	Clough, Jonathan	–	Cambridge University Press	2015

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1.	Cyber Forensics and Investigation on Smart Devices	Akashdeep Bhardwaj, Keshav Kaushik	Volume 1	Bentham Science Publishers Pte. Ltd. Singapore.	2024	https://benthambooks.com/ebook-files/sample-files/9789815179576-sample.pdf
2.	THE DIGITAL FORENSICS HANDBOOK	LUCAS MAHLER	-	ResearchGate	2018	https://www.researchgate.net/profile/Lucas-Mahler/publication/342511010_Digital_Forensics_Handbook_--_A_Student_Project/links/5ef889d6458515505078c356/Digital-Forensics-Handbook--A-Student-Project.pdf

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Information security and Cyber Forensics	Swayam	2021	https://onlinecourses.swayam2.ac.in/cec21_ge10/preview
2.	Digital Forensics Concepts	Coursera	2021	https://www.coursera.org/learn/digital-forensics-concepts
3.	Digital forensics	The Open University	2019	https://www.open.edu/openlearn/science-maths-technology/digital-forensics/content-section-0?active-tab=description-tab

Course Outcomes

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

CO1	Apply digital forensic procedures and tools to conduct preliminary investigations of cybercrime scenarios involving computers, networks, emails, and mobile devices.
CO2	Analyze digital evidence and forensic reports to identify patterns, anomalies, and potential security breaches across computer, mobile, and cloud platforms.
CO3	Design a digital forensics investigation strategy and lab setup that aligns with legal, technical, and organizational requirements including cyber laws and forensic standards.

CO-PO mapping

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

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	**No. of Assessments**	**Marks**
Internals	2	40
QUIZ/AAT	2	10
Total		**50**

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

Bloom's Level	**Percentage of Questions to be Covered**
Remember / Understand	30%
Apply / Analyze	40%
Create / Evaluate	30%

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VII**		
Course Title:	**Malware Analysis**		
Course Code:	**23IC7PEMWA**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
1	BASIC ANALYSIS: Basic Static Techniques: Antivirus Scanning, Hashing, Packed and Obfuscated Malware, Portable Executable File Format, Static Analysis in Practice. Malware Analysis in Virtual Machines: The Structure of a Virtual Machine, Creating Your Malware Analysis Machine, Using Your Malware Analysis Machine, The Risks of Using VMware for Malware Analysis. Basic Dynamic Analysis: Sandboxes: The Quick-and-Dirty Approach, Running Malware, Monitoring with Process Monitor, Monitoring with Process Monitor, Comparing Registry Snapshots with Regshots, Faking a Network, Packet Sniffing with Wireshark.	8
2	ADVANCED STATIC ANALYSIS: IDA Pro: The IDA Pro Interface, Using Cross references, Enhancing Disassembly, Extending IDA with Plug-ins, Recognizing C Code Constructs in Assembly: Disassembling Arithmetic Operations, Recognizing if Statement, Recognizing Loops, Understanding Function Call Conventions, Disassembling Arrays, Analyzing Linked List Traversal, Analyzing Malicious Windows Programs: The Windows API, The Windows Registry, Networking APIs, Following Running Malware.	8
3	ADVANCED DYNAMIC ANALYSIS: Debugging: Source-Level vs. Assembly-Level Debuggers, Kernel vs. User-Mode Debugging, Using a Debugger, Exceptions, OLLYDBG: Loading Malware, The OllyDbg Interface, Memory Map, Viewing Threads and Stacks, Executing Code, Breakpoints, Kernel Debugging with WinDbg: Drivers and Kernel Code, Setting Up Kernel Debugging, Using WinDbg, Kernel Debugging in Practice, Rootkits.	8
4	MALWARE FUNCTIONALITY: Malware Behavior: Downloaders and Launchers, Backdoors, Credential Stealers, Persistence Mechanisms. Covert Malware Launching: Launchers, Process Injection, Process Replacement, Hook Injection, APC Injection. Data Encoding: Goal of Analyzing Encoding Algorithms, Common Cryptographic Algorithms, Custom Encoding, Decoding	8
5	ANTI-REVERSE-ENGINEERING: Anti-Disassembly: Understanding Anti-Disassembly, Defeating Disassembly Algorithms, Anti-Disassembly Techniques. Anti-Debugging: Windows Debugger Detection, Identifying Debugger Behavior, Interfering with Debugger Functionality, Debugger Vulnerabilities. Anti-Virtual Machine Techniques: VMware Artifacts, Vulnerable Instructions. Packers and Unpacking: Packer Anatomy, Identifying Packed Programs, Unpacking Options, Automated Unpacking, Manual Unpacking.	8

