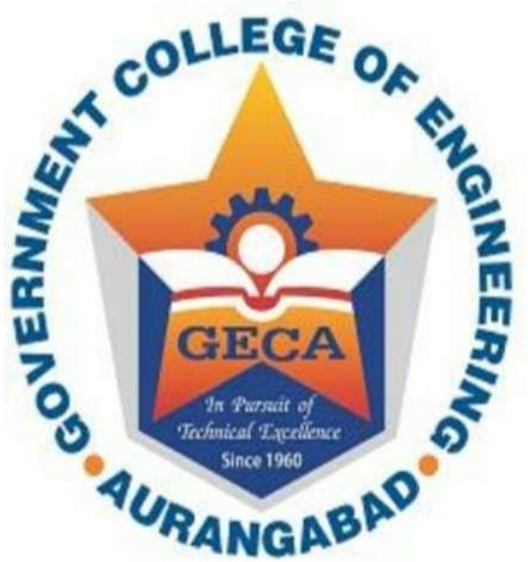

GOVERNMENT COLLEGE OF ENGINEERING AURANGABAD

(An Autonomous Institute of Govt. of Maharashtra)
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Department of Information Technology

Second Year IT Curriculum Structure & Detailed Syllabus (UG Program)

(Effective from: A.Y. 2022-2023)

Program Specific Outcomes (PSOs)

After successful completion of the program graduates would:

PSO I Apply core IT Knowledge to identify, formulate and solve emerging engineering problems.

PSO II Design, develop and deploy quality software products by applying knowledge of modern IT concepts and tools.

PSO III Apply the skills of IT professionals to develop novel solutions in societal and environmental contexts

Program Educational Objective(s)

After graduation and few years of graduation, the (Information Technology) graduates would

PEO I Interpret, design and analyze data for effective problem solving

PEO II Pursue advanced studies to adapt to current trends

PEO III Attain professional careers and provide services in societal and environmental context for sustainable development

PEO IV Work successfully with effective communication skills, professionalism, team work and ethical attitude

Program Outcome(s)

The program enables students to achieve by the time of graduation:

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 modeling 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.

Mapping of PEOs and POs

	Programme Educational Objective(s)	Program Outcome(s)
PEO I	Interpret, design and analyze data for effective problem solving	1,2,3
PEO II	Pursue advanced studies to adapt to current trends	3,4,5,6,7,9
PEO III	Attain professional careers and provide services in societal and environmental context for sustainable development	4,5,6,7,8,9,10,11,12
PEO IV	Work successfully with effective communication skills, professionalism, team work and ethical attitude	6,8,10,11,12

Government College of Engineering, Aurangabad

(An Autonomous Institute)

Teaching and Evaluation Scheme from year 2022-2023

Second Year B. Tech. Program in Information Technology

Semester III

Course				Teaching Scheme			Continuous Evaluation in terms of Marks					
Sr No	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**	**ISE I**	**ISEII**	**ISEIII**	**ESE**	**Total**
1	BSC	MABS2002	Engineering Mathematics III	2	1	-	3	15	15	10	60	100
2	PCC	ITPC2001	Discrete Mathematical Structures	3	-	-	3	15	15	10	60	100
3	PCC	ITPC2002	Data Structures	3	-	-	3	15	15	10	60	100
4	PCC	ITPC2003	Computer Networks	3	-	-	3	15	15	10	60	100
5	PCC	ITPC2004	Object Oriented Programming	3	-	-	3	15	15	10	60	100
6	ESC	ITES2001	Digital Electronics and Microprocessors	3	-	-	3	15	15	10	60	100
7	PCC	ITPC2005	Lab- Data Structures	-	-	2	1	25			25	50
8	PCC	ITPC2006	Lab-Computer Networks	-	-	2	1	25			25	50
9	PCC	ITPC2007	Lab- Object Oriented Programming	-	-	2	1	25			25	50
10	ESC	ITES2002	Lab- Digital Electronics and Microprocessors	-	-	2	1	50			-	50
		Total		**17**	**1**	**8**	**22**	**215**	**90**	**60**	**435**	**800**

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Dated: 18th April 2023

Government College of Engineering, Aurangabad

(An Autonomous Institute)

Teaching and Evaluation Scheme from year 2022-2023

Second Year B. Tech. Program in Information Technology

Semester IV

Course				Teaching Scheme			Continuous Evaluation in terms of Marks					
Sr. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**	**ISE I**	**ISEII**	**ISEIII**	**ESE**	**Total 100**
1	BSC	MABS2012	Engineering Mathematics IV	3	1	-	4	15	15	20	60	100
2	PCC	ITPC2010	Design and Analysis of Algorithms	3	-	-	3	15	15	10	60	100
3	PCC	ITPC2011	Database Management Systems	3	-	-	3	15	15	10	60	100
4	PCC	ITPC2012	Operating System	3	-	-	3	15	15	10	60	100
5	PCC	ITPC2013	Internet of Things	3	-	-	3	15	15	10	60	100
6	OEC	ITOE1010	Open Elective-I	3	-	-	3	15	15	10	60	100
7	MC	INMC2010	Environmental Science	3	-	-	-	15	15	10	60	100
8	PCC	ITPC2014	Lab- Design and Analysis of Algorithms	-	-	2	1	25			25	50
9	PCC	ITPC2015	Lab- Database Management Systems	-	-	2	1	25			25	50
10	PCC	ITPC2016	Lab- Operating System	-	-	2	1	25			25	50
11	PCC	ITPC2017	Lab- Internet of Things	-	-	2	1	25			25	50
			Total	**21**	**1**	**8**	**23**	**190**	**90**	**70**	**460**	**800**

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MABS 2002: Engineering Mathematics-III (for EEP, IT)	
Teaching Scheme	**Examination Scheme**
Lectures : 2Hrs/Week	**ISE-I : 15 Marks**
Tutorial : 1Hr/Week	**ISE-II : 15 Marks**
Total Credits : 3	**ISE-III :10Marks**
	End Semester Exam : 60 Marks

Course Description:

MABS 2002 Engineering Mathematics-III is a compulsory course to second year engineering students of EEP and IT of the institute in the Semester –III and is a continuation of previous year courses viz. MABS1001 Engineering Mathematics-I and MABS1002 Engineering Mathematics-II . This course intends to provide engineering students a coherent and balanced account of major mathematical techniques and tools.

Course Objective:

This course intends to provide an overview of analytical techniques to solve ordinary and partial differential equations and introduce different Integral Transforms i.e. Laplace Transform, Fourier Transform and Z- Transform, which we apply to solve many Engineering problems.

Course Outcomes: After completing the course, students will be able to:

CO1 Define linear differential equations (LDE),Cauchy's and Legendre's differential equations, first order partial differential equations, Lagrange's equation, Laplace Transform, Fourier Transform and Z-Transform, region of convergence.

CO2 Summaries the solution of LDE with constant and variable coefficients, solution of homogeneous and non-homogeneous PDE, properties of Laplace Transform, Fourier Transform and Z-Transform.

CO3 Find Laplace Transform of derivative and integration, inverse Laplace Transform using properties, partial fraction method and convolution theorem, Fourier Transform of periodic functions, Z-transform of discrete functions, inverse Fourier Transform and inverse Z-transform.

CO4 Solve linear differential equations with constant and variable coefficients, first order linear and non-linear partial differential equations, second order homogeneous and non homogeneous linear partial differential equations.

Detailed syllabus:

Unit-I **Linear Differential Equations (LDE):**

Linear differential equations **(LDE)** with constant coefficients, method of variation of parameters, second order linear differential equations with variable coefficients, Cauchy's and Legendre's differential equations.

Unit-II **Partial Differential Equations (PDE):** First order linear/nonlinear partial differential equation, Lagrange's equation.solution to homogenous and non-homogenous linear partial differential equations of second and higher order by complimentary function and particular integral method.

Unit-III **Laplace Transform (LT):** Definition of Laplace Transform, Properties of Laplace Transform, Laplace Transform of elementary functions, LaplaceTransform of derivative of functions, LaplaceTransform of integration of functions.Laplace Transform of periodic functions, inverse Laplace Transform using definition, properties and partial fraction, convolution theorem.

Unit-IV **Fourier Transform (FT):** Fourier integral theorem, Fourier sine and cosine integrals, Fourier transform pair, Fourier sine and cosine transform pairs, properties of Fourier transform, Fourier transform of simple functions, convolution theorem.

Unit-V **Z Transform:** Z transform of elementary functions, region of convergence, properties and theorems of Z transform, inverse of Z transform using convolution theorem, partial fraction method, inversion integral method.

Text and Reference Books

1. Advanced Engineering Mathematics by Erwin Kreyszig, Willey Eastern Ltd. Mumbai.
2. Higher Engineering Mathematics by B. S. Grewal, Khanna publication, New Delhi.
3. Engineering Mathematics-A Tutorial Approach by Ravish R Singh, Mukul Bhatt.
4. Advanced Engineering Mathematics by H. K. Dass, S. Chand and Sons.
5. Calculus by G. B. Thomas and R. L. Finney, Addison- Wesley, 1996
6. Elements of Partial Differential Equations by I.N. Sneddon
7. Boyce &DiPrima, Elementary Differential Equations and Boundary Value Problems

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1										1
CO2	3	1										1
CO3	3	2	1									1
CO4	3	2										1

3 – High, 2 – Medium, 1– Low

Teaching Strategies:

The teaching strategy planned through the lectures, and team based home works. Exercises assigned weekly to stimulate the students to actively use and revise the learned concepts, which also help the students to express their way of solving the problems fluently in written form. Most critical concepts and mistakes emphasized

Teacher's Assessment: Teacher's assessment of 10 marks based on the following.

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1) Home assignments
2) Surprise tests with multiple choice questions

Assessment: ISEI, II, III (Class Test-1, Class Test-2, TA) & ESE

TA: Students will perform one or more of the following activities

1. Surprise Test
2. Assignment using Mathematical tools like Mathematica/MatLab or similar.
3. Quiz
4. Any other activity suggested by course coordinator

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I (Class Test-1)**	**ISE II (Class Test-2)**	**ISE III (TA + Surprise Test)**	**End Semester Examination**
K1	Remember	03	03		
K2	Understand	12	12	10	60
K3	Apply				
K4	Analyze				
K5	Evaluate				
K6	Create				
Total Marks 100		15	15	10	60

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ITPC2001: Discrete Mathematical Structures		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Tutorial: -	**ISE II**	**15 Marks**
Credits: 03	**ISE III**	**10 Marks**
	End Semester Examination	**60 Marks**

Course description:
This course covers fundamental concepts in discrete mathematics with applications to computer science and information technology. Topics include sets, functions, relations, logical connectives, analysis techniques based on counting methods and recurrence relations, trees and graphs and algebraic systems.

Course Outcomes: After completing the course, students will able to:

CO1 Explain the fundamental concepts of sets, logical connectives, relations, functions and algebraic systems
CO2 Solve mathematical problems using mathematical reasoning methods
CO3 Demonstrate discrete problems using sequences, combinatorics and counting techniques
CO4 Apply information theory and non linear data structures for finding effective solutions to a variety of problems.

Detailed Syllabus:

Unit 1 Sets, Combinations of sets, Finite and Infinite sets, Uncountably infinite sets, Mathematical Induction, Principle of inclusion and exclusion, Multisets, Propositions, Logical Connectives, Conditionals and Biconditionals, Logical equivalences, Euclidean Algorithm

Unit 2 Permutations and Combinations: rule of sum and product, Permutations, Combinations, Algorithms for generation of Permutations and Combinations. Discrete Probability, Conditional Probability, Bayes' Theorem, Information theory and Mutual Information

Unit 3 Relations, Properties of Binary Relations, Closure of relations, Warshall's algorithm, Equivalence relations and partitions, Partial ordering relations and lattices, Chains and Anti chains, Functions, Recursive functions, Pigeon hole principle., Recurrence relation, Linear Recurrence Relations with constant Coefficients, Homogeneous Solutions, Total solutions, solutions by the method of generating functions

Unit 4 Graphs & Trees Basic terminology, multi graphs and weighted graphs, Eulerian paths and circuits, Hamiltonian paths and circuits, Factors of a graph, planar graph, graphcoloring. Trees, rooted trees, path length in rooted trees, binary search trees, spanning trees and cut sets

Unit 5 Algebraic Systems: Algebraic Systems, Groups, Semi Groups, Monoids, Subgroups, Permutation Groups, Codes and Group codes, Isomorphism and Automorphisms, Homomorphism and Normal Subgroups, Rings, Integral domain and Fields.

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Text and Reference Books

1. 1.C. L. Liu, D. P.Mohapatra, "Elements of Discrete Mathematics", 3rd Edition, Tata McGraw Hill, 2008, ISBN 978-0-07-066913-0
2. R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education, 2001, ISBN 81-7808-279-9
3. G. Shanker Rao, "Discrete Mathematics and Structure", 1st Edition, New Age International publisher, 2003, ISBN 81-224-1424-9
4. B. Kolman, R. Busby and S. Ross, "Discrete Mathematical Structures", 4th Edition, Pearson Education, 2002, ISBN 81-7808-556-9
5. J. Tremblay, R. Manohar, "Discrete Mathematical Structures with application to Computer Science", McGraw-Hill, 2002, ISBN 0-07-065142-6
6. Kenneth H. Rosen: Discrete Mathematics and Its Applications, 5th Edition, Tata McGraw-Hill, 2003, ISBN 0-07-053047-5

Web Resources

1. Introduction to Discrete Mathematics for Computer Science Specialization, offered by University Of California San Diego HSE University, Platform – Coursera
2. Discrete Mathematics, by Prof. Sudarshan Iyengar, Prof. Prabuchandran K.J, IIT Ropar, IIT Dharwad https://nptel.ac.in/courses/106/106/106106183/
3. Discrete Mathematics – IIITB, by Prof. Ashish Choudhury, IIIT Bangalore, https://nptel.ac.in/courses/106/108/106108227/
4. Discrete Structures, Prof. Dipanwita Roychowdhury, IIT Kharagpur. https://Nptel.Ac.In/Courses/106/105/106105192/

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes

Course outcomes	Program Outcomes												Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	1									3	1	
CO2		3			2							1	3	1	
CO3	3	2	1	1									3	1	
CO4	3	2	1	1								1	3	1	

3 – High 2 – Medium 1 - Low

Assessment:

ISE I: Class Test-I of Maximum Marks-15

ISE II: Class Test-II of Maximum Marks-15

ISE III: Teacher's Assessment of Maximum Marks-10

Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1) Surprise test
2) Assignment
3) Quizzes

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4) Any other activity suggested by course coordinator

ESE: End Semester Examination of Maximum Marks-60

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**ISE II**	**ISE III**	**End Semester Examination**
K1	Remember	5	5	2	10
K2	Understand	7	7	3	20
K3	Apply	3	3	5	20
K4	Analyze	-	-	-	10
K5	Evaluate	-	-	-	-
K6	Create	-	-	-	-
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	K2	K3	K3	K3
	CO1	CO2	CO3	CO4
ISE I(15 Marks)	6	5	2	2
ISEII (15 Marks)	2	3	5	5
ISEIII (10 Marks)	2	2	3	3
ESE Assessment (60 Marks)	10	20	20	10
Total Marks 100	20	30	30	20

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ITPC2002 : Data Structure		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Tutorial: 0	**ISE II**	**15 Marks**
Credits:03	**ISE III**	**10 Marks**
	End Semester Examination	**60 Marks**

Course Description: This course covers some of the general-purpose data structures and algorithms, and software development. It is aimed at helping you understand the reasons for choosing structures or algorithms. This course covers concepts of various data structures like stack, queue, list, tree and graph. Additionally, the course includes idea of sorting and searching.

Course Outcome: After completing the course, students will be able to

CO1 Understand basic data structures and their use in fundamental algorithms.

CO2 Select appropriate data structure as applied to specified problem definition.

CO3 Compare asymptotic notations of algorithms to analyze the consumption of resources

CO4 Apply searching, sorting, insertion, deletion, traversing mechanism on primitive and non-primitive data structures

CO5 Apply abstract data types using arrays and linked list

Detailed Syllabus:

Unit 1 **Introduction to data structure:** Definition, types of data structure, The Arrays as an ADT: Using One-Dimensional Arrays, Using Two-Dimensional Arrays, Definition and Examples, **Searching & Sorting searching -** classification on the basis of big-O notation , Different sorting techniques, such as selection sort, bubble sort, merge sort, quick sort, heap sort, shell sort, radix sort, comparisons between different sorting techniques, Sequential searching, index Sequential searching binary searching.

Unit 2 **The Stacks& Queues :** The stack as an ADT, Operations on stack, Stack implementations, Stack applications, The queue and its sequential representation, The queue as an ADT, Basic Definition, types of queue as Circular Queue, priority queue, applications of queue

Unit 3 **Linear Data Structure & their representation** : Definition, concept, types of linked lists, singly linked list, Circular linked lists, singly circular linked list, Doubly linked lists, Operations like insertion, deletion, insertion in order, searching, updating , Applications of linked lists such as polynomial manipulation, Comparison of singly linked, circularly linked & doubly linked list

Unit 4 **Trees:** Definition, Basic terminology, operation on binary trees, linked storage representation for binary search trees, Basic operation on binary search tree such as creating a binary search tree, searching, modifying ,inserting & deleting the element, destroy a binary search tree, tree traversals ,in-order, pre-order, post-order , tree application for expression evaluation , height balanced trees, B trees, B+ trees, AVL trees

Unit 5 **Graph:** Definitions, basic terminology, matrix representation & implementation of graphs, graph travels, DFS, BFS, Shortest path - Dijkstra's algorithm, Floyd's algorithm, spanning tree- Prim's algorithm, Kruskal's algorithm

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Text Books & Reference Books

1. Yedidyah Langsam, Moshe J. Augenstein, Aaron M.Tenenbaum, "Data Structures using C and C++", Pearson Pub.
2. G.S. Baluja, "Principles of Data Structures using C and C++"
3. G. S. Baluja, "Data Structures Through (A Practical approach)Dhanpat Rai & Co(P) LTD.
4. Yashavant P Kanetkar, "Data Structures through C", BPB Pub.
5. Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures"
6. Robert L Kruse, "Data Structures and Program Design", PHI

Web Resources

https://nptel.ac.in/courses/106102064 Data Structures And Algorithms, IIT Delhi
https://nptel.ac.in/courses/106106127 Programming, Data Structures and Algorithms, IIT Madras
https://repository.dinus.ac.id/docs/ajar/Principles_of_Data_Structures_Using_C_and_C++.pdf
https://cse01-iiith.vlabs.ac.in/ Virtual Lab Data Structures

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course outcome	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	1	2								3	3	3
CO2	2	3	2	2	3								3	3	2
CO3	2	2	3	2									2	2	2
CO4	3	3	2	2	3								3	2	3
CO5	3	2	2	3	3								3	2	2

3– High 2 – Medium 1 - Low

Assessment:

ISE I: Class Test-I of Maximum Marks-15
ISE II: Class Test-II of Maximum Marks-15
ISE III: Teacher's Assessment of Maximum Marks-10
Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1) Power point presentation
2) Question & answer / Numerical solution
3) Surprise test
4) Any other activity suggested by course coordinator

ESE: End Semester Examination of Maximum Marks-60

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Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	05	05	00	10
K2	Understand	10	10	05	25
K3	Apply	00	00	05	25
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	K1	K2	K3
	CO1	CO2,CO3	CO4,CO5
ISE I (15 Marks)	05	10	00
ISE II (15 Marks)	05	10	00
ISE III (10 Marks)	00	05	05
ESE Assessment (60 Marks)	10	25	25
Total Marks 100			

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ITPC2003 : Computer Networks		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Tutorial: 0	**ISE II**	**15 Marks**
Credits:03	**ISE III**	**10 Marks**
	End Semester Examination	**60 Marks**

Course Description: From conventional small-scale networks to modern high-speed mobile and wireless Internet, the Internet domain has evolved at a rapid pace. To meet the demands for establishing a secure and highly trustworthy information technology infrastructure, a vast number of methodologies, systems, and designs were developed at each protocol level. The course is designed in Top-down approach to understand the network architecture, protocols and their functionalities and also the requirements for the future Internet design.