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Prescribed Text Books				
Book Title	**Authors**	**Edition**	**Publisher**	**Year**
Practical Malware Analysis: The Hands-on guide to Dissecting Malicious Software	Michael Sikorski and Andrew Honig,	1st	No Starch Press,	2012

ReferenceText Books				
Book Title	**Authors**	**Edition**	**Publisher**	**Year**
Rootkits:Subverting the Windows Kernel	Jamie Butler and Greg Hoglund	-	Addison-Wesley	2005
Practical Reverse Engineering	Dang, Gazet and Bachaalany,	1st	Wiley	2014
The Rootkit Arsenal: Escape and Evasion in the Dark Corners of the System	Reverend Bill Blunden	Second Edition	Jones & Bartlett Learning	2012

Course Outcomes:

CO1	Apply malware classification techniques and assess functionality through anti-reverse engineering.
CO2	Analyze various malicious files to uncover embedded malicious behavior.
CO3	Design a systematic malware analysis framework to detect and classify attacks.

CO PO Mapping:

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

Tool	**Remarks**	**Marks**
Internals	**Best 2 of 3**	**40**
AAT	**1**	**10**
Total		**50**

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Malware Analysis and Introduction to Assembly Language	coursera	2024	https://www.coursera.org/learn/malware-analysis-and-assembly

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

Bloom's Level	**Percentage of Questions to be Covered**
Remember / Understand	30%
Apply / Analyze	40%
Create / Evaluate	30%

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VII**		
Course Title:	**Object Oriented Modelling and Design**		
Course Code:	**23IC7PEOOM**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
1	Class Modelling: Object and class concepts; Link and associations concepts; Generalization and inheritance. Advanced Class Modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages.	8
2	State Modelling: Events, States, Transitions and Conditions; State diagrams; .State diagram behaviour Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency.	8
3	Interaction Modelling: Use case models; Sequence models; Activity models. Advanced interaction modelling: Use case relationships; Procedural sequence models; Special constructs for activity models. System Conception: Devising a system concept; elaborating a concept; preparing a problem statement	8
4	Domain Analysis: Overview of analysis; Domain class model; Domain State Model; Domain Interaction Model; Iterating the analysis. Application Analysis: Application interaction model; Application class model; Application State Model; Adding operations.	8
5	Design Patterns - Introduction to patterns, Pattern categories; Relationships between patterns; Pattern description. Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber	8

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Object - Oriented Modeling and Design with UML	Michael Blaha, James Rumbaugh	2nd	Pearson Education	2007
2	Pattern-Oriented Software Architecture, A System of Patterns,	Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad,Michael Stal	1st	John Wiley and Sons	2007

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Pattern-Oriented Software Architecture: A System of Patterns	Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal	1st	John Wiley and Sons	2006

2	Object-Oriented Analysis and Design with Applications	Grady Booch	3rd	Pearson Education	2007
3	Object-Oriented Analysis, Design and Implementation	Brahma Dathan, Sarnath Ramnath	1st	Universities Press	2009
4	UML 2 Toolkit	Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado	1st	Wiley-dreamtech India	2004

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1	Object Oriented analysis and design	NPTEL	2024	https://archive.nptel.ac.in/courses/106/105/106105153/
2	Object-Oriented Design	Coursera	2024	https://www.coursera.org/learn/object-oriented-design