Course Outcomes: After completing the course, students will able to:

CO1	Differentiate between layered network architectures and components used in networking
CO2	Explain functionalities of various protocols at different layers
CO3	Describe the network components, protocols and services used for establishing computer network
CO4	Use appropriate protocols and algorithms based on the networking requirements
CO5	Distinguish between different routing, transportation and application strategies for the Internet

Detailed Syllabus:

Unit 1 **Introduction to Computer Networks**

Types of networks, Topologies, Network Models: ISO-OS and TCP/IP network architectures, Services at the Different Layers, Circuit Switching and Packet Switching, Delay, Loss, and Throughput, Network under Attack

Unit 2 **Application Layer:**

Principles of Network Applications, The Web and HTTP , File Transfer Protocol (FTP), Electronic Mail in the Internet, DNS-The Internet's Directory Service, Peer-to-Peer Sharing

Unit 3 **Transport Layer**

Introduction and Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport-UDP, Principles of Reliable Data Transfer , Connection-Oriented Transport , Principles of Congestion Control , TCP Congestion Control
Socket Programming

Unit 4 **Network Layer**

Introduction, Virtual Circuit and Datagram Networks, Working of Router, The Internet Protocol (lP): Forwarding and Addressing in the Internet, Routing Algorithms, Routing in the Internet, Broadcast and Multicast Routing

Unit 5 **The Link Layer and Local Area Networks**

Link Layer: Introduction and Services , Error-Detection and -Correction Techniques, Flow Control, Error Control, Media Access Control - Channel Access Protocols, Framing, Multiple Access Protocols, Link-Layer Addressing, Ethernet, Link-Layer Switches, PPP: The Point-to-Point Protocol , Link Virtualization: A Network as a Link Layer

Text and Reference Books

1. "Computer Networking- a top-down approach featuring the Internet", by James F. Kurose and Keith W. Ross, Person Education, ISBN-10- 0132856204, 6th Edition.
2. "Data Communications and Networking", by Forouzan B. A, Tata McGraw-Hill Publications, 2006, ISBN-0-07-063414-9, 4th edition.
3. "Computer Networks", by Tanenbaum A. S., Pearson Education , 2008, ISBN- 978-81-7758-165-2, 4th Edition
4. "Computer Networks- A Systems Approach", by Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann, ISBN-978-81-312-1045-1, 4th Edition.
5. "Computer Networks and Internet", by Comer D., Pearson Education, ISBN-81-297-0330-0, 2nd Edition.

Web Resources:

NPTEL course : COMPUTER NETWORKS AND INTERNET PROTOCOL
https://nptel.ac.in/courses/106/105/106105183/
Virtual Lab: Advanced Computer Networks http://vlabs.iitkgp.ac.in/ant/
Virtual Lab: Computer Networks http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course outcome	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
CO1	3	2						1					1		
CO2	1	2													
CO3	1			1											
CO4	1		2	2								2	2		2
CO5	1		2	3							1	2	2	1	3

3 – High 2 – Medium 1 - Low

Assessment:

ISE I: Class Test-I of Maximum Marks-15
ISE II: Class Test-II of Maximum Marks-15
ISE III: Teacher's Assessment of Maximum Marks-10
Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1) Quiz
2) Question & answer / Numerical solution
3) Power point presentation

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4) Simulation
5) Mini projects
6) Virtual Lab Assignments
7) Any other activity suggested by course coordinator

ESE: End Semester Examination of Maximum Marks-60

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**ISE II**	**ISE III**	**End Semester Examination**
K1	Remember	05	00	00	10
K2	Understand	10	05	00	20
K3	Apply	00	10	05	20
K4	Analyze	00	00	05	10
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	**K2**	**K2**	**K3**	**K4**
	CO1,CO2	CO1,C02,CO3	CO3, CO4	CO5
ISE I (15 Marks)	10	05	00	00
ISE II (15 Marks)	10	05	00	00
ISE III (10 Marks)	00	00	05	05
ESE Assessment (60 Marks)	15	15	20	10
Total Marks 100				

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ITPC2004 : Object Oriented Programming		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Tutorial: 0	**ISE II**	**15 Marks**
Credits:03	**ISE III**	**10 Marks**
	End Semester Examination	**60 Marks**

Course description: Object Oriented Programming is designed to create sophisticated programs to solve real-world problems using object oriented approach. The course emphasizes to improve the logical thinking of the students.

Course Outcomes: After completing the course, students will able to:

CO1 Explain the necessity for Object Oriented Programming paradigm over Procedure Oriented Programming.
CO2 Demonstrate the fundamental concepts and principles of object oriented programming.
CO3 Make use of Java standard API library to write an object oriented system.
CO4 Apply Multithreading and Exception handling concepts to develop efficient and error free codes.
CO5 Select object oriented principles and techniques to implement real world applications.

Detail Syllabus:

Unit 1 **Introduction to Object Oriented Concepts:**
Procedure Oriented Programming, Object Oriented Programming, Comparison of Object Oriented Programming with Procedure Oriented Programming, The Byte code, Java Development Kit (JDK), Garbage collection, Console I/O, variables and reference variables, arrays, operators, control statements, type conversion and casting, Function Prototyping, Function Overloading, Introduction to Classes and Objects, member functions and member data, objects and functions, objects and arrays, Constructors, Static block, Static Data, Static Method, String and String Buffer Classes

Unit 2 **Inheritance, Polymorphism, Packages and Interfaces:**
Basic concepts, Types of inheritance, Member access rules, Usage of this and Super key word, Method Overloading, Method overriding, Abstract classes, Dynamic method dispatch, Usage of final keyword, Defining package, Access protection, importing packages, Defining and Implementing interfaces, and Extending interfaces

Unit 3 **Exception handling and Multithreading:**
Exception types, Usage of Try, Catch, Throw, Throws and Finally keywords, Built-in Exceptions, Creating own Exception classes, Concepts of Thread, Thread life cycle, creating threads using Thread class and Runnable interface, Synchronization, Thread priorities, Inter Thread communication

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Unit 4 **AWT Controls and Event handling:**

The AWT class hierarchy, user interface components-Labels, Button, Text Components, Check Box, Check Box Group, Choice, List Box, Panels, Scroll Pane, Menu, Scroll Bar, Working with Frame class, Colour, Fonts and layout managers, Events, Event sources, Event Listeners, Event Delegation Model, Handling Mouse and Keyboard Events, Adapter classes, Inner classes

Unit 5 **The Applet and Swings:**

Applet basics, Applet Architecture, An Applet skeleton, Simple Applet display methods, Requesting repainting, Using the Status Window, The HTML APPLET tag, Passing parameters to Applets, getDocumentbase() andgetCodebase() The origins of Swing, Two key Swing features, Components and Containers, The Swing Packages, A simple Swing Application, Create a Swing Applet, Jlabel and Image Icon, JTextField, The SwingButtons, JTabbedpane, JScrollPane, JList, JComboBox, JTable

Text and Reference Books:

1. Herbert Schildt, "*The Complete Reference Java2",* 7th Edition, TMH Publications.
2. E Balguruswamy, *"Programming with Java - A Primer"*
3. Cay S. Horstmann, Gary Cornell*, "Core Java Volume II"* - Pearson Education.
4. StevenHolzner, "*Java 2 Black Book*", Dreamtech Pub.
5. Head First Java, O'rielly publications
6. T. Budd (2009), An Introduction to Object Oriented Programming, 3rd edition,PearsonEducation, India.
7. Y. Daniel Liang (2010), Introduction to Java programming, 7th edition, Pearson education, India.

Web Resources:

NPTEL course : Programming In Java https://onlinecourses.nptel.ac.in/noc22_cs47

Virtual Lab: Core Java Programming https://java-iitd.vlabs.ac.in/

Mapping of Course outcome with Program Outcomes:

Course outcome	Program Outcomes												PSO's		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1														
CO2		1									1	1	1	1	
CO3														2	
CO4									1					2	
CO5	2	2	3	1	1	1		1	2	2	2	1	3	3	1

3 – High 2 – Medium 1 – Low

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Assessment:
ISE I: Class Test-I of Maximum Marks-15
ISE II: Class Test-II of Maximum Marks-15
ISE III: Teacher's Assessment of Maximum Marks-10
Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1) Course projects
2) Power point presentation
3) Question & answer
4) Any other activity suggested by course coordinator

ESE: End Semester Examination of Maximum Marks-60

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	00	00	00	00
K2	Understand	03	03	05	24
K3	Apply	12	12	05	36
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment Table:

Assessment Tool	K2	K3
	CO1, CO2	CO3,CO4, CO5
ISE I (15 Marks)	03	12
ISE II (15 Marks)	03	12
ISE III (10 Marks)	00	10
ESE (60 Marks)	24	36

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Dated: 18th April 2023

ITES2001: Digital Electronics and Microprocessors		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Tutorial: 0	**ISE II**	**15 Marks**
Credits:03	**ISE III**	**10 Marks**
	End Semester Examination	**60 Marks**

Course Description: This course covers binary arithmetic, fundamentals of digital circuits, and their use in combinational and sequential logic design. This course also provides study of fundamentals of 8086 microprocessor, architecture, interrupt structure, instruction set and assembly language Programming of 8086.

Course Outcomes: After successful completion the course, students will be able to:

CO1 Understand and explore the fundamental concepts of digital electronics and 8086 microprocessor

CO2 Solve binary arithmetic, and conversions between different number systems

CO3 Apply various minimization techniques and Boolean laws to simplify logic expressions

CO4 Construct various digital circuits using logic gates, combinational and sequential logic

CO5 Develop the ability to write assembly language programs for 8086 microprocessor

Detailed Syllabus:

Unit 1 **Binary arithmetic, Boolean algebra, Logic Gates:**
Number systems and their interconversion, Binary arithmetic, 2's complement arithmetic, Error detecting and correcting codes, BCD code (8421 code), Gray codes, Excess three codes, ASCII, EBCDIC code. Basic gates, Universal gates and their truth tables, Boolean laws, De-Morgan's theorem, Duality theorem, realization of Boolean expressions using logic gates.

Unit 2 **Combinational Logic design**
SOP and POS form, K-Map minimization, don't care condition, Binary half and full adders and subtractors, BCD to Seven Segment decoder, binary to gray and gray to binary conversion, Quine McClusky minimization technique, Multiplexers, cascading of multiplexers, Demultiplexers, cascading of demultiplexers, Binary and BCD Adders.

Unit 3 **Flip-Flops, Sequential Logic Design**
Flip-flops - One bit memory cell, Clocked SRFF, JKFF, D- Type, T-type FF, Application of flip-flops. **Registers**- Shift registers, Universal register, Bi-directional register, Application of shift registers as ring counters, twisted ring counter. **Counters** - Ripple or Asynchronous Counters, Modulus of Counters, Introduction to 54/74 series asynchronous counter ICs, Cascading of ripple counter IC's, synchronous counters and synchronous counter design, up/down counters.

Unit 4 **8086 Microprocessor:** Introduction to 8086 microprocessor, Architecture, Pin diagram and signals of 8086, Programmers model of 8086, Segmentation, Logical to physical address translation, Even and Odd memory banks, Minimum /Maximum mode of 8086, Read /Write cycle timing diagrams.

Unit 5 Addressing modes, Instruction set, Instruction Formats, Stack, Assembler Directives, Procedures (Near & Far), Macro, Loop constructs, 8086 Programming examples. 8086 Interrupt structure, Interrupt Vector Table (IVT), ISR, Introduction to Advanced microprocessors.

Text and Reference Books:

1. R. P Jain, "*Modern Digital Electronics*", Tata Mcgraw Hill, 4th edition. ISBN 0-07-066911-2
2. R. P. Jain & Thomas L. Floyd, "*Digital Fundamentals*", Pearson, 9th edition
3. D. P. Leach, A. P. Malvino, G. Saha ,"*Digital Principles & Applications*", Tata Mcgraw Hill ,7th edition. ISBN 0-07-014170-3
4. Douglas Hall, "*Microprocessors & Interfacing*", McGraw Hill, Revised 2nd Edition, 2006 ISBN 0-07-100462-9
5. K.M. Bhurchandi, A.K.Ray "*Advanced Microprocessors and Peripherals: Architecture, Programming & Interfacing*", Tata McGraw Hill,2004 ISBN 1-25-900613-1

Web Resources:

NPTEL course : Digital Circuits https://nptel.ac.in/courses/108/105/108105113/
NPTEL course : Digital Circuits and Systems https://nptel.ac.in/courses/117/106/117106086/
NPTEL course : Microprocessors and Interfacing https://nptel.ac.in/courses/108/103/108103157/
Virtual Lab: Digital Electronics https://de-iitr.vlabs.ac.in/
Virtual Lab Digital Electronics Circuits http://vlabs.iitkgp.ernet.in/dec/

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course outcome	Program Outcomes												PSO's		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3											1	3		
CO2	1														
CO3	2	2	1										2		
CO4	3	1	2		1				2	1			1	1	
CO5	3	1			1				1	1		1	1	1	

3 - High 2 – Medium 1 –Low

Assessment:

ISE I: Class Test-I of Maximum Marks-15
ISE II: Class Test-II of Maximum Marks-15
ISE III: Teacher's Assessment of Maximum Marks-10
Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1) Quiz
2) Question & answer
3) Power point presentation
4) Any other activity suggested by course coordinator

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ESE: End Semester Examination of Maximum Marks-60

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**ISE II**	**ISE III**	**End Semester Examination**
K1	Remember	00	00	00	10
K2	Understand	10	10	05	20
K3	Apply	05	05	05	30
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	**K1, K2**	**K3**
	CO1	CO2,CO3, CO4,CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	10	05
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	30	30
Total Marks 100		

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ITPC2005: Lab Data Structure		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE I (Term Work)**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

CO1 Interpret neat code by selecting appropriate data structure

CO2 Discover the ability to write reusable code and abstract data types in C

CO3 Identify appropriate data types and algorithms for solving real life problems

CO4 Design and implement abstract data types with static or dynamic representation.

List of the Experiments:

The student shall perform minimum ten experiments of the following using TURBO C, C++/ Code Blokes.

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
	Level: Basic (all)			
1	Create an array of n integers. Perform following operations on array 1. Accept a value(item) from user and insert it into specified position 2. Delete a value(item) from specified position from given array 3. Display the content of the array	S2	CO1, CO3	2
2	Implement following program 1.Sort the following lists in ascending order using selection sort and quick sort Eg.56, 57, 92,38,44,90,61,73,22,87,54,21	S1	CO1, CO2	1
3	Implement following program 1.Sort the following lists in ascending order using radix sort and bubble sort Eg. 156, 57, 192,38,44,9,1,713,122,87,54,21	S1	CO1, CO2	1
4	Accept n array elements, perform following operations: a)Accept a number from user b)Apply following searching techniques on it, if number is found in given array; display the position of the number. 1. Linear search 2. Binary search	S3	CO2, CO3	2

5	Implement C program to accomplish the following stack operations. a)Push b)Pop c) Stack empty d)Stack Full e)Stack Empty	S2	CO2, CO3, CO4	2
6	Write C Program to convert following infix expression into prefix , postfix. Eg.(A+B)*(C^D)/H	S3	CO4, CO3, CO4	2
Level: Moderate (any three)				
7	Implement Simple queue and Circular queue to perform following operations. 1. Insert an elements 2. Deleting an element 3. Queue is Empty 4. Queue is Full 5. Display the element of queue.	S3	CO2, CO3, CO4	2
8	Implement Singly linked list to perform following operations. 1. Insert a number in the beginning , Specified position and ending position of the list 2. Delete a number from the beginning , Specified position and ending position of the list	S3	CO2, CO3, CO4	2
9	Implement Circular Doubly linked list to perform following operations. 3. Insert a number in the beginning , Specified position and ending position of the list 4. Delete a number from the beginning , Specified position and ending position of the list	S3	CO2, CO3, CO4	2
Level: Complex (any two)				
10	Create a binary tree to perform following operations 1. Insert a node 2. Search for a node 3. Deletion of a node 4. Traverse tree in inorder, preorder, postorder	S4	CO2, CO3, CO4	3
11	Implement a program to Traverse a Given graph using BFS and DFS	S4	CO2, CO3, CO4	3
12	Implement a c program to find shortest path using following techniques. 1. Dijkstra's Algorithm 2. Prim's Algorithm 3. Kruskal's Algorithm	S4	CO2, CO3, CO4	3

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Assessment:
ISE I (Term Work) : In-Semester Evaluation of 25 marks each will be based on practical assignments completed and timely submission

End Semester Evaluation: The ESE will be based on oral / practical performance of the students

Assessment Table:

Assessment Tool	K1	K2	K3	K3
	CO1	CO2	CO3	CO4
Term work(25Marks)	06	07	06	06
Practical Examination & Viva Voce(25 Marks)	06	07	06	06

Assessment Pattern: Use the relevant table for assessment pattern.

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**End Semester Examination**
S1	Imitation	06	06
S2	Manipulation	07	07
S3	Precision	06	06
S4	Articulation	06	06
S5	Naturalization	00	00
Total Marks		25	25

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course outcome	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
CO1	3	2	3		2								3	2	1
CO2	3	3	3		3								3	2	2
CO3	3	3	3	3	2							2	1	3	1
CO4	3	3	3	1	2								2	3	3

3 – High 2 – Medium 1 – Low

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ITPC2006 : Lab. Computer Networks		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE I**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes: After completion of this course students will be able to:

CO1	Exercise delay, throughput, addressing and network commands
CO2	Demonstrate algorithms and protocols used on different layers
CO3	Develop an ability to simulate LAN, routing, flow control, congestion control and reliable data transfer
CO4	Analyze network packets using Tools

Suggestive list of the Experiments:
The student shall perform minimum ten experiments of the following using TURBO C/C++/ Java/Python

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
Level: Basic (five) (5*1=5)				
1	Write a program for data transfer to simulate working of Physical Layer. Write two separate programs for sender and receiver, Sender Side: 1) accept a string, convert each character into ASCII and ASCII to Binary. Receiver Side: 1) Read Binary values sent by the sender, convert into ASCII and further convert ASCII to Character and finally display the string received.	S1	CO1	1
2	Use *ping* command along with at least five options for five different hosts and compare the results **ping** [**-t**] [**-a**] [**-n** *count*] [**-l** *size*] [**-f**] [**-i** *TTL*] [**-v** *TOS*] [**-r** *count*] [**-s** *count*] [**-w** *timeout*] [**-R**] [**-S** *srcaddr*] [**-p**] [**-4**] [**-6**] *target* [/**?**]P Perform a Trace Route for destination on three times hours of the day. a. Find the average and standard deviation of the round-trip delays at each of the three hours. b. Find the number of routers in the path at each of the three hours. Did the paths change during any of the hours? c. Try to find the physical location of the destination and check if the delay is influenced by the distance **TraceRoute Command Syntax** **tracert** [**-d**] [**-h** *MaxHops*] [**-w** *TimeOut*] [**-4**] [**-6**] *target* [/**?**]	S1	CO2	1

3	Write a program to find the Class of an IP address and also check the subnet mask	S1	CO2	1
4	To explore propagation delay and transmission delay, consider two hosts, A and B, connected by a single link of rate R bps. Suppose that the two hosts are separated by m meters, and suppose the propagation speed along the link is s meters/sec. Host A is to send a packet of size L bits to Host B. Write a program to calculate i) propagation delay, dprop = m/ s ii) transmission time of the packet, dtrans= L /R. iii) endtoend delay de-to-e = dprop+ dtrans (ignoring processing and queuing delays) (Eg Suppose s = $2.5*10^8$, L = 120 bits, and R = 56 kbps. Find the distance m so that dprop equals dtrans. Check the output for different input values)	S2	CO1	1
5	Host A then groups the bits into y-byte packets. There is one link between Hosts A and B; its transmission rate is z Mbps and its propagation delay is d msec. As soon as Host A gathers a packet, it sends it to Host B. As soon as Host B receives an entire packet, it converts the packet's bits to an analog signal. To calculate the time elapse from the time a bit is created (from the original analog signal at Host A) until the bit is decoded (as part of the analog signal at Host B). Write a program to calculate : i) Time required to build the packet = (y/x) msec ii) Time required to transmit the packet=(y/z) msec iii) Consider propagation delay w msec, and calculate Total delay	S2	CO2	1
Level: Moderate (any three from 7-10) (4*3=12)				
6	Leaky bucket consists of a bucket that can hold up to *b* tokens. If the bucket is filled with less than *b* tokens when a token is generated, the newly generated token is added to the bucket; otherwise the newly generated token is ignored, and the token bucket remains full with *b* tokens. Write a program to simulate Leaky bucket algorithm	S2	CO3	3
7	Write a program for DNS lookup. Given an IP address input, it should return URL and vice-versa.	S2	CO1	3
8	Write a program for error detection and correction for 7/8 bits ASCII codes using CRC	S3	CO3	3
9	Write a program to simulate the behavior of link state routing protocol to find suitable path for transmission	S3	CO3	3
10	Write a program to simulate the behavior of distance vector routing protocol	S3	CO4	3

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11	**Compulsory** Simulate a Local Area Network using Network Simulator 2 (Virtual Labs may be used) OR Use Wireshark for Packet sniffing and analysis			
Level: Complex (any two) (4*4=8)				
12	Write a program to simulate Go back N Mode of Sliding Window Protocol in peer to peer mode	S3	CO3	4
13	Write a program to simulate Selective Repeat Mode of Sliding Window Protocol in peer to peer mode	S3	CO3	4
14	Write a program using sockets for wired network to implement Peer to Peer Chat	S3	CO1	4

Assessment:
ISE I (Term Work) : In-Semester Evaluation of 25 marks each will be based on practical assignments completed and timely submission

End Semester Evaluation: The ESE will be based on oral / practical performance of the students

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**End Semester Examination**
S1	Imitation	04	04
S2	Manipulation	08	08
S3	Precision	10	05
S4	Articulation	03	03
S5	Naturalization	00	05
Total Marks		25	25

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Dated: 18th April 2023

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course outcome	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
CO1	1	3	2										2		3
CO2	1	2	2										2		1
CO3	1		2										2		1
CO4	1	3	1	2	3								2		3

3 – High 2 – Medium 1 - Low

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Dated: 18th April 2023

ITPC2007: Lab. Object Oriented Programming		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE I* (Term Work)**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes: After completion of this course students will be able to:

Course Outcomes

CO1	Understand the development environment for compiling, debugging and executing Java program.
CO2	Implement Object Oriented Programming concepts using Java programming.
CO3	Develop GUI using Applet & Swing components.
CO4	Analyze program using exception handling and multithreading.