Course Outcomes

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

CO1	Apply the knowledge of class, State & Interaction Modelling using Unified Modelling Language to solve a given problem
CO2	Analyse a System for a given requirement using Unified Modelling language
CO3	Design a given system using high level strategy
CO4	Conduct practical experiment to solve a given problem using Unified Modeling language

CO-PO mapping:

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

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	**No. of Assessments**	**Marks**
Internals	3	40
QUIZ/AAT	1	10
Total		**50**

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

Bloom's Level	**Percentage of Questions to be Covered**
Remember / Understand	30%
Apply / Analyze	40%
Create / Evaluate	30%

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VII**		
Course Title:	**Adversarial AI Attacks**		
Course Code:	**23IC7PEAAI**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
1	**Security and Adversarial AI,** Technical requirements, Securing our adversarial playground, Securing code and artifacts, Bypassing security with adversarial AI, Adversarial AI landscape.	8
2	**Poisoning Attacks,** Basics of poisoning attacks, Staging a simple poisoning attack, Backdoor poisoning attacks, Hidden-trigger backdoor attacks, Clean-label attacks, Advanced poisoning attacks, Mitigations and defenses	8
3	**Model Tampering with Trojan Horses and Model Reprogramming:** Injecting backdoors using pickle serialization, Injecting Trojan horses with Keras Lambda layers, Trojan horses with custom layers, Neural payload injection, Attacking edge AI, Model hijacking	8
4	**Evasion Attacks against Deployed AI,** Fundamentals of evasion attacks, Perturbations and image evasion attack techniques, NLP evasion attacks with BERT using TextAttack, Attack scenario – sentiment analysis attack example, Universal Adversarial Perturbations (UAPs), Black-box attacks with transferability, Defending against evasion attacks, Mitigation strategies overview, Summary.	8
5	**LLM Foundations for Adversarial AI,** A brief introduction to LLMs, Developing AI applications with LLMs, Hello LLM with Python, Hello LLM with LangChain, Adversarial Attacks with Prompts, Adversarial inputs and prompt injection, Direct prompt injection, Automated gradient-based prompt injection, Risks from bringing your own data, Indirect prompt injection, LLM guard. **Poisoning Attacks and LLMs**,Poisoning attacks on fine-tuning LLMs.	8

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Adversarial AI Attacks, Mitigations, and Defense Strategies: A cybersecurity professional's guide to AI attacks, threat modeling, and securing AI with MLSecOps	John Sotiropoulos	1st	Packt Publishing	2024

2.	The Comprehensive Guide to LLM Security	Kritin Vongthongsri	-	https://www.confident-ai.com/blog/the-comprehensive-guide-to-llm-security	2024

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Adversarial Learning and Secure AI	David J. Miller, Zhen Xiang, George Kesidis	1st	Cambridge University Press	2023
2.	Deep Learning (Adaptive Computation and Machine Learning series)	Ian Goodfellow, Yoshua Bengio , Aaron Courville	1st	The MIT Press	2016
3	Transformers for Natural Language Processing: Build innovative deep neural network architectures for NLP with Python, PyTorch, TensorFlow, BERT, RoBERTa, and more	Denis Rothman	1st	Packt Publishing	2021
4.	Strengthening Deep Neural Networks: Making AI Less Susceptible to Adversarial Trickery	Katy Warr	1st	O'Reilly Media, Inc	2019

Course Outcomes

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

CO1	Apply security techniques to protect machine learning models from adversarial attacks.
CO2	Analyze the impact of adversarial attacks on machine learning models and assess defense strategies.
CO3	Design methods to enhance the robustness of machine learning models against adversarial examples.

CO-PO mapping

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

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	2	40
QUIZ/AAT	1	10
Total		**50**

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VII**		
Course Title:	**Major Project Phase-2**		
Course Code:	**23CS7PWPP2**		
L-T-P:	**0-0-7**	**Total Credits:**	**7**

Guidelines:

1. Preparation of detailed design for the project (Continuation of Major Project Phase 1).
2. Implementation of the sub-modules and their integration.
3. Testing and validation.
4. Preparation and publication of implementation paper.
5. Preparation and submission of Major Project Phase 2 report.