List of the Experiments:

The student shall perform minimum ten experiments of the following using Java

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
Level: Basic (all) **Implement programs on Fundamentals of Java Programming**				
1	Write a Java program to convert time in seconds to hours, minutes and seconds and display the output in format HH:MM:SS	S1	CO1	02
2	Write a Java program to rearrange all the elements of a given array of integers so that all the odd numbers come before all the even numbers.	S2	CO2	02
3	Write a Java program that accepts three integers from the user and return true if two or more of them (integers) have the same rightmost digit. The integers are non- negative.	S2	CO2	02
4	Create a Java class called Complex with the following details as member variables within it. (i) Real (ii) Imaginary. Develop a Java program to perform addition and subtraction of two complex numbers by using the method add() and subtract( ) respectively, by passing object as parameter and display result using method display(). Initialize the real and imaginary values of the complex number using parameterized constructor. Also demonstrate overloading constructors and methods.	S2	CO2	02
5	Design an Address class with member variables Street num, city, state and country and appropriate constructor. Design a Student class with constructor (Student (String	S2	CO2	02

	USN, String Name, String addr)), College class with constructor (College (String Name, String addr)) and Employee class with constructor (Employee (String EmpID, String Name, String addr)). Write a Java program to create 'n' Student objects, College Objects and Employee objects and print the student, college and employee addresses respectively and demonstrate passing of object as a parameter to the constructor.			
Level: Moderate (any three)				
6	**Applet:** Write a java program that develop an applet that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.	S2	CO3	03
7	**AWT Controls and Event handling:** Write a java program that works as a simple calculator. Use a GridLayout to arrangeButtons for digits and for the + - * % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.	S2	CO3	03
8	**Exception Handling:** Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.	S3	CO4	03
9	**Multithreading:** Write a Java program that implements a multithreaded program with three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd the third thread will print the value of cube of the number.	S3	CO4	03
10	**Abstract classes, Inheritance & polymorphism:** Write a java program to create an abstract class named shape that contains two integers and an empty method named printArea(). Create three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class shape. Each one of the class contains only the method printArea() that print the area of the given shape	S2	CO2	03

Level: Complex (any two)				
11	Write a Java program for the following: i) Create a doubly linked list of elements. ii) Delete a given element from the above list. iii) Display the contents of the list after deletion	S3	CO4	03
12	Write a java program to simulate a traffic light. The program lets the user select one of the three lights: red, yellow or green. On selecting a button, an appropriate message with ”Stop” or “Ready” or “ Go” should appear above the buttons selected color.	S2	CO4	03
13	Write a Java program that implements Quick sort algorithm for sorting a list of names in ascending order.	S3	CO4	03

Assessment:
ISE I (Term Work) : In-Semester Evaluation of 25 marks each will be based on practical assignments completed and timely submission

End Semester Evaluation: The ESE will be based on oral / practical performance of the students

Assessment Table:

Assessment Tool	**S1**	**S2**	**S3**
	CO1	CO2, CO3	CO4
ISE I (Term Work)	05	10	10
End Semester Evaluation (Practical Examination & Viva Voce)	05	10	10

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	End Semester Examination
S1	Imitation	05	05
S2	Manipulation	10	10
S3	Precision	10	10
S4	Articulation	00	00
S5	Naturalization	00	00
	Total Marks	25	25

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes:

Course outcome	Program Outcomes												PSO's		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1												1		
CO2	1	1											2		1
CO3		1	2		3									2	
CO4		1	3		3		1	1	1	1	1	1		2	

3 – High 2 – Medium 1 - Low

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Dated: 18th April 2023

ITES2002: Lab Digital Electronics and Microprocessors		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE I (Term Work)**	**50 Marks**
Credits:01	**End Semester Evaluation**	**00 Marks**

Course Outcomes: After completion of this course students will be able to:

CO1 Implement functions with logic gates.

CO2 Build various combinational and sequential circuits, and test their functionalities.

CO3 Implement arithmetic/logical operations, block transfer/exchange using 8086 assembly language programming.

CO4 Develop 8086 assembly language programs to perform array operations and string manipulations.

List of the Experiments:

The student shall perform minimum ten experiments of the following using digital trainer kit, hardware components/digital logic simulator and MASM/8086 simulator.

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
Level: Basic (all)				
1	Implement basic gates, universal gates and verify their truth tables.	S1	CO1	04
2	Construct half adder, full adder, half subtractor, full subtractor and test their functionalities.	S2	CO1, CO2	04
3	Implement multiplexer/demultiplexer circuit and verify their operation.	S2	CO2	04
4	Write and execute 8086 ALP to perform addition and subtraction, multiplication and division, BCD arithmetic on two 16-bit numbers.	S1	CO3	04
5	Write and execute 8086 ALP to perform Logic operations –converting packed BCD to unpacked BCD, BCD to ASCII conversion.	S2	CO3	04
Level: Moderate (any three)				
6	Construct & analyze the code conversion circuits Binary to Gray Code, Gray to binary code.	S2	CO1, CO2	06
7	Build and test the functionality of BCD adder.	S2	CO1, CO2	06
8	Implement and verify Shift registers.	S2	CO2	06
9	Develop 8086 ALP to perform String operations- reverse string, length of the string.	S2	CO4	06

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10	Write and execute 8086 ALP to find smallest/largest number within an array.	S2	CO4	06
Level: Complex (any two)				
11	Design and analyze up/down counter, mod counter.	S2	CO2	06
12	Implement and analyze bidirectional Shift registers.	S2	CO2	06
13	Write and execute 8086 ALP to sort array in ascending /descending order.	S2	CO4	06
14	Implement String operations- string comparison, string concatenation using 8086 assembly language programming.	S2	CO4	06

Assessment:

ISEI (Term work) : In-Semester Evaluation of 50 marks based on performance of students in practical hours, practical assignments completed, and timely submission.

Assessment Table:

Assessment Tool	S1	S2
	CO1	CO2,C03, CO4
ISE1/ Term work(**50** marks)	10	40

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**End Semester Examination**
S1	Imitation	10	00
S2	Manipulation	40	00
S3	Precision	00	00
S4	Articulation	00	00
S5	Naturalization	00	00
Total Marks		**50**	00

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Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course outcome	Program Outcomes												PSO's		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3		1		2				1						
CO2	3	2	2		2				1			1	1		
CO3	3	1	1		2				1			1		1	
CO4	3	1	1		2				1			1	1	1	

3 – High 2 – Medium 1- Low

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MABS 2012:Engineering Mathematics-IV Semester-IV(For IT)	
Teaching Scheme **Lectures : 3 Hrs/Week** **Tutorial : 1 Hr/Week** **Total Credits : 04**	**Examination Scheme** **Class Test-I : 15 Marks** **Class Test-II : 15 Marks** **Teachers Assessment : 10 Marks** **End Semester Exam : 60 Marks**

Perquisites: Nil

Course Description: MABS 2012 Engineering Mathematics-IV is a compulsory course for second year IT students of the institute. The course aims to equip the students with statistical tools and concepts that help in decision-making. This course is intended to provide engineering students a coherent and balanced account of probability and statisticsthat form the basis of many engineering analysis tools. This course gives exposure on vector spaces and linear mapping.

Course objectives:

1. Create interest in students in statistical thinking.
2. To understand, analyze, and solve problems on random variables statistics, significance testing and goodness of fit tests for probability distributions
3. Understand vector spaces
4. Understand concepts of linear mapping and orthogonality.

Course Outcomes expected: On completion of this course student should be able to:

CO1 Define the basic concepts of probability distributions, random variable and sampling, vector spaces, subspaces, basis, linear transformation, eigenvalues, eigen vectors.

CO2 Explain the concepts of random variable, probability distributions and population parameters of large or small size sample, range and kernel of LT, inverse of LT, symmetric, skew-symmetric, and orthogonal matrices, Gram-Schmidt orthogonalization.

CO3 Find lines of regression, best fit of curve by least square methods. probability by using binomial distribution, poisson distribution, normal distribution, variance, standard deviation in terms of expectations, matrix associated with a linear map.

CO4 Compute and interpret the results of bi-variate regression and correlation analysis, for forecasting

CO5 Apply the regression techniques (least square method) and correlation techniques to the sample data, testing hypothesis for small and large samples, non-parametric tests for significance testing and goodness of fit of the probability distribution. Gram-Schmidt orthogonalization to find Orthogonal Basis.

Detailed Syllabus:

Unit-I **Basic Statistics:** Measures of central tendency, dispersion, moments, skewness and kurtosis, correlation coefficient, lines of regression, curve fitting, method of least square, straight lines, second degree parabola,

exponential and power curves, binomial distribution, poisson distribution, normal distribution.

Unit-II **Random Variables:** Random variable, discrete random variables, continuous random variables, definition of distribution and types of distribution: p.d.f, p.m.f, c.d.f. of random variables, characteristic function of random variables, univariate and bivariate distribution and its marginal distribution. **Mathematical Expectations:** Mathematical expectation: definition and properties, mean, variance, standard deviation in terms of expectations, moment generating function, characteristics function.

Unit-III **Sampling and Tests of Significance**: Basic concepts sampling and its type (simple random, stratified and cluster), its needs; types of hypothesis, types of error, critical region; level of significance, procedure of testing hypothesis, test of significance: large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations,
test for single mean, difference of means and correlation coefficients, test for ratio of variances - chi-square test for goodness of fit and independence of attributes.

Unit-IV **Linear Algebra-I:** Vector space, linear dependence of vectors, basis, dimension; linear transformations (maps), range and kernel of a linear map, rank and nullity, inverse of a linear transformation, rank-nullity theorem, composition of linear maps, matrix associated with a linear map.

Unit-V **Linear Algebra-II:** Eigen values, eigenvectors, symmetric, skew-symmetric, and orthogonal matrices, eigen bases, Diagonalization; inner product spaces, Gram-Schmidt orthogonalization.

Text and Reference Books:

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, S. Chand & Sons.
2. S.C. Gupta , Fundamentals of Statistics, Himalaya Publishing House
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
6. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", Elsevier, New Delhi, 5th Edition, 2004.

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Mapping of Course outcome with Program Outcomes (Information Technology)

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										2
CO2	3	2		1								2
CO3	3	2	1	2								2
CO4	3	2	2	2								2
CO5	3	2	2	3								2

3 – High, 2 – Medium, 1 – Low

Teaching Strategies:

The teaching strategy planned through the lectures, and team based home works. Exercises assigned weekly to stimulate the students to actively use and revise the learned concepts, which also help the students to express their way of solving the problems fluently in written form. Most critical concepts and mistakes emphasized

Assessment:
ISE I-Class Test-I of Maximum Marks-15
ISE II-Class Test-II of Maximum Marks-15
ISE III-Teacher's Assessment of Maximum Marks-10

Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1) Surprise test
2) Question & answer / Numerical solution
3) Quiz
4) Assignment using Mathematical tools like Mathematica/MatLab or similar
5) Any other activity suggested by course coordinator

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I (Class Test-1)**	**ISE II (Class Test-2)**	**ISE III (TA + Surprise Test)**	**End Semester Examination**
K1	Remember	01	03		
K2	Understand	14	12	10	60
K3	Apply				
K4	Analyze				
K5	Evaluate				
K6	Create				
Total Marks 100		15	15	10	60

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ITPC2010: Design and Analysis of Algorithms		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Tutorial: -	**ISE II**	**15 Marks**
Credits: 03	**ISE III**	**10 Marks**
	End Semester Examination	**60 Marks**

Course Description: The course design and analysis of algorithms is an introduction to algorithms. It covers various algorithm design techniques and methods to find time and space complexity of algorithms.

Course Outcomes: After completing the course, students will able to:

CO1 Explain the asymptotic complexity of algorithms by using mathematical foundations
CO2 Identify best, average and worst-case time complexity of algorithms
CO3 Choose appropriate algorithmic design technique for solving problems
CO4 Analyze the time and space complexity of algorithms

Detailed Syllabus:

Unit 1 **Introduction**
Algorithm concepts, need for analysis, time and space complexities, asymptotic notations for algorithms, analyzing control structures, worst and average, best case analysis, amortized analysis, Recurrence relations for analysis of recursive algorithms using Substitution method, Recursion tree method and Masters theorem

Unit 2 **Divide and conquer**
Divide and conquer basic strategy and its complexity, binary search, finding maximum and minimum, heap sort, Strassen's matrix multiplication. (Self Study: Selection Sort, quick sort) **Greedy method**: Basic strategy and its complexity, application to job sequencing with deadlines problem, minimum cost spanning trees, knapsack problem, optimal merge pattern, optimal storage on tapes.

Unit 3 **Dynamic Programming:** Basic strategy and its complexity, principle of optimality, multistage graphs, all pairs shortest path, travelling salesman problem, single-source shortest path **Traversal and Search Techniques:** Connected components and spanning trees, biconnected Components and DFS

Unit 4 **Backtracking**: Basic strategy, 8-Queen's problem, graph coloring, sum of subsets, graph coloring problem, Hamiltonian Cycles

Unit 5 **Branch and Bound:** The method of branch and bound, least cost search, 15 puzzle problem **NP Hard and NP Complete Problems:** Non deterministic algorithms, classes NP Hard and NP complete, clique decision problem, node cover decision problem chromatic number decision problem

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Text and Reference Books

1. Introduction to Algorithms: Cormen T.H. et.al: Prentice Hall of India
2. Computer Algorithms: Horowitz, Sahani, Rajasekhara, Galgotia Publications Pvt. Ltd
3. Fundamentals of Algorithms: Brassard, Bratley, Prentice Hall

Web Resources

5. https://onlinecourses.swayam2.ac.in/cec22_cs13/preview
6. https://onlinecourses.nptel.ac.in/noc22_cs27/preview
7. https://www.coursera.org/specializations/algorithms
8. https://archive.nptel.ac.in/noc/courses/noc15/SEM1/noc15-cs02/

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes

Course outcomes	Program Outcomes												Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	1	1							1	3		
CO2		3	2	2	1							1	3		
CO3			3	2	1							1		3	
CO4				3	2							1		3	

3 – High 2 – Medium 1 - Low

Assessment:

ISE I-Class Test-I of Maximum Marks-15
ISE II-Class Test-II of Maximum Marks-15
ISE III-Teacher's Assessment of Maximum Marks-10

Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1) Surprise test
2) Question & answer / Numerical solution
3) Quizzes
4) Power point presentation
5) Any other activity suggested by course coordinator

ESE-End Semester Examination of Maximum Marks-60

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Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	5	5	2	10
K2	Understand	7	7	3	20
K3	Apply	3	3	5	20
K4	Analyze	-	-	-	10
K5	Evaluate	-	-	-	-
K6	Create	-	-	-	-
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	K2	K3	K3	K3
	CO1	CO2	CO3	CO4
ISE I(15 Marks)	6	5	2	2
ISEII (15 Marks)	2	3	5	5
ISEIII (10 Marks)	2	2	3	3
ESE Assessment (60 Marks)	10	20	20	10
Total Marks 100	20	30	30	20

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ITPC2011 : Database Management System		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Tutorial: 0	**ISE II**	**15 Marks**
Credits:03	**ISE III**	**10 Marks**
	End Semester Examination	**60 Marks**

Course Description: Database Management System. In short, a DBMS is a database program. Technically speaking, it is a software system that uses a standard method of cataloging, retrieving, and running queries on data. The DBMS manages incoming data, organizes it, and provides ways for the data to be modified or extracted by users or other programs. Some DBMS examples include MySQL, PL/SQL, Microsoft Access, SQL Server, FileMaker, Oracle, RDBMS, dBASE, and FoxPro. Since there are so many database management systems available, it is important for there to be a way for them to communicate with each other.

Course Outcome: After completing the course, students will able to

CO1	Understand the basic concepts and architecture associated with DBMS
CO2	Translate entity-relationship diagrams into relational tables, populate a relational database and formulate SQL queries on the data
CO3	Apply normalization steps in database design and removal of data anomalies
CO4	Identify basic database storage structures and access techniques: file and page organizations, indexing methods
CO5	Analyze the principles and concepts of information integrity, security, confidentiality and transaction control

Detailed Syllabus:

Unit 1 **Introduction:**

Database definition, Necessity of database, DBMS, Examples, Characteristics of the Database Approach, Advantage of using a Database Approach, Database System Architecture, Data Models, Schemes and Instances, Data Independence, Database Languages and Interfaces, Database System Environment, Classification of Database Management Systems. Database users and administrator.

Unit 2 **ER Models, Relational Models:**

Different types of integrity constraints-Primary Key, Unique , Foreign key, Check, Not Null, Super key, Candidate Key **E-R model**- Entity, Entity set, Strong and Weak entity ,Entity-Relationship Diagrams, Entity-Relationship Design Issues, Weak Entity Sets, Attributes-Simple, Derived, Composite, Multi valued, Identifier, Relationship, Associative entity, Cardinality constraints, Degree of relationship. E-R diagram naming conventions and design issues. Examples, Extended E_R Features. **Relational Models:**-the Relational Data Model, the Relational Algebra: Fundamental Relational-Algebra Operations, Additional Relational-Algebra Operations, Extended Relational-Algebra operations. ER-to-Relational Mapping

Unit 3 **SQL:**

Background, Structure of SQL Queries, Data Definition language-Create, alter, Describe, Drop, Truncate clause, create table using Integrity constraints Select clause, Set Operations, Functions-single row functions-general, conversion, date, character, Multiple row functions -Aggregate

Functions, Group by clause, Having clause, Nested Sub queries, Complex Queries, Views, Modification of the Data-DML-Insert, Update, Delete, Different types of joins **Advanced SQL :,** Authorization and transaction control SQL clauses, Embedded SQL, Introduction to PL/SQL-Cursor, triggers, Procedures.

Unit 4 **Database Designing and Storage:**

Relational Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Decomposition Using Functional Dependencies, Decomposition using Multivalued Dependencies, More Normal Forms up to BCNF. **Storage and File Structure:** Overview of Physical Storage Media, Data-Dictionary Storage.

Unit 5 **Query Processing and Transaction Processing:**

Overview of Query Processing, Measures of Query Cost, Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation. Transaction support in SQL Concurrency control techniques, concurrency control based on timestamp based protocol, validation based protocol, deadlock handling, Database Recovery Techniques based on Immediate Update, Failure classification, Shadow Paging, Log based recovery, failure with loss of Nonvolatile Storage

Text Books & Reference Books

1. Abraham Silberschatz and Henry Korth, Sudarshan : Database System Concepts, 5th Edition, ISBN : 0-07-120413X, Tata McGraw-Hill. Author, Title of the book, Publisher, Edition, Year of publication
2. Elmasri and Navathe : Fundamentals of Data base Systems (5th Ed.), Addison-Wesley, 1999.
3. Raghu Ramakrishnan, "Database Management System", Tata McGraw-Hill Publishing Company, 2003.
4. Hector Garcia–Molina, Jeffrey D.Ullman and Jennifer Widom- "Database System Implementation"- Pearson Education- 2000. 3. Peter Rob and Corlos Coronel- "Database System Concepts", Cengage Learning Edition 2008

Web Resources

https://onlinecourses.nptel.ac.in/noc19_cs46/preview
https://onlinecourses.swayam2.ac.in/cec21_cs11/course

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course outcome	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
CO1	1	2	2	1									1		
CO2	1	2	2										2	2	2
CO3		2	3	3									2	2	3
CO4		1	1											1	
CO5			2	3									1	1	

3– High 2 – Medium 1 – Low

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Assessment:
ISE I-Class Test-I of Maximum Marks-15
ISE II-Class Test-II of Maximum Marks-15
ISE III-Teacher's Assessment of Maximum Marks-10

Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1) Surprise test
2) Question & answer / Numerical solution
3) Quizzes
4) Power point presentation
5) Any other activity suggested by course coordinator

ESE-End Semester Examination of Maximum Marks-60

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**ISE II**	**ISE III**	**End Semester Examination**
K1	Remember	05	05	00	05
K2	Understand	10	10	05	25
K3	Apply	00	00	05	18
K4	Analyze	00	00	00	12
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	**K2**	**K2**	**K3**	**K4**
	CO1	CO2,CO3	CO4	CO5
ISE I (15 Marks)	05	10	00	00
ISE II (15 Marks)	05	10	00	00
ISE III (10 Marks)	00	02	05	03
ESE Assessment (60 Marks)	10	20	18	12
Total Marks 100				

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ITPC2012: Operating System		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Tutorial: 0	**ISE II**	**15 Marks**
Credits:03	**ISE III**	**10 Marks**
	End Semester Examination	**60 Marks**

Course Description: This course covers mechanisms, algorithms, and techniques used to build an operating system. It gives description about the operating system structure and the hardware support for building modern operating systems. We will cover processes, threads, inter-process communication, synchronization, and CPU scheduling. We will discuss in detail memory management. Finally, we will introduce I/O, file systems, and OS security issues.