- In-house project teams should meet their Guides weekly and update about the progress of the projects, whereas the industry project students meet their Guides once in fifteen days.
- CIE evaluation: Carried out twice in a semester by an internal panel comprising of Internal Guide and three other faculty members of the department.
- SEE evaluation: Conducted at the end of the seventh semester by both internal guide and an external examiner from other institutions.
- Evaluation is based on the demonstration of the working project by the team, project report and publication.

Note: CIE will be evaluated for 100 Marks and will be reduced to 50 Marks.

Course Outcomes (COs):

CO1	Apply the software engineering principles in planning, formulating an innovative design/ approach and computing the requirements appropriate to chosen topic within the context of legal, societal and environment constraint.
CO2	Apply the concepts of mathematics, science and engineering to implement the project and draw conclusions out of the results, while exhibiting integrity and ethical behavior in engineering practice.
CO3	Monitor, manage project schedules, resources and work assignments to ensure timely completion.
CO4	Test and defend performance of the implemented project and understand the implication of the solution.
CO5	Perform individually as well as in a team, accepting responsibility, taking initiative, and providing leadership, necessary to ensure project success.
CO6	Use formal and informal communications with team members and guide, make presentations and prepare technical document.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	2			2	2					2	2		
CO2	3			3	3			3						3	3
CO3											3				
CO4							1								1
CO5									1			1			
CO6										2		2			

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Assessment Plan for CIE:

Tool	Remarks	Marks
Evaluation by Guide	--	**50**
Evaluation by Panel	--	**48**
Peer Evaluation	--	**2**
Total		**100**

Rubrics for Project Evaluation:

Criteria	Exemplary	Proficient	Partially Proficient	Points
Planning	(15) Project schedule: Progress, milestones and deliverables with realistic estimates of the time (Gant chart). Identify resources: (hardware and software) required to accomplish the development effort. Cost estimates of hardware and software.	(14-6) Project schedule: Progress, milestones and deliverables (Gant chart). Identify resources: (hardware and software) required to accomplish the development effort. Cost estimates of hardware and software.	(5-1) Project schedule: Progress, milestones and deliverables are not planned accordingly. Identify resources: (hardware and software) required to accomplish the development effort. Cost estimates of hardware and software.	__/15
Detailed Design	(15) Design is as per problem formulation. Architectural design/ System design: identifying the sub-systems. Abstract specification of the sub-systems, Interface design Carefully chosen a methodology or approach that is well-suited to the formulated problem.	(6-14) Design is as per problem formulation. Architectural design/ System design: identifying the sub-systems. Abstract specification of the sub-systems, Interface design.	(1-5) Design does not target the problem formulation optimally. Architectural design/ System design: identifying the sub-systems. Abstract specification of the sub-systems, Interface design.	__/15
Implementation	(25) Completed implementation for all set objectives as per the design and specification; justifying latest tools and techniques used. Implementation of methodology/approaches/ technique is Sustainable, innovative	(24-15) Completed implementation for all set objectives as per the design and specification; justifying latest tools and techniques used. Implementation of methodology/approaches/ technique is specific	(14-1) Completed implementation for all set objectives as per the design and specification;	__/25