Course Outcome: After completing the course, students will able to

CO1 Interpret fundamental concepts, structures, layers and types of OS

CO2 Apply process scheduling using various types of system call to find process states

CO3 Analyze synchronization techniques for interprocess communication.

CO4 Classify the mechanisms adopted for memory management and file management

CO5 Examine the issues related to security in OS

Detailed Syllabus:

Unit 1 **Introduction to operating system:** introduction to OS, evolution of Oss, functions of OS, OS structure, types of operating systems, basics of system calls.

Unit 2 **Process Management:** Concept of a process: states, operations with examples from UNIX (fork, exec) and/or Windows. Process scheduling, interprocess communication (shared memory and message passing), UNIX signals.
Threads: multithreaded model, scheduler activations, examples of threaded programs.
Scheduling: multi-programming and time sharing, Context switch, scheduling algorithms, multiprocessor scheduling, and thread scheduling (examples using POSIX threads).

Unit 3 **Process Synchronization**: critical sections, classical two process and n-process solutions, hardware primitives for synchronization, semaphores, monitors, classical problems in synchronization (producer-consumer, readers-writer, dining philosophers, etc.).
Deadlocks: characterization, prevention and avoidance, detection and recovery.

Unit 4 **Memory Management:** Basic concepts of memory, types of memory, swapping, paging segmentation, fragmentation, demand paging, virtual memory, page replacement algorithms, working set model, implementations from operating systems such as UNIX, windows, current Hardware support for paging e.g. Pentium/ MIPS processor.

Unit 5 **File Management and security of OS:** Secondary storage and Input/output, device controllers and device drivers file systems, directory structure, disks, disk space management, disk scheduling, NFS, RAID, other devices, Operations on them, UNIX FS, UFS protection and security, NFS. Protection and security: Illustrations of security model of UNIX and other OSs. Examples of attacks.

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Text Books & Reference Books

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, 8th Ed., John Wiley, 2008.
2. William Stallings, Operating Systems: Internals and Design Principles. Prentice-Hall, 6th Ed., 2008.
3. AS Tanenbaum, Modern Operating Systems, 3rd Ed., Pearson, 2009.
4. AS Tanenbaum, AS Woodhull, Operating Systems Design and Implementation, 3rd Ed., Prentice Hall, 2006.
5. M. J. Bach. Design of the Unix Operating System, Prentice Hall of India, 1986.

Web Resources

- https://nptel.ac.in/courses/106106144
- https://www.os-book.com/OS9/slide-dir/index.html

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course outcome	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
CO1	2	3	1	2	2								3	2	2
CO2		1	2	3	2								2	3	2
CO3		1	1	3	3						2		2	3	2
CO4			1	2	3		2						2	2	3
CO5				2	3	2	2	2			2	1	2	2	3

3– High2 – Medium 1 – Low

Assessment:

ISE I-Class Test-I of Maximum Marks-15
ISE II-Class Test-II of Maximum Marks-15
ISE III-Teacher's Assessment of Maximum Marks-10

Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1) Surprise test
2) Question & answer / Numerical solution
3) Quizzes
4) Power point presentation
5) Any other activity suggested by course coordinator

ESE-End Semester Examination of Maximum Marks-60

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Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	05	00	00	05
K2	Understand	10	05	05	20
K3	Apply	00	05	05	20
K4	Analyze	00	05	00	10
K5	Evaluate	00	00	00	05
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	**K1**	**K2**	**K3**
	CO1	CO2,CO3	CO4,CO5
ISE I (15 Marks)	05	10	00
ISE II (15 Marks)	00	10	05
ISE III (10 Marks)	00	05	05
ESE Assessment (60 Marks)	10	25	25
Total Marks 100			

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ITPC2013: Internet of Things		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Tutorial: -	**ISE II**	**15 Marks**
Credits: 03	**ISE III**	**10 Marks**
	End Semester Examination	**60 Marks**

Course description: Now-days, the Internet of Things has received enormous attention. It has the potential to optimize the performance of systems and processes, deliver solutions that dramatically improve energy efficiency, security, health, education and improves quality of life. For enterprises, IoT can underpin solutions that improve decision-making and productivity in manufacturing, retail, agriculture and other sectors. This course is aimed to familiarize the students with the concept of IoT and includes IoT architecture, protocol and analytics. Also, this course covers Web of Things, Cloud of Things, security and privacy for IoT, and applications of IoT.

Course Outcomes: After completing the course, students will able to:

CO1 Understand and explore the concepts of Internet of Things.
CO2 Describe architecture, building blocks, and communication Technologies of IoT.
CO3 Interpret Web of Things and Cloud of Things architectures.
CO4 Summarize security issues and security services of IoT
CO5 Use IoT protocols and analytics to design an IoT application.

Detailed Syllabus:

Unit 1 **Introduction to Internet of Things** - Introduction to IoT, Overview of IoT, What is IoT, Why IoT, Vision of IoT, Characteristics of IoT, Four Pillars of IoT, Challenges and requirements of IoT, Opportunities for IoT, Introduction to M2M, M2M to IoT, An emerging industrial structure for IoT- Industry 4.0

Unit 2 **IoT Architecture** - IoT Layered Architecture, Building blocks of IoT, Networking and Communication, Wired & Wireless connectivity and technology, IoT Communication Models and APIs, Wireless Sensor Network, IoT Communication technologies, NFC, RFID, ZigBee.

Unit 3 **IoT Protocol and Analytics** - IoT Protocol stack, TCP/IP Protocol stack vs IoT Protocol stack, IoT Protocol Standardization, IoT Protocols- MQTT, CoAP, AMQP, DDS, REST, XMPP, Cloud Computing in IoT- IoT with Cloud Architecture, IoT Analytics, Data visualization and its importance in IoT , IoT front end interface, Internet of Things and Big Data.

Unit 4 **Web of Things-** Web of Things versus Internet of Things, Two Pillars of the Web Architecture, Standardization for WoT, Platform Middleware for WoT, Unified Multitier WoT Architecture, WoT Portals and Business Intelligence.
Cloud of Things - The Cloud of Things Architecture.

Unit 5 **IoT Security, Privacy and Trust -** Need of IoT Security, Issues in IoT security, Trust for IoT, Security and Privacy for IoT, Physical IoT Security, On Devices Security and

Privacy, IoT Applications, Case studies of IoT - Case studies of Smart home, Smart city, and Smart environment.

Text and Reference Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "*From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence*", 1st Edition, Academic Press, 2014, ISBN: 978-0-12-407684-6
2. Vijay Madisetti and Arshdeep Bahga, "*Internet of Things (A Hands-on-Approach)*", 1stEdition, VPT, 2014, ISBN: 978-0996025515
3. Francis daCosta, *"Rethinking the Internet of Things: A Scalable Approach to Connecting Everything*", 1st Edition, Apress Publications, 2013, ISBN-13: 978-1430257400
4. Raj Kamal, "*Internet of Things: Architecture and Design Principles*", 1st Edition, McGraw Hill Education, 2017, ISBN: 978-9352605224

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs53/preview
2. https://www.iiitmk.ac.in/iot-lab/
3. https://iotify.io/iot-virtual-lab/

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes

Course outcomes	Program Outcomes												Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3				1	1	1	1	1	1	1	1	1	1	1
CO2	1					1	1								
CO3	1			1											
CO4						2	2	2							
CO4	3	2	2	1	2	2	2	2	2	1	1		3	3	3

3 – High 2 – Medium 1 - Low

Assessment:

ISE I-Class Test-I of Maximum Marks-15
ISE II-Class Test-II of Maximum Marks-15
ISE III-Teacher's Assessment of Maximum Marks-10

Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1) Surprise test
2) Question & answer / Numerical solution
3) Quizzes
4) Power point presentation

5) Any other activity suggested by course coordinator

ESE-End Semester Examination of Maximum Marks-60

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**ISE II**	**ISE III**	**End Semester Examination**
K1	Remember	05	00	05	10
K2	Understand	10	10	05	30
K3	Apply	00	05	00	20
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		**15**	**15**	**10**	**60**

Assessment table:

Assessment Tool	**K2**	**K2**	**K2**	**K3**
	CO1	**CO2**	**CO3,CO4**	**CO5**
ISE I (15 Marks)	10	05	00	00
ISEII (15 Marks)	05	10	00	00
ISEIII (10 Marks)	00	05	05	00
ESE Assessment (60 Marks)	15	15	20	10
Total Marks 100	30	35	25	10

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ITPC2014: Lab- Design and Analysis of Algorithms		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE I**	**25 Marks**
	End Semester Evaluation	**25 Marks**

Course Outcomes: After completion of this course students will be able to:

- **CO1** Experiment with recursive and iterative algorithms
- **CO2** Make use of divide and conquer approach and greedy algorithms
- **CO3** Write programs using dynamic programming techniques and traversal techniques
- **CO4** Write programs on backtracking approach and branch and bound techniques

List of the Experiments:

The student shall perform minimum ten experiments from the following list:

Sr. No.	Title of the Experiments	Skill/ Knowledge Level	CO	Marks for ESE
Level: Basic (All)				
1	Implement recursive and iterative algorithms for specific problems.	S2	1	2
2	Implementation of sorting methods using recursion.	S2	1	2
3	Write a program for finding maximum and minimum using divide and conquer approach	S2	2	2
Level: Moderate (Any six)				
4	Implement merge sort using divide and conquer approach.	S2	2	2
5	Implement the Greedy Knapsack problem.	S2	2	2
6	Write a program for finding minimal spanning Trees using Prim's/ Kruskal's Greedy approach.	S2	2	2
7	Write a program for finding shortest path using multistage graph problem.	S2	3	2
8	Implement the all-pairs shortest path problem using dynamic programming approach.	S2	3	4
9	Implement the different techniques for tree traversals	S2	3	2
10	Implement the graph traversal techniques	S2	3	2
Level: Complex (Any one)				
11	Illustrate 8-Queens problem using general backtracking method and recursive backtracking method.	S3	4	2

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12	Implement a program for travelling salesperson problem algorithm using (a) Backtracking approach, and (b) Branch and Bound approach	S3	4	4

Assessment:
ISE I (Term Work): In-Semester Evaluation of 25 marks will be based on practical assignments completed and timely submission
End Semester Evaluation: The ESE will be based on oral / practical performance of the students

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level/Skill acquired**	**ISE I**	**End Semester Examination**
S1	Imitation	5	5
S2	Manipulation	15	10
S3	Precision	5	10
S4	Articulation	-	-
S5	Naturalization	-	-
Total Marks 100			

Assessment table:

Assessment Tool	**S3**	**S3**	**S3**	**S3**
	CO1	CO2	CO3	CO4
ISE I (25 Marks)	5	5	8	7
ESE Assessment (25 Marks)	5	5	8	7
Total	10	10	16	14

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course outcome	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
CO1			3		3							2	3	2	1
CO2			3		3							2	3	2	1
CO3			3		3							2	3	2	1
CO4			3		3							2	3	2	1

3 – High 2 – Medium 1 – Low

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ITPC2015: Lab Database Management System		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE I (Term Work)**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes: After completion of this course students will be able to:

CO1 Identify and test SQL queries using DDL and DML commands

CO2 Discover the need for logical operation, set operators, UNION, DISTINCT, LIKE, and use them appropriately

CO3 Evaluate PL/SQL queries

CO4 Design ER-models to represent simple database application scenarios

List of the Experiments:

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
Level: Basic (all)				
1	To Study different types of Oracle/ MySQL etc Data types	S1	CO1,CO2	2
2	To Study and Implement different types of DDL commands.	S1	CO1	2
3	To study and Implement different types of DML commands.	S2	CO1	2
4	To study and Implement different integrity constraints	S3	CO1,CO2	2
Level: Moderate (any three)				
5	To Implement different types SQL functions	S3	CO1,CO2	2
6	To Implement subqueries.	S3	CO1,CO2, CO4	2
7	To study and Implement views.	S3		2
8	To Implement different types of joins	S3	CO1,CO2, CO4	2
Level: Complex (any two)				
9	Study of Open Source Databases : MySQL	S4	CO1,CO2	2
10	Design at least 10 SQL queries for suitable database application using SQL DML statements: Insert, Select, Update, Delete with operators, functions, and set operator	S3,S4	CO1,CO2,CO3	3
11	To study and Execute cursor and procedure in PL/SQL	S4	CO1,CO2, CO3	3
12	To study and Execute trigger in PL/SQL	S4	CO1,CO2, CO4	3

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Assessment:
ISE I (Term Work): In-Semester Evaluation of 25 marks will be based on practical assignments completed and timely submission
End Semester Evaluation: The ESE will be based on oral / practical performance of the students

Assessment Table:

Assessment Tool	S1	S2	S3	S4
	CO1	CO2	CO3	CO4
Term work(25Marks)	06	07	06	06
Practical Examination & Viva Voce(25 Marks)	06	07	06	06

Assessment Pattern: Use the relevant table for assessment pattern.

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**End Semester Examination**
S1	Imitation	06	06
S2	Manipulation	07	07
S3	Precision	06	06
S4	Articulation	06	06
S5	Naturalization	00	00
Total Marks		25	25

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course outcome	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
CO1	1	2	1											1	
CO2	1	2	2	3									1	1	2
CO3	1	2	3	2										2	2
CO4		2	3	3	2									3	3

3 – High 2 – Medium 1 - Low

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ITPC2016 : Lab Operating System		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE I (Term Work)**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes: After completion of this course students will be able to:

CO1	Make use of different system and I/O calls, UNIX commands and shell programming.
CO2	Demonstrate algorithms for process scheduling and process synchronization.
CO3	Determine interprocess communication and memory management schemes.
CO4	Select and implement security solutions, file handling to manage projects.

List of the Experiments:

The student shall perform minimum ten experiments of the following using variants of OSs

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
Level: Basic (all)				
1	Installation guidelines of various operating systems.	S1	CO1	2
2	Basic commands interpretation using OS features.	S1	CO1	1
3	Implement shell programming.	S1	CO1	1
4	Implement system calls fork (), exec () etc. and observe process states.	S2	CO1,CO2	2
Level: Moderate (any three)				
5	Simulate the following CPU scheduling algorithms (any two) a) FCFS b) SJF c) Round Robin d) Priority.	S3	CO2	2
6	Simulate Bankers Algorithm for Dead Lock Avoidance and Dead Lock Prevention	S3	CO3	2
7	Write a C program to simulate producer-consumer problem using Semaphores.	S3	CO2,CO3	2
8	Write a C program to simulate the concept of Dining-philosophers problem.	S3	CO2,CO3	2
Level: Complex(any three)				
9	Write a C program to simulate the following contiguous memory allocation Techniques a) Worst fit b) Best fit c) First fit.	S3	CO3,CO4	3

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10	Simulate all page replacement algorithms (any two) a)FIFO b) LRU c) OPTIMAL	S4	CO3,CO4	3
11	Write a C program to simulate disk scheduling algorithms(any two) a) FCFS b) SCAN c) C-SCAN	S4	CO3,CO4	3
12	Simulate all file allocation strategies a) Sequential b) Indexed c) Linked.	S4	CO3,CO4	2

Assessment:
ISE I (Term Work): In-Semester Evaluation of 25 marks will be based on practical assignments completed and timely submission
End Semester Evaluation: The ESE will be based on oral / practical performance of the students

Assessment Table:

Assessment Tool	S1	S2	S3	S4
	CO1	CO2	CO3	CO4
Term work(25Marks)	06	07	06	06
Practical Examination & Viva Voce(25 Marks)	06	07	06	06

Assessment Pattern: Use the relevant table for assessment pattern.

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**End Semester Examination**
S1	Imitation	06	06
S2	Manipulation	07	07
S3	Precision	06	06
S4	Articulation	06	06
S5	Naturalization	00	00
Total Marks		25	25

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

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

3 – High 2 – Medium 1 – Low

ITPC 2017 : Lab Internet of Things		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE I (Term Work)**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes: After completion of this course students will be able to:

CO1 Implement interfacing of I/O devices with Arduino/ Raspberry Pi.

CO2 Implement interfacing of various sensors, shield with Arduino/Raspberry Pi.

CO3 Implement different protocols using Arduino/ Raspberry Pi.

CO4 Design and implement IoT system for real time applications.

List of the Experiments:

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
Level: Basic (all)				
1	Implement a program using Arduino IDE for Blink LED.	S2	CO1	2
2	Implement a program for RGB LED using Arduino.	S2	CO1	2
3	Implement interfacing of ultra-sonic sensor with Arduino.	S2,S3	CO1, CO2	2
4	Implement a Program for foe monitor temperature using Arduino.	S2,S3	CO1,CO2	2
5	Implement WiFi shield using Arduino.	S2	CO1, CO2	2
Level: Moderate (any three)				
6	Implement RFID, NFC using Arduino/Rasberry Pi	S2	CO1, CO3	2
7	Implement MQTT protocol using Arduino.	S2	CO1, CO3	2
8	Implement Web controlled LED using REST protocol and Arduino.	S2	CO1, CO3	3
9	Build Google Assistant with Raspberry Pi.	S2	CO1,CO3	3
10	Create a simple web interface for Raspberry Pi board to control the connected LEDs remotely through the interface.	S2	CO1,CO2, CO3	3
Level: Complex (any two)				
11	Implement Zigbee Protocol using Arduino / Raspberry Pi.	S2	CO1,CO3	4
12	Implement Arduino based *fire alarm system* using emperature and smoke sensors.	S2,S3,S4	CO1,CO2, CO4	4

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13	Implement a weather monitoring system using humidity, temperature and raindrop sensor and Raspberry Pi/Arduino board.	S2,S3,S4	CO1,CO2, CO4	4
14	Write an application using Raspberry Pi/Arduino for traffic signal monitoring and control system.	S2,S3,S4	CO1,CO2, CO4	4

Assessment:
ISE I (Term Work): In-Semester Evaluation of 25 marks will be based on practical assignments completed and timely submission
End Semester Evaluation: The ESE will be based on oral / practical performance of the students

Assessment Table:

Assessment Tool	**S2**	**S3**	**S4**
	CO1,CO2	CO3	CO4
ISE1/ Term work(**25** marks)	15	10	00
ESE (25 Marks)	10	10	05

Assessment Pattern: Use the relevant table for assessment pattern.

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**End Semester Examination**
S1	Imitation	00	00
S2	Manipulation	15	15
S3	Precision	05	05
S4	Articulation	05	05
S5	Naturalization	00	00
Total Marks		**25**	**25**

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes
3 – High 2 – Medium 1 - Low

Course outcome	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
CO1	3								1				1	1	
CO2	3								1			1	1	1	
CO3	3								1			1	1	1	
CO4	3	2	2	1	2	2	2	2	2	1	1	1	2	2	2

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Following is the list of courses from CBCS curriculum and their equivalent courses from new CBCS curriculum:

Table of Equivalence for the courses of SY IT					
CBCS			**New CBCS**		
Course Code	**Course Code**	**Course Code**	**Course Code**	**Course Name**	**Credits**
IT2032	Data Structures	IT2032	ITPC2002	Data Structures	3
IT2035	Lab- Data Structures	IT2035	ITPC2005	Lab- Data Structures	1
IT2039	Database Management Systems	IT2039	ITPC2011	Database Management Systems	3
IT2041	Lab- Database Management Systems	IT2041	ITPC2015	Lab- Database Management Systems	1

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