	and is specific to the needs of the project and robust to cater to future enhancements. Showed competency in developing the system and fulfilled the objectives in the given timeline.	to the needs of the project and robust to cater to future enhancements. Showed competency in developing the system and fulfilled the objectives in the given timeline.	justifying latest tools and techniques used. Did not adhere to the given timeline.	
Testing and Validation	(5) Data interpretation, integration, analysis and test results interpretation communicated clearly. Included high quality charts, tables, graphs, images, etc. to assist in interpreting the results and closes with a strong conclusion.	(4-3) Data interpretation, integration, analysis and test results interpretation communicated clearly. Included high quality charts, tables, graphs, images, etc. to assist in interpreting the results.	(2-1) Data interpretation, integration, analysis and test results lacks clarity.	__/5
Publication of Implementation Paper	(5) Prepared and received acceptance for Implementation Paper	(4-3) Prepared Implementation Paper	(2-1) Not Prepared Implementation Paper	__/5
Report	(15) Clear and Effective writing and adherence to appropriate report format. All figures, graphs, charts, and drawings are accurate, consistent with the text, and of good quality. They enhance understanding of the text. All are labelled correctly.	(14-6) Writing that is clear and effective for most part and minor errors in adherence to appropriate report format, all figures, graphs, charts, and drawings are accurate, consistent with the text, and of good quality. They enhance understanding of the text. All are labelled correctly. [6-14]	(5-1) Unclear and ineffective writing and multiple errors in adherence to appropriate report format. All figures, graphs, charts, and drawings are accurate, consistent with the text, and of good quality. They enhance understanding of the text. All are labelled correctly.	__/15

Oral communication	(10) Clear and effective communication. Presentation includes appropriate contents and is clearly organized. Presentation highlights key ideas and closes with a strong conclusion. Answer questions/queries professionally.	(9-6) Communication is clear. Presentation includes appropriate contents and is clearly organized. Presentation highlights key ideas. Answer questions/queries professionally.	(5-1) Unclear communication. Presentation includes appropriate contents. Presentation highlights key ideas.	__/10
Group Participation	(4) Did a full share of the work or more and volunteers to help others? Provided many good ideas; inspired others; clearly communicated ideas and needs. Completed assigned work ahead of time.	(3-2) Did almost as much work as others. Participated in discussions; on some occasions, made suggestions. Completed assigned work on time.	(1) Did less work than others. Listened mainly; Rarely spoke up, and ideas were off the mark. Needed much reminding; submission was late.	__/4
Ethics	(4) Upholds the standards of honesty and integrity. Addressed the societal and environmental issues and responsibilities.	(3) Upholds the standards of honesty and integrity. Addressed few societal and environmental issues	(2-1) Upholds the standards of honesty and integrity.	__/4
Peer Review	Peer evaluation by team members			__/2
Total				**__/100**

Note: The Project will be evaluated for 100 Marks and reduced to 50 Marks.

SEE Exam (50 Marks):
The Project work will be evaluated by an External Examiner along with the Guide.

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VII**		
Course Title:	**Indian Knowledge Systems**		
Course Code:	**23MA7HSIKL**	**Total Contact Hours:**	**15 hours**
L-T-P:	**1-0-0**	**Total Credits:**	**1**

Unit No.	Topics	Hours
1	Introduction to Indian Knowledge Systems (IKS): Overview, Vedic Corpus, Philosophy, Character scope and importance, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge vs. western knowledge	**5**
2	Traditional Knowledge in Humanities and Sciences: Linguistics, Number and measurements- Mathematics, Chemistry, Physics, Art, Astronomy, Astrology, Crafts and Trade in India and Engineering and Technology	**5**
3	Traditional Knowledge in Professional domain: Town planning and architecture Construction, Health, wellness and Psychology-Medicine, Agriculture, Governance and public administration, United Nations Sustainable development goals	**5**

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to Indian Knowledge System- concepts and applications	B Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana R N	1st	PHI Learning Private Ltd	2022
2.	Traditional Knowledge System in India	Amit Jha	1st	Atlantic Publishers and Distributors (P) Ltd	2009
3	Knowledge Traditions and Practices of India	Kapil Kapoor, Avadesh Kumar Singh	1st	DK Print World (P) Ltd	2005

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

E-Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year	URL
1.	What can we learn from Indian Knowledge Systems	Michel Danino	-	IIT Gandhinagar	2016	https://www.youtube.com/watch?v=LZP1StpYEPM
2.	Ayurvedic Inheritance of India	Dr M. S. Valiathan	-	IIT Madras	2013	http://nptel.ac.in/courses/121106003/
3.	Centre of Excellence for Indian Knowledge System	-	-	IIT Kharagpur	-	http://www.iitkgp.ac.in/department/KS;jsessionid=C5042785F727F6EB46CBF432D7683B63
4.	Protecting and Promoting Traditional Knowledge: Systems, National Experiences and International Dimensions	Sophia Twarog and Promila Kapoor	-	-	2004	https://unctad.org/system/files/official-document/ditcted10_en.pdf
5.	Biological Diversity and Traditional Knowledge	Prof S. Kannaiyan	-	-	-	http://nbaindia.org/uploaded/docs/traditionalknowledge_190707.pdf

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

MOOC Course

Sl. No.	Course name	Course Offered By	Year	URL
1.	Ayurvedic Inheritance of India	IIT Madras	2013	http://nptel.ac.in/courses/121106003/

Course Outcomes

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

CO1	Provide an overview of the concept of the Indian Knowledge System and its importance
CO2	Appreciate the need and importance of protecting traditional knowledge
CO3	Recognize the relevance of Traditional knowledge in different domains
CO4	Establish the significance of Indian Knowledge systems in the contemporary world

CO-PO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2							3				1			
CO2						2									
CO3			2	2											
CO4						3	2								

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	2	20
Quiz	2	10
AAT/ EXPERIENTIAL LEARNING	-	20
Lab Component	-	-
Total		**50**

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Bloom's Level	Percentage of Questions to be Covered
Remember / Understand	90%
Apply / Analyze	10%
Create / Evaluate	-

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

8TH SEMESTER

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VIII**		
Course Title:	**Cyber Physical Systems**		
Course Code:	**23IC8PECPS**	**Total Contact Hours:**	**40 hours**
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
1	Introduction: Cyber-Physical System, Key Features of Cyber-Physical Systems. Safety Requirements: Safety Specifications, Verifying Invariants, Enumerative Search, Symbolic Search.	8
2	Synchronous Model: Reactive Components, Properties of Components, Composing Components. Asynchronous Model: Asynchronous Processes, Asynchronous Design Primitives, Asynchronous Coordination Protocols.	8
3	Liveness Requirements: Temporal Logic, Model Checking, Proving Liveness. Dynamical Systems: Continuous-Time Models, Linear Systems, Designing Controllers, Analysis Techniques, Design Processes: Modelling, Design , Analysis.	8
4	Discrete Dynamics: Discrete Systems, The Notion of State, Finite-State Machines, Extended State Machines, Nondeterminism. Hybrid Systems: Actor Model for State Machines, Continuous Inputs, State Refinements, Classes of Hybrid Systems.	8
5	Invariants and Temporal Logic: Invariants, Propositional Logic Formulas, LTL Formulas, Using LTL Formulas, Models as Specifications, Type Equivalence and Refinement, Language Equivalence and Containment.	8

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Principles of Cyber - Physical Systems	Rajeev Alur	First	MIT Press	2015
2.	Introduction to Embedded Systems- A Cyber Physical Systems Approach	Lee, Sanjit Seshia	First	MIT Press	2011

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Cyber Physical Systems	Raj Rajkumar	First	Pearson	2017

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1.	Logical Foundations of Cyber-Physical Systems	Andre Platzer	1st	Springer	2018	https://www.google.com/books/edition/Logical_Foundations_of_Cyber_Physical_Sy/buFmDwAAQBAJ?gbpv=1

MOOC Course

Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Foundations of Cyber-Physical Systems	NPTEL	2025	https://nptel.ac.in/courses/106105241

Course Outcomes

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

CO1	Apply the concept of characteristics, requirements and architecture for cyber physical systems.
CO2	Analyze the performance of embedded processing, memory, bus efficiencies, real time operating system performance for cyber physical systems.
CO3	Design the suitable Cyber- Physical System Model for a given scenario.

CO-PO mapping

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

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	**No. of Assessments**	**Marks**
Internals	2	40
Quiz	2	10
Total		**50**

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

Bloom's Level	**Percentage of Questions to be Covered**
Remember / Understand	30%
Apply / Analyze	40%
Create / Evaluate	30%

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VIII**		
Course Title:	**Wireless and Mobile Communication**		
Course Code:	**23IC8PEWMC**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
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**
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**
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**
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**
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**

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Wireless Communications	Andreas F Molisch	1st	Wiley, India	2010
2.	Wireless Communications and Networks	William Stallings	2nd	Pearson	2013
3.	Mobile Communications	Joschen Schiller	2nd	Pearson	2014

Reference Text Book

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

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

E-Book						
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**	**URL**
1.	Wireless and Mobile Networking	Mahbub Hassan	1st	CRC Press	2022	https://www.researc hgate.net/publication /360956823_Wireles s_and_Mobile_Netw orking

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	Demonstrate cryptographic encryption and decryption techniques.
CO3	Explore a network simulator and demonstrate the working of a wireless scenario

CO-PO 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)

Assessment Tool	**No. of Assessments**	**Marks**
Internals	Best 2 of 3	40
Quiz	-	-
Lab Component	-	-
AAT	1 (Usage of network simulator)	10
Total		**50**

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

AAT Plan:

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

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

Bloom's Level	Percentage of Questions to be Covered
Remember / Understand	40%
Apply / Analyze	50%
Create / Evaluate	10%

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Semester:	**VIII**		
Course Title:	**IoT Analytics**		
Course Code:	**23IC8PEITA**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-0**	**Total Credits:**	**3**

Unit No.	Topics	Hours
1	Defining IoT analytics and challenges: Defining IoT analytics, IoT analytics challenges. IoT application Domains, IoT Reference model, Performance evaluation and modelling of IoT systems, machine learning and statistical technique for IoT.	8
2	Cloud and Fog Topologies: The openstack cloud architecture, constraints of cloud architectures for IoT, Fog Computing: The Hadoop philosophy of fog computing, Fog Computing versus Edge Computing versus Cloud Computing, Open Fog Reference Architecture. Creating an AWS cloud analytics Environment: The AWS Cloud Formation Overview, The AWS Virtual Private Cloud (VPC) setup walk-through. How to terminate and clean up the environment.	8
3	Collecting All the Data – Strategies and Techniques: Designing Data Processing for Analytics, Applying Big Data Technology for Storage, Apache Spark for Data Processing, To Stream or Not to Stream, Handling Changes.	8
4	Communicating with others- Visualization and dashboarding: common mistakes when designing visuals, the hierarchy of questions method, designing visual analytics for IoT data, creating a dashboard with tableau, creating and visualizing alerts.	8
5	IoT Security: Cyber security vernacular, Anatomy of IoT cyber-attacks, Physical and hardware security, Cryptography, Software defined perimeter, Blockchain and crypto currencies in IoT, IoT security best practices.	8

Prescribed Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security	Perry Lea	1st	Packt Publishing	22 January 2018
2	Analytics for the Internet of Things (IoT): Intelligent analytics for your intelligent devices	Andrew Minteer	1st	Packt Publishing	24 July 2017

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

Reference Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1	An Introduction to IoT Analytics	Harry G. Perros	1st	Taylor & Francis	31 July 2024

MOOC Course				
Sl. No.	**Course name**	**Course Offered By**	**Year**	**URL**
1.	Architecting smart IoT devices.	Coursera	2017	http://nptel.ac.in/courses/106105031/

Course Outcomes

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

CO1	Apply cloud services, data processing frameworks and cybersecurity techniques to implement analytics-driven, secure, and scalable IoT solutions.
CO2	Analyse IoT analytics frameworks, cloud-fog-edge architectures, data acquisition strategies, relevant to IoT systems.
CO3	Analyse system components and evaluate the role of data analytics and security in IoT environments.

CO-PO mapping

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

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	3	40
QUIZ/AAT	1	10
Total		**50**

SEE Exam Question paper format

In all five units, two questions are to be asked for 20 marks each as internal choice.

Bloom's Level	Percentage of Questions to be Covered
Remember / Understand	30%
Apply / Analyze	40%
Create / Evaluate	30%

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBERSECURITY INCLUDING BLOCKCHAIN)

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF CSE (IOT AND CYBER SECURITY INCLUDING BLOCK CHAIN